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MOBILE HEALTH APPLICATION AND COVID-19: OPPORTUNITIES AND CHALLENGES

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ABSTRACT:

The Novel Coronavirus has been declared a pandemic by the World Health Organization (WHO), which as at April 27, 2020 COVID-19 infected more than 2,959,929 people worldwide and resulted in more than 202,733 deaths in 213 countries. In recent times, mobile technologies have expanded exponentially in both emerging and developed countries. Mobile technology adoption is now much greater than those of traditional internet and land-line telephones. Mobile Phone tracking approach is a powerful tool in the fight against the COVID- 19 pandemic. Since the outbreak of the pandemic, there has been a scramble to use mobile phone to fight the virus. A lot of measures have been taken to reduce the rate of community transmission and despite the various measures taken; the rate of the infection and mortality rate is still very high. Therefore, this paper discusses the model of mobile tracking surveillance and monitoring for prompt detection of infected patient. The paper also, made efforts to convey the benefits the government and public health authorities can derived in determining the best course of action to control the COVID-19 pandemic. The hope of using mobile tracking technology in COVID-19 will have a great impact on the quality of outbreak care that can be delivered to patients across socioeconomic and geographic boundaries.

KEYWORDS: COVID-19, Mobile health, Surveillance, Infectious disease

I. INTRODUCTION

According to the Telecom Regulatory Authority of India's 2014 report (TRAI), there are 943.9 million cellular telephones in India with a teledensity of 75 percent and a share of 97 percent of total telephones (Choy, 2017). The TRAI study also discusses that while wired internet covers about 10 percent of the population (mostly in big cities), internet service reaches deep into every demographic, and more significantly, most of us have access to a mobile device either through their phone or a family member's shared phone. This makes cell phones the most common forum for computing. The cell phone offers omnipresent connectivity and customized computing. This fact alone makes them an ideal option for different personal use uses, such as knowing about the transport medium, health care guidance, education, or entertainment. Mobile device portability is the key and most important feature of mobile devices. Portability is therefore done at the high cost of the mobile device's limited power and processing ability.

Infectious diseases are causes of mortality and morbidity worldwide, which impact many countries severely. Mobile devices are used in the healthcare industry for several purposes. Most significantly, they require new ways of treating infectious diseases by offering powerful resources for effective prevention and treatment for doctors and patients alike. Because COVID-19's common risk factors are linked to human behavior, cell phone-based health approaches can also be used to counter the burden of COVID-19 by concentrating on behavioral improvement interventions to encourage a healthier lifestyle.

Mobile health (mHealth) is the process of using remote communication tools to promote clinical and public health practice [3, 4]. Smart devices are portable in form and include cell phones, remote personal assistants, apps for patient tracking, and other wireless devices. mHealth technologies are attracting significant attention due in large part to global mobile technology proliferation. Over 85% of the world's population has been projected to be reached by a commercial wireless connection with over 5 billion cell phone subscriptions [5, 6]. Mobile healthcare

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apps vary from contact between patients and health services (such as call centers, schedule notifications, compliance with treatment) to health tracking and surveillance (such as reports, patient tracking devices), and accessibility to point-of-care details (sanitary records, decision support).

Mobile monitoring applications were also used by health authorities and associations to help patients collect, interpret, process, and distribute health-based information from sensors and other biomedical systems. Mobile tracking technologies are among the privacy-critical applications that address the risks of the life of the user, especially patients, they need a functionality that can meet the needs and expectations of users, both patients and healthcare personnel.

