COVID-19 APPROPRIATE BEHAVIOUR CHANGE, HUMAN RIGHTS, AND INFORMATION COMMUNICATION TECHNOLOGY: A REVIEW OF THE INDIAN CONTEXT

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ABSTRACT

Access to information relating to pandemic or health services is a human right. A large population in India have limited access to internet, community radios and television viewership, depriving them off digital based information on pandemic risk reduction and mitigation. The objective of this article is to review how Government of India used Information Communication Technology (ICTs) for COVID-19 Disease Prevention and Risk Mitigation, COVID-19 Appropriate Behaviour Change (CAB) in India, whether certain population are at risk of being deprived of access to COVID-19 related information which is their human right, and way forward. Secondary Review of Literature and stakeholder consultations were used as methodology to identify gaps, key learning and way forward. Literature reviewed indicates the need for redrafting the 123-year-old legislation (British colonial period) 'Epidemic Act of India, 1897' and that ICTs influence behaviour during pandemics and epidemics. Learnings and recommendations from this study include the need for redefining vulnerability in terms of "who have access to internet and who don't", "who is/was infected and who weren't", geographical location, socio-cultural norms apart from traditional parameters of income, age, gender and poverty for better uptake of prevention related information. Richard Heeks (2010) model for ICT4D (ICTs For Development) Value Chain is suggested by the authors and translated into a framework in the context of COVID-19 risk mitigation, prevention and preparedness using ICTs in a holistic human rights & social work approach.

Keywords: Behaviour Change, COVID-19 Pandemic, ICTs, COVID-19 disease Appropriate Behaviour (CAB), ICT For Development Value Chain, Human Rights, Social Work

1. Introduction

A staggering number of people were impacted by the COVID-19 disease directly or indirectly (GoI, 2020). Loss of life& livelihoods has been reported by various Governments, institutions and individuals. A situation of panic and emergency has been continuing in different parts of the world in different phases, with countries battling different variants of the virus. WHO declared COVID-19 disease as a Public Health Emergency of International Concern (PHEIC) and as a Pandemic in 2020 (MoHFW 2020; WHO, 2020). The first case of the COVID-19 pandemic in India was reported on the 30th of January 2020 among individuals returning from China. Subsequently, more cases were found, when an Air India flight from Italy landed in India. During 2nd week of March 2020, India declared COVID-19 as a Pandemic. Section 2 of Epidemic Diseases Act, 1897 was invoked by the Government of India (GoI) and various State Governments to mitigate the disease through public notices in connection with travels, segregation, hospitalization, temporary accommodation for infected people and punishments if authorities or people were non-compliant. During 2nd week of March, the National Disaster Management Act, 2005, National Disaster Management Guidelines Management of Biological Disasters, 2008, National Policy on Disaster Management, 2009 and Section 269

and 270 of CrPC (Code of Criminal Procedure, India) were invoked. With relevant policies and procedures in place, the Indian Government began using Information Communication Technology (ICTs) as ways and means to create awareness about COVID-19 disease through dashboards and applications, news and media, telephone lines and mobile technology for disease prevention and risk mitigation to assist people. Given that there exists a digital gender divide in India (Gilwald, 2018), how far ICTs have helped in COVID-19 disease risk mitigation, disease prevention and COVID Appropriate Behaviour (CAB) uptake is yet to be understood in detail, which is a human right. With this, the objective of this article is to review how Govt. of India used ICTs for COVID-19 Disease Prevention and Risk Mitigation, COVID-19 Appropriate Behaviour Change, whether certain population is deprived of access to COVID-19 related information, given that to know is their human right and way forward.

2. Methods

This paper is broadly based on the literature and documents collected from different secondary sources including Government departments and consultation with relevant stakeholders linked with COVID-19. It is worth mentioning here that there are limited scientific articles available on this topic so far.

3. Results and Discussion

3.1 Influence of ICTs on behaviour

Citing the 1918 influenza pandemic (US), (Brauer, 2011) stated that during an epidemic people tend to change their behaviour, infected people inclined to reduce number of contacts with others, susceptible people from the population avoided contacts to evade infection, estimates of extent of epidemic differed because of differences in response to uninfected and infected individuals during disease outbreak. (Shehu et al., 2019) established that physical and mental health related behaviours were influenced by ICTs used for health-promoting lifestyle behaviour which further played a critical role in Non-Communicable Diseases (NCD) prevention and control irrespective of age group, ICTs when used for health promoting lifestyle behaviour programs improve health behaviour that are important for prevention and control of both Communicable Diseases (CDs) and NCDs. (Malins et al., 2020), state that ICTs used in low-intensity, personalized relapse prevention method and Cognitive Behavioural Therapy (CBT) for common mental health problems and health anxiety, post treatment, result in stable wellbeing for up to six months. Health seeking behaviour of infected and non-infected people may be different. ICTs influence behaviour change. Behavioural Change strategies need to be designed based on the different needs of populations. SMART messaging is a good way of ensuring post treatment anxiety management and control. The Information Communication Technology for Development (ICT4D) value chain gives a clear vision of how to achieve Sustainable Development Goals (SDGs) using ICTs (Heeks, 2010). Richard Heeks (2010) found unequal access to ICTs was exacerbated by age, gender, education, income. He emphasized to move from looking at ICTs through the lens of inputs (access and infrastructure) to 'outputs, inputs and outputs were connected via a value chain, inputs connected with process and process with output. The ICT4D value chain had four domains- Readiness, Availability, Uptake and Impact. Readiness was found to be the systematic prerequisite for and ICT4D initiative at national level (infrastructure, skills and policy) with specific hard and soft elements feeding into individual measures. Availability pertained to transition of ICT4D initiatives from inputs to ICT deliverables. Uptake was the process of access converted to usage in reality and could be scaled up. Impact had 3 key elements – outputs (micro-level behavioural changes connected with technology use), Outcomes (wider costs and benefits related with ICTs) and Development Impacts (contribution of ICT to broader development goals). There is scope for this framework to be tested. The pathway which includes readiness, availability, uptake and impact can be adopted for effective COVID-19 containment and uptake/adoption of CAB.

3.2 Review of policies and acts applied by government of India for containing COVID-19 disease

Proactive policies, legislation and procedures are essential for disease risk mitigation and prevention. Epidemic Act of 1897 is a brief historical legislation from colonial British period to control Bubonic plague outbreak in India (BT, 2020). Outbreak spread from across

Bombay to Poona, Gujarat, Karachi etc. (Ebrahim, 2016). The 123-year-old legislation gives powers to State Governments (Section 2) to take measures for disease mitigation through public notices in case of a threat from epidemic (then Bubonic Plague) (Sharma, 2020). It vests powers to Government officials to take preventive measures appropriate to stop the epidemic from spreading (inspection of people travelling, segregation, hospitalization, providing temporary accommodation for infected people, and penalties for not following State & Government orders), if satisfied that epidemic is dangerous, it can take proactive measures for mitigation and prevention of transmission by inspection of people and detention of vessels coming from foreign shores. Section 3 of this legislation, non-obeying of the regulations by the State and Central Government in connection with the disease management is punishable under section 188 of Indian Penal Code (45 of 1879) (Srinivas, 2020). Section 4 provides legal protection to implementors. Drawback of this legislation is that it doesn't give full power to the Centre to deal with biological emergencies, doesn't empower people to deal with epidemics, nor mentions of creating awareness on epidemic outbreaks (Sharma, 2020). During the COVID-19 pandemic, healthcare personnel were being discriminated, ostracized and attacked upon for being in close contact with infected COVID-19 patients. Union Cabinet of the Indian Government held a meeting (22nd April 2020) and promulgated an Ordinance to amend the Epidemic Diseases Act, 1897 (PIB, 2020). The two main amendments to this 123-year legislation included – a) protection of healthcare service personnel and property including their living/working premises against violence during epidemics a cognizable and non bailable offence (human rights of health service providers) and b) Committing or instigating violence against health workers to be punished with imprisonment for a term of three months to five years and with a fine of Rs.50, 000/- to Rs.2, 00,000.

In March 2020 during the COVID-19 pandemic, Government of India, invoked, the National Disaster Management Act 2005, National Disaster Management Guidelines Management of Biological Disasters2008, National Policy on Disaster Management 2009, Section 269 and 270 of CrPC (Code of Criminal Procedure).