Coronavirus, (COVID-19) is highly infectious disease. The high rate of transmission of this novel virus is very alarming as the number of confirmed cases of people that contacted the diseases increases daily with the majority of these cases (n=983,457) reported in the United States of America alone, preceded by Spain (n=209,465) and Italy (n=199,414) (https:/covid19.who.int/). According to World Health Organization (WHO), as at 27 April, 2020 over 2,959,929 confirmed and 202,733 death recorded cases in 213 countries. COVID-19 outbreak was declared by WHO 30th January 2020 as a global emergency [1] with numerous health bodies such as the WHO and Centre for Disease Control and Prevention (CDC) in United State have cautioned against further spread of infectious disease [1, 2]. They suggest avoiding traveling to high-risk areas, interaction with symptomatic persons, and meat intake from locations with established COVID-19 outbreaks. Personal hygiene steps, including regular hand washing and the use of PPE, such as face masks, are also recommended. Management focuses mainly on delivering compassionate care, with respiratory treatment being the primary factor in treatment. Often advocated was treatment containing corticosteroids and antivirals as part of vital management schemes. Nonetheless, no particular antiviral is currently approved for the treatment of COVID-19, and there is currently no vaccine available. The amount of new confirmed cases keeps growing at a deeply disturbing pace, given the strategic implementation of those measures. Consequently, up-to-date management recommendations for the defense against COVID-19 are urgently needed. Therefore, this paper discusses the concept of mobile tracking approaches to COVID-19 disease surveillance and monitoring for prompt detection of the infected or suspected person.

II. MOBILE TRACKING APPLICATION IN HEALTHCARE

In the modern day technology, Mobile technologies is of high significance due to the enormous impact it plays in the advent of the ubiquitous computing gadgets, such gadgets includes: mobile phones, computers, mobile computers, PDA, PC, smart phones and many others. The governments, educational institution, banking institution, and so many others change to the use of mobile technologies for their businesses in replacement for the desktop applications so as to ensure an expanded and enlarged business with no limitations. The M-Health applications as also been adopted by the Health organizations and agencies in other to offer patients the ease of capturing, analysing, processing and transmitting health related information from biomedical systems and sensors. Lately, Mobile technologies has turn out to be a significant tool for interactions and communications beyond limit. Since mostly all mobile devices today are equipped with high computing capability. Various applications have transformed to the mobile application from the earlier standalone application where the possibility of linking with thousands and millions of the populace with astonishing technologies is achievable.

The effect of this happening has indirectly affected the M-Health applications as at now the mHealth application had transformed the conventional technique of getting things done in the healthcare system to the newly advanced method been brought about by the support of Smartphone. Where it is been used for capturing, analysing and transmitting health related information from sensors and biomedical systems. [7, 8] stated in his research that the health care system is very complex and highly risky. To allow for its efficient use, it is expedient that the M-Health application possesses all the required and quality attributes. Conducting software testing is the only way to achieve maximum quality. Several mobile applications even after undergoing different testing types and stages, before getting to the end testing phase, they are still unable to meet the user's requirements. At times user acceptance testing might have been ignored or may have not been conducted properly for the mobile applications. Conducting proper user acceptance test is of great importance in the mHealth application as it has great effect on human life. It classifies as one of the safety-critical type applications. In the advanced countries, Feature phones and basic phones have been replaced greatly by smart phones such as Samsung Galaxy, Google Nexus, Apple iphones and so

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many more. Basic phones are still predominant in the developing countries due to the expensive cost of smart phones.

Nevertheless, the usage and ownership of Android based smart phones here are increasing rapidly. The feature phones can still be used in obtaining and transmitting health based data despite the fact that it has a narrow computing capability. For instance short message services (SMS) is used in transmitting text messages. Therefore, given that smart phones are basically powerful computers that has the capacity to store huge amounts (16–128 GB or more) of data, infinite quantity of clinical and health knowledge in form of databases and applications can be easily stored on it. This great capability enables and aid medical knowledge, advice and technical know-how to be available any time and at anywhere.

This is in contrast to a common deed in telemedicine in which a person that needs medical care interacts directly with a medical expert via video conference or phone. In such situation, software and hardware for telemedicine shrinks the geographical distances. As both the medical expert and the patient are in a two way (synchronous) communication. And synchronous transmission is aided respectively. This shows that a busy medical expert must create time in other take part in the remote encounter with the patient and their local giver and may unable to partake or possible with the patient and their local giver and may unable to partake or possibly delay in participating at the appointed time due to an unforeseen circumstances or events. Conversely, to schedule time from the busy schedule of a medical specialist or expert may be challenging. The local care giver could be one of the following, a health worker, physician, or a closed member of the patients' family.