The National Disaster Management Guidelines Management of Biological Disasters (2008) primarily has a holistic approach to management of biological disasters using latest technology for effective prevention, mitigation and preparedness and state-of-art facilities, mentions need for legislative and regulatory frameworks, mental health support, rehabilitation, recovery and coordination of various departments and ministries for biosafety and biosecurity. National Policy on Disaster Management, approved by the Cabinet of Government of India on 22nd October 2009 was invoked during the COVID-19 pandemic. The policy promotes a culture of prevention, preparedness and resilience through knowledge, education and innovation, encouraging mitigation measures based on technology and traditional knowledge, environment sustainability (GoI, 2009). The policy which is more state-of-art in comparison to the NDMA Act, 2005, has a guideline for mainstreaming disaster management into the development planning process (outlining establishment, enabling regulatory frameworks, compliances, institutional and financial arrangements, effective mechanisms for identification of disaster risks and it's monitoring), emphasizes on importance of ICTs for early warning systems, forecasting, fail-safe communication, information sharing and promoting proactive and need based partnership with media for disaster management for outreach to vulnerable people with a caring approach which are important in COVID-19 context too.
Sections 269 and 270 of the Code of Criminal Procedure, India (CrPC) were also invoked. The CrPC is more people specific with regard to spread of infectious disease and punishment if done on purpose. Section 269 is a punishable offence indicating that, any act that by any individual who is negligent, or does an act negligently leading to spread of any infectious disease, and a danger to life will be imprisoned for a term extending to six months or with fine or with both (Indian Kanoon, 2020).

While Section 270 of the CrPC clearly states that if any individual does any act out of malice / malignant, knowing that the act will

result in the spread of the disease which is dangerous to life would be punished with imprisonment of up to two years or with fine, or both (Indian Kanoon, 2020).

The National Policy on Disaster Management, apart from rescue, relief, preparedness, mitigation, rehabilitation also stresses on ways and means of information sharing, exchange of knowledge and wisdom to prevent natural disasters. ICTs can play a great role to limit the spread of the COVID-19 virus and the Government of India is currently using it to its full potential. The 1879 Epidemic Act needs updating and effective use of ICTs, risk mitigation strategies, prevention and preparedness activities integrated into it.

3.3 Comparison of the situation during the Bubonic Plague Epidemic detected in 1896 and COVID-19 Disease Pandemic of 2020 in India - Human rights perspective

The Bubonic plague infecting Bombay Presidency was first detected in September 1896 in Mandvi by Dr. Acacio Gabriel Viegas. It spread rapidly to Punjab, Bengal, the United Province and Burma. Immigrant labour living in 'chawls' were most effected by the plague. The British ignored the spread of the plague because it benefitted their trade with China. When things got out of control British administration hastily drafted, 'The Epidemic Disease Act of 1897' (Dey, 2020). British administration in India was given the power to do anything to prevent the plague. Initial relief efforts were shrouded by atrocities on those affected by the plague and normal people who were stripped off their dignity. People began to flee Bombay presidency to other places taking the plague with them (Dey, 2020). No efforts were made by British administration to counsel, share information and knowledge with common people. As a result, by 1901, the death toll was estimated as 1900 people per week and the population of Bombay presidency came down from 820,000 to 780,000. Learning from this experience one cannot deny that empathy, care, proper knowledge, sharing of information on prevention and proper disease surveillance would have reduced the death toll and the trauma it caused.

In comparison, to that period, the current pandemic situation has been better managed by the Government of India, with its legislations based on human rights, various legislations relating to health, biological disasters and need for preparedness, prevention, mitigation and ICTs. However, there are gaps with regard to managing migrant population and quality healthcare. Yet, from day one, Information, Education and Communication (IEC) regarding Do's and Don'ts for limiting spread of the pandemic and appropriate behaviour uptake have been implemented at various stages for health service providers and health service seekers. (Fig 1. Comparison between Bubonic Plague Epidemic detected, 1896 and COVID-19 Disease Pandemic, 2020, India)

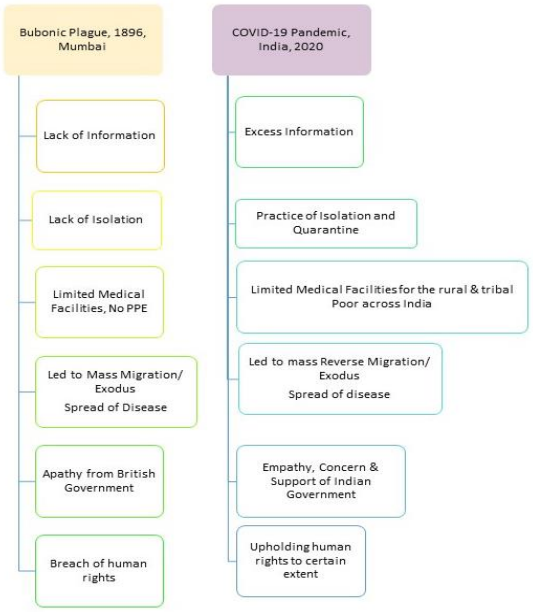

Figure 1: Comparison between Bubonic Plague Epidemic detected, 1896 and COVID-19 Disease Pandemic, 2020, India

3.4 Need for data driven development (DDD) for effective COVID-19 management and digital inclusion

A pandemic is the worldwide spread of a new disease (WHO, 2010). Hughes (2017) emphasized need for a global surveillance system for pandemic prevention especially for mitigation of the risk of zoonotic transmissions as ICTs aid in behavioural modification, evident from Siera Leone's incidence mapping, contact tracing to warn of secondary infection, education, use of posters, other risk mitigation and outreach activities to minimize impacts of Lassa fever. Authors further indicated there was a need for further research on how disease

spread can be mitigated using different mediums such as behaviour change communication, educating on public health education and social mobilization. Refined, processed and analyzed data is valuable and data poor (limited internet access, no digital trail, no digital identities) face risk of exclusion including risk of accessing insurance (World Bank, 2018).

India had the world's second-largest internet population (over 483 million users) in 2018 off which, 390 million users accessed internet via mobile phones, figures estimated at over 500 million by 2023 (Diwanji, 2020). Author found approximately 65 million direct to home TV subscribers across India in 2017with viewership of at least four hours every day(46%). 35% Indian population access internet. From this proportion 81% accessed internet over mobile phones. 65% population didn't have access to internet.

A question that comes to mind is, "How does the Arogya Setu App which is used for tracing COVID-19 infected persons and their health and vaccination status a full proof app when a large proportion of population has no internet access?" It may be inferred that the use of apps for safety, information on diseases, and disease surveillance in the COVID-19 context is limited. Other ICT strategies need to be adopted for creating awareness on preparedness and effective prevention of COVID-19disease containment. This also re-establishes that a digital divide does exist in India. The Indian population is divided into those who have access to the internet and those who do not. Those who do not are the most vulnerable and excluded. Adapting to a new way of living during the COVID-19 pandemic times will be a challenge for these vulnerable and excluded population because of the sheer lack of adequate information and knowledge on disease risk prevention and preparedness and a breach of their human rights. Also, to be taken into account is the fact that, the spread of the population of the second largest democracy in the world has varied geographical terrains (including difficult to access or inaccessible areas), myriad socio-cultural and language settings.

Economic Times (2018) reported that Broadcast radio (AM) outreached 99% of the Indian population, whereas FM radio's outreach was 65%. EY-FICCI reported that 47 new radio stations were operationalized across 35 cities in 2018. There are 386 radio stations in India which presents great opportunity for outreach to a larger population.

Community Radio Stations (CRS) have the scope to be a large platform for informing on preparedness, prevention of COVID-19 by transmitting need based Behavioural Change Communication broadcasts. Currently, 19 sample CRSs covered an area or 7818 sq. km. coverage area through 14.8 lakh households (71 lakh population). Also, the overall proportion of listeners was 29% through 4.4 lakh households i.e., a population of 20.8 lakh population (Ministry of Information and Broadcasting, 2015).

It may be concluded that the focus should not only be on mobile apps and television, but on the use of other means of communication that have a wider outreach to bridge the digital divide and provide necessary information regarding health and COVID-19 pandemic. This would help people to adapt to the new challenges of COVID-19 effectively and adopt Covid-19 Disease Appropriate Behaviours that will catalyze mitigation of the disease as well as its prevention for service seekers, service providers and social workers. Focus needs to be on Data Driven Development.