The major advantage of mHealth is inherent in the name itself. "Mobility" A good example is the recent development brought forward by the India government called ArogyaSetu. ArogyaSetu is a mobile application initiated to bond the health care services with the India populace in other to combine fights against corona virus (COVID-19) pandemics. This app is targeted to augment Government initiatives in India, particularly the Department of health, in actively getting across to and informing the users of the app as regards the risks, best practices and relevant advices relating to how to contain COVID-19 epidemic. The good aspect of the application is its usefulness in tracking the COVID-19 cases; however two important things are missing: It depicts the number of people who took the self-assessment and number of people confirmed positive for COVID-19 in a particular area, but does not show the distance or geographical location of the COVID-19 positive confirmed users despite that it uses GPS. The app is used by low number of people, and even very few people take the self-assessment. For more effectiveness, linking this application to a cost free aadhaara verifiable 12-digit identification number that was issued by the UIDA to India residents are expedient. Various accessories and tools embedded in the mobile itself permits blood testing and little investigations.

One can get health support any time and at anywhere because of its convenience, easy to reach, and its connectivity through the 4G and 5G and unlimited access to WI-FI wherever available. Health care cost has reduced greatly because phones are now inexpensive, easy to use and available anywhere at all time. Mobile healthcare issues and draw backs are as follows: typing is made difficult due to the smallness in the screen size of phones and autocorrect makes it worse sometimes. For data access at any point in time there is need for over all dependence on connectivity which makes it lack reliability. Towers for cell phones are quite expensive and therefore are only provided and made available in places where people are many.

Basements, walled-off areas cannot be reached easily with signals. Mobile phones may be misplaced or lost .Another thing that is more important than the personal lost or monetary cost is the breach of privacy that may come up if someone's data is pried or opened. The privileges of the owner of a mobile phone may become that of the one who finds it. Or even an illegal or privileged access to the medical records of a hospital can be misused. Aside the seriousness of misplaced or stolen credit card information the seriousness of breach in health data security is next.

III. MOBILE TRACKING APPLICATION IN COVID-19

The 2019-2020 Coronavirus disease global epidemic (COVID-19) raises unimaginable threats for governments and communities' worldwide (Anderson, et al., 2020). In addition to medical measures, non-pharmaceutical metrics have proven crucial to reduce and control the spread of the virus [11, 12, 13, 29]. This involves (aggressive)

ISSN- 2394-5125 VOL 7, ISSUE 15, 2020

checking and tracing, restrictions on social gatherings, closures of schools and colleges, limits on international and domestic travel and physical distance, up to complete regional and country lockdowns. However, effective and rapid decision making throughout all periods of the outbreak, accurate and appropriate data are needed not just on diseases as well as on human nature, in particular on people's movement and physical co-presence. Encouraging research on human flexibility has demonstrated that the implementation of mobile monitoring can help model the spatial spread of coronavirus [14, 15, 16, 17]. Scientists and governments have thus started to work with private enterprises, especially mobile communication companies, to assess and visualize the feasibility of control measures.

In China, Baidu data has been used to evaluate how the lockdown of Wuhan affected the spread of the virus [18, 19, 20]. In Italy, researchers and local governments are collaborating to estimate the effectiveness of travel restrictions [9, 21]. European authorities (including Austria, Belgium, Germany, Italy, France, and Spain) are working with researchers and mobile network operators to understand the compliance and impact of the social distancing measures put in effect to combat the COVID-19 pandemic and to identify and predict potential hotspots of the disease [22, 23]. Using the city of Boston, United States, as a test case, researchers aggregated location data from over 180 apps to enable precise measurements of social distancing on a day-by-day basis, and project in great detail the effects of different policies on the spread of COVID-19 [9, 24]. However, there is currently hardly any Communication or sharing of knowledge among those country or even national initiatives. Though ad-hoc processes could be established successfully (but still not quickly) at national or international level, local or perhaps regional partnerships seem almost unrealistic considering the number of participants, the spectrum of interests and objectives, the range of regulations in question with the need to protect civil rights. The worldwide size and spreading of the COVID-19 epidemics underlines the need for such a better organized or harmonized method.