3.5 ICT initiatives by the government of India for preparedness, prevention and mitigation of COVID-19

Risk has been defined as 'the sensitive task of dealing with a latent or slowly advancing crisis before it breaks in full force' (Seymour and Moore, 2000). It is expected that proper risk management will reduce impact of natural/ biological disasters. Effective risk communication underpins robust risk management and is best way to avert crisis (Sriramesh et al., 2007). Sriramesh et.al. 2007 highlight that ICTs have potential for better &effective risk communication in Asia Pacific region. In countries like South Korea and Singapore, Artificial Intelligence (AI), Robotics, Chatbots, Games and Simulations have been effectively used to create awareness of risks of COVID-19 disease, prevention methods, help and assistance points (ITU, 2020).

Government of India used ICTs in COVID-19 risk prevention and management to a great extent. 24 x 7 days a week medical helpline was established to answer queries regarding COVID-19, prevention, testing, preparedness and mitigation with 10 dedicated telephone lines as reported by The Hindu, 4th March 2020 (IANS, 2020). The Containment Plan of (MoHFW, 2020) included early detection by screening passengers from abroad at Points of Entry (PoE) at 21 designated airports, 12 major ports, 65 minor ports and 8 land crossings, surveillance and contact tracing through Integrated Disease Surveillance Program (IDSP) for tracking travelers, detection of clusters of acute respiratory illness, risk communication for public awareness and prevention. The Govt. used ICTs for pandemic prevention, surveillance in containment zone, testing of suspect samples, isolation or medical care, social distancing, intensive risk communication, social messaging (Twitter, Facebook, LinkedIn) for awareness, update on progress and current situation. Risk Communication strategy (risk communication material, use of different Communication Channels- interpersonal communication and mass communication), media management, set up Control Rooms at State, District Level and in containment zones (IANS, 2020). Standard Operating Procedure (SOP) were designed for early contact tracing of COVID-19 cases via ICTs and for tracing and classification of high and low risk zones. Govt. maintained an e-dashboard for updating data and MIS with various formats for data collection and processing. The Govt. drafted COVID-19 related inflight announcements. Mapping and color coding of hotspots was initiated by the Government of India (PTI, 2020). Telecommunication industry came up with new ringtones with COVID-19 related social messages, prevention and testing for awareness. The Ministry of Information and Broadcasting was entrusted with timely dissemination of information/ IEC material, including relevant advisories, 'dos and don'ts'. Same Ministry launched the iGOT platform, an online training platform for training on effective Pandemic management (GoI, 2020). The training program called 'Diksha' can be sourced on laptops/ desktops and mobile phones. All information required for risk mitigation and preparedness available on the same website, the Government of India's IEC material was designed in time.

'Arogya Setu' (literally meaning a bridge giving freedom from disease) is a mobile app developed by National Informatics Centre (NIC) under the Ministry of Electronics and Information Technology (MoEIT) (Agarwal, 2020). Aarogya Setu turned into the world's fastest growing mobile app on night with 50 million users in 13 days as on April 15th 2020 (Sharma, 2020).

The app tracks Covid-19 disease, informs users about no. of COVID-19 positive cases present in a radius of 500m, 1 km, 2 km, 5 km and 10 km from user, creates awareness on the disease, vaccination status, connects Indian citizens with essential health services.

Released by Government of India on April 20th, 2020, the operating system used is Android and iOS. The app is available in 12 Indian languages. GPS and Bluetooth features of a smartphone to track the coronavirus infection. The App helps Government take necessary, timely steps for assessing risk of spread of COVID-19 disease. Application Programming Interface (API) was used for ease of access by other computer programs, web services and health services.

Kerala, Gujarat and Delhi Government used drones to keep an eye on large gatherings and following of lockdown rules (Captain, 2020). COVID-19 Dashboards are used effectively by most State Governments to give information on current status of infected individuals, number of deaths, treated and cured, number migrated. Government of Odisha has an online registration form for registering travel history and foreign return status so that testing and tracking is done on time. Mobiles helped connect with migrants and coordinate their return and food security.

As a risk management measure India's military used drones and guns for shooting ultraviolet light to contain spread of virus. Also, India's military Electronics and Mechanical Engineering (EME) Corps developed a quadcopter to sanitize areas in less than five minutes (Kapoor, 2020).

Many companies migrated from manual to digital mode of working using Zoom and Microsoft teams. Use of zoom & other online platforms for studies being used by private schools, colleges and universities.