The use of mobile tracking application into systematic initiatives to monitor the COVID-19 pandemic will contribute critically to four wide areas of research:

Understanding the Situational will benefit from enlarging exposure to previously inaccessible population forecasts and flexibility knowledge to better understand COVID-19 patterns and geographic distribution by participants across sectors. During the global epidemic, earlier than usual awareness and initiation phase focus will be on situational assessment and quick detection of highly contagious situations and their contacts. Study have shown that isolation policies of contagious persons and their close relatives, together with monitoring and normal testing methods, are successful as early-stage pandemic prevention measures [27].

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• Cause-and-effect use cases will help investors recognize main drivers and impacts of introducing various steps to contain COVID-19 spread. We seek to decide which factors make a significant difference for a situation and whether additional problems may be induced. When group transmission enters exponential rates during the acceleration process, the emphasis is on containment measures, which usually include limitations on social interaction and movement. The aggregated mobile tracking framework is important here for assessing the effectiveness of the policies enforced by controlling movement within and between affected territories. Flexibility information therefore leads to the creation of more reliable epidemiological frameworks that may clarify and predict disease transmission, as seen for outbreaks of Influenza A (H1N1) [9, 28]. In effect such models will inform resource management (e.g. respirators, intensive care units).

• Routines of prediction will leverage people counts and flexibility data in real time to allow new analytical technologies and encourage investors to determine potential risks, needs and opportunities. As the peak of

ISSN- 2394-5125 VOL 7, ISSUE 15, 2020

infections hits, limitations will possibly be removed during the deceleration and planning phases. Constant situational surveillance will be essential because it is predicted that the COVID-19 epidemic will come in waves [9, 29]. Close-real-time data on mobility and hotspots would be essential to understand how lifting and re-establishing different policies translate into behaviour, in particular identifying the best mix of policies at the right time (e.g. general movement restrictions, school closures, ban on public gatherings) and balancing those constraints with economic resilience aspects [9].

• Effect evaluation seeks to determine when, when and how different strategies impact the spread of COVID-19 and includes data to recognize barriers that hamper the accomplishment of certain targets or the effectiveness of specific interventions. After the global epidemic has subsidized, mobile tracking will be useful for post-hoc analysis of the influence of various procedures on disease progression, and value-benefit analysis of mobility limitations [9]. The knowledge can also help to develop apps such as the Korean app (Corona 100 m) to help individuals restart a (cautious) social life without undue stress and reduce the spread of a virus further. Traces of cell phones can be used to infer human movement and relationships in society. Scientists used different types of mobile network data (e.g. call details records, x data records and passive records), GPS data and mobile application data [9].

IV. MOBILE TRACKING APPLICATION FOR COVID-19 SURVEILLANCE AND MONITORING

The communities are reacting at an unprecedented pace to the COVID-19 epidemic. Some of these reactions would have long-lasting consequences, so we have to ensure that the actions of today will not endanger our future health. The most important changes will come from emerging health surveillance technologies using a cell phone, artificial intelligence, and automated decision-making to analyze digital fingerprints of individuals, recognize those potentially compromised, monitor their connections, and impose social isolation. Several have claimed that such automated communication tracing may be more efficient than mass lockdown in containing the outbreak [26]. For example, the Israeli government approved the repackaging of an anti-terror mobile tracking system, searching the location stories of all its entire population to control and implement the personality-isolation of successful testing people. Since then, the Israeli Ministry of Health has released a mobile application that allows people to test if they have interacted with someone contaminated and need to isolate themselves [30].

In China, two major mobile electronic payments providers, Alipay and WeChat, have launched apps that combine the health, position and financial details of users to create a risk rating for personal infection. These innovations are used by governments and companies to determine whether to give anyone access to stores, transportation, or public spaces [33]. Government agencies around the world are rapidly seeking the implementation of COVID-19 personal automated connection tracing (Day, 2020). One apparent problem is the high probability of inaccurate, biased, or untransparent analytics producing true positive outcomes. The other one is "surveillance slink" when surveillance established for a specific reason, such as fighting the COVID-19 epidemic, is more widespread and irreversible in usage. Prominent scientists and advocates are now stressing there would be much of the control that we embrace today as "unusual means for incredible times" [31].

In addition to perceived injustices and violated civil liberties, the regulation also has major psychological implications. Years of research indicate that individuals and communities can succeed only in conditions that meet basic wants and needs, as well as a sense of self-reliance and flexibility in your behavior. Monitoring can build a sense of power and knowledge as a thwarting discretion with adverse incentives and well-being effects [34].

More specifically, the main challenge for engineers and developers designing mobile health tracking monitoring and surveillance is to match devices with the principles of those under monitoring and to convey both these fundamental values and the justification for surveillance to broader society. Once again, health psychology could provide scientific proof to direct the prototype of interventions that support patient freedom [35, 36] and increasingly align socially responsible structures for mobile phone applications with this concept [37]. Health monitoring can only pose ethical concerns. They are often portrayed as a zero-sum exchange-off between privacy and security. But independence psychology proposes a constructive solution if both parties support well-being as the widely valued target, health surveillance can become a fair and equitable game, both successful and freely chosen.

The spread of the current COVID-19 epidemic across the world has decelerated in certain affected countries, but as of April 29, 2020, daily case numbers were still high. However, increased visibility didn't stop contacts with identified cases from moving to areas that were not affected and caused further spreading. As a result, though the increase in COVID-19 cases has slowed, the amount of attention has improved, creating new operational problems for health experts and field medical researchers. The termination of transmission from person to a person requires successful case detection, i.e. control of immediate isolation, assessment, and care, physical distancing, hand washing, along with detection and potential tracking of contacts. Dense population movement, stigmatization of individuals perceived to be contagious, and concerns of people in touch with them need a large number of workers to reach out to patients and contact individuals and to establish communication. At the same time, a significant number of reports have to be checked that reach the public health service across a range of platforms and formats.

Current security technologies are not typically designed to overcome these difficulties. Moreover, the complexity and delay of surveillance data due to various sources of information and infrastructural obstacles including the intermittent quality of connectivity or transportation infrastructure in the affected regions have resulted in reduced consistency of epidemiological studies. Mobile Tracking Surveillance and Monitoring Application (MTSMA) has been developed to address that need. MTSMA aims to ensure the reliability of credible real-time surveillance data and to handle case verification and also monitoring and tracking of any interactions as ideally necessary during the COVID-19 epidemic. MTSMA's four key features are (i) the dual-level management capabilities built based on comprehensive and in-depth assesses of the specific procedures and people involved in the effective COVID-19 monitoring in Nigeria; (ii) its definition to achieve real-time coordination with surveillance systems already in place in a certain part of Nigeria, such as the National Center for Disease Control (NCDC) (iii) Its unified IT backend structure, using existing high data storage software and database resources, combined with (iv) it is a mobile interface for bi-directional sharing of information for field workers applied to generic devices without any more setup.

V. CONCLUSION

Mobile health applications help promote impactful monitoring and regulate techniques for epidemics, include but are not restricted to contact detection, social mobilization, navigation, interaction, shrivelling, and response. It can also support domestic and global initiatives to monitor the spread of COVID-19 epidemic disease, have performed and continued to play a vital role in increasing awareness of COVID-19, preventing the spread of infection and promoting the position of frontline medical professionals by offering better means of communicating fast, secure and accurate directions and knowledge. Organized research on enhanced mobile monitoring technologies on risks and disease prediction and emergency response provides a variety of possible benefits and incentives but also introduces important ethics, medical and legal concerns spanning from stigmatization, informed consent, lack of confidence, protection, safety, inaccuracy, images of distress, and accessibility or use inequalities. Reliance on and expanded electronic access to using applications for data and information collection, sharing, and/or distribution needs to be improved and realistic ethical and medical preparation for current and potential risks at all levels. Researched knowledge and insights from the tracking and analysis of other cell phone-based apps, many social media, and online emergency awareness and risk management response to potential COVID-19 disease prevention and containment. This may serve as the basis for concrete proof-based national and regional mobile app for public health readiness and introduction and implementation of disaster response to policymakers, legislatures, the general public, health workers and practitioners, and reporters. Promoting concrete proof-based, systematic, cost-effective and real-time frontline digitization of technologies in humanitarian crises to improve the response of communities to epidemics and initiatives in future disease priorities, readiness for health systems and crisis action plans to address the 2030 Sustainability Objectives.

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