3.6 Application of Richard Heeks' 'ICT4D Value Chain' to COVID-19 risk, preparedness, prevention & behaviour change - Lessons and key concerns

Learnings from the literature reviewed and information published on Government web portals have been clubbed under different heads (Readiness, Availability, Uptake and Impact (Richard Heek's ICT4D Value Chain) in the context of COVID-19 for policy makers and implementors. (Figure 2: Application of Heeks' ICT4D Value Chain to COVID-19 Containment via ICTs resulting in behaviour Change and Better Adaptation, Proposed by authors (2020)

3.6.1 COVID-19 "Readiness" - Lessons and key concerns

Population, demography and political will are important for COVID-19 management. India with a population of 1.3 billion people has high risk of community transmission with disastrous consequences. There is political will at the Centre for quick measures to contain the pandemic, different State Governments had different ways of pandemic management, mostly with knee jerk actions. Right policies, a form of readiness is an essential element of the 'ICT4D' Value Chain impactful development at the right time. 'The Epidemic Disease Act of 1897' has lacunas which needs to be addressed in the context of independent and digital India. Data, information, knowledge and wisdom should be used for proactive redrafting of the 'Act' with people, political support and experience of past epidemic and pandemics (Small Pox, Ebola, Avian Flu, SARS).

Need based Data Driven Development is the need of the hour with integration of data available on health, determinants of health, diseases. Strategies to overcome risk of diseases can be derived by studying patterns of the disease spread, intensity and impact. Currently, there is a deluge of data unused for creating scenarios of risk mitigation and containment. Preparedness to manage epidemics and pandemics is limited. ICTs can be effectively used for data integration with possible risk mitigation outcomes.

Definition of who is vulnerable needs to be revised in terms of "who have access to internet and who don't" and "who is infected and who isn't", geography, socio-cultural ad language settings, apart from traditional demographic parameters of income, age, gender and poverty. Even the space one lives in can be a defining factor for transmission and risk of getting infected with the disease. More the number of people living in a single room, the more the risk of transmission. Example, five to ten migrant workers living in one room at their place of work, poor households with only a single room, prisons, mental asylums. It is also suggested that vulnerability be looked at from the perspective of migrant and resident population.

Demand for knowing more about the COVID-19 pandemic already exists with urban educated people wanting more information for effective adaptation and protection. In rural areas, a more relaxed and casual attitude towards it exists and demand for information needs to be created for better preparedness as safe and good health is their human right too. Disease treatment protocol needs to be well drafted and shared with all health service providers.

There is a need for anthropologists to work alongside epidemiologist and public health experts. As evident role of anthropologist during the Ebola outbreak was important in providing insights on social dynamics of health, disease transmission and emergency public health response during the Ebola outbreak (2013-16) (Stellmach et al., 2018).

3.6.2 COVID-19 and "Availability" - Lessons and key concerns

Evident that for transfer of information, knowledge and wisdom access to ICTs is essential. In India, a large chunk of the population has limited internet access, limited hours of television viewership, limited Community Radio Stations (CRS) and AM, FM listeners. Only using mobile apps and television for conveying COVID-19 Appropriate Behaviour messages for prevention, preparedness and adaptation isn't enough. A mix of ICT mediums have to be used for better outreach as a strategy. ICT facilitated communication strategy for Covid - 19 disease Appropriate Behaviour uptake needs to consider geographical spread and access, socio-cultural milieu and language. SMART messaging should be used to remove fear and anxiety among patients, those who

underwent quarantine and those who were infected but are now free from the virus, values and motivation being key components of SMART messaging. Currently, all actions of the Government are based on addressing immediate concerns looming up. There are no measurable targets set for containing the disease.

3.6.3 COVID-19 and "Uptake" - Lessons and key concerns

While South Korea and Singapore use Artificial Intelligence (AI) & Robotics, Chatbots, Games and Simulations effectively to create awareness of the risks of COVID-19 disease and its prevention, monitoring, tracking and containment., in India mobile apps, television, limited radio jingles are the only way in which ICTs have been used to address pandemic concerns. There is an absence of disease diagnosis through AI and Imaging which would enhance efficient response and outreach of health service providers and demand for service. Studies of spread of pandemics from a zoonotic perspective and proactive actions are the need of the hour (Hughes et al., 2015).

Grassroot frontline workers and decentralized governance representatives have limited or no access to the algorithm designed by the Ministry of Health and Family Welfare for capturing data on infected and non-infected individuals and reporting systems are not yet fully functional, leaving rural and tribal areas open to disease risks. Civil Society Organizations (CSOs) & social workers play a big role in socio-economic development, research, monitoring and evaluation, policy and advocacy and many more sectors. Unfortunately, the Government didn't use this available platform to reach out to a larger populace. The CSOs can play a catalytic role in bridging the gap between Government, frontline / social workers, elected representatives and people in trying times. The focus currently is only on orange and red zones for containment. Green zones are also vulnerable because people and migrants tend to move towards safer places to avoid being infected, thus risking communities in green zones. Mitigation measures such as social mobilization, public health education, and behavioural change and communication strategies can play a vital role in disease reduction and mitigation and therefore need to be used accordingly. There is a need for care and empathy, human rights & social work approach.

3.6.4 COVID-19 and "Impacts" - Lessons and key concerns

Expected outputs, outcomes and framework for development impacts is not envisaged as yet by the Government. Every action taken by the Government is a sudden response/ knee jerk response to a situation. The Government has to move from knee jerk reactions to planned and measurable strategies.

4. Conclusion and Recommendations

To prevent the COVID-19 zoonotic disease from spreading, new and different innovative methods of risk mitigation and prevention need to be in place. Literature indicates that ICTs influence behaviour. New variants of the SARS-Cov-2 virus and increased number of deaths and spread to rural and tribal areas, demands for fast uptake and practice of COVID-19 Appropriate Behaviour. Given the large Indian population, limitation in space and migrant exodus risk, geographical spread, myriad social and cultural settings and languages, disease surveillance and monitoring need to be super robust, with a human rights approach, focusing on data driven development. India needs to move beyond mobile apps and television use for behaviour change communication and awareness on COVID-19 pandemic using artificial intelligence, robotics, simulations, and imaging. Big data management and analysis is essential to address issues on endemics and pandemics. It will also help in shaping health seeking behaviour of people at risk and of patients. The use of Community Radio Stations to catalyze change for preparedness and health seeking behaviour, needs to be tapped. Data systems and legality of access to personal data should be disclosed to the public.

India needs to redefine who is vulnerable in terms of the existing digital divide, those who are infected and those who are not infected, residents and migrants for effective disease risk reduction and Covid-19 Appropriate Behaviour practice. At the same time, messaging should be based on gender, socio-economic conditions and age. It is important to redefine vulnerability and have an ICT strategy in place for containment of the disease

based on levels of vulnerabilities. A subject attracting sustained attention in recent anthropological studies of epidemic control technologies indicate a shift from a public health focus on prevention to one on preparedness (Lynteris and Poleykett, 2018).

Coordination between Central ministries and State governments with one nodal agency Ministry of Health and Family Welfare (MoHFW) for all pandemic & epidemic related activities is recommended. A legislation on essential health services during epidemics, pandemics, biological disasters and bio terrorism along with dedicated personnel and institutional and implementation framework is recommended. Redrafting/ amendment of Epidemic Disease Act of 1897', focusing on improvised disease and biological hazard management, strategies for possible risks risk assessment in different scenarios, preparedness, prevention, mitigation and containment, institutional arrangements for implementation, behavioural change strategies for better adaptation, effective use of ICTs for awareness and assessment and SMART messaging as part of protocol for disease treatment is recommended.

India needs to develop a framework and implement a robust risk management and disease surveillance system to reduce COVID-19 impact and future risks and improved outreach and defined Behavioural Change Communication strategy for knowledge uptake & use by people via different ICTs mediums, use of ancient wisdom and knowledge, monitoring public sentiment on policy reforms, lockdowns and other restrictions and responding to their needs accordingly is recommended. Richard Heeks' ICT4D Value Chain has been suggested as a framework for designing ICT based initiatives for COVID-19 disease Appropriate Behaviour Uptake leading to prevention and risk mitigation of the disease (Figure 2: Application of Heeks' ICT4D Value Chain to COVID-19 Containment via ICTs resulting in behaviour Change and Better Adaptation, Proposed by authors,2020).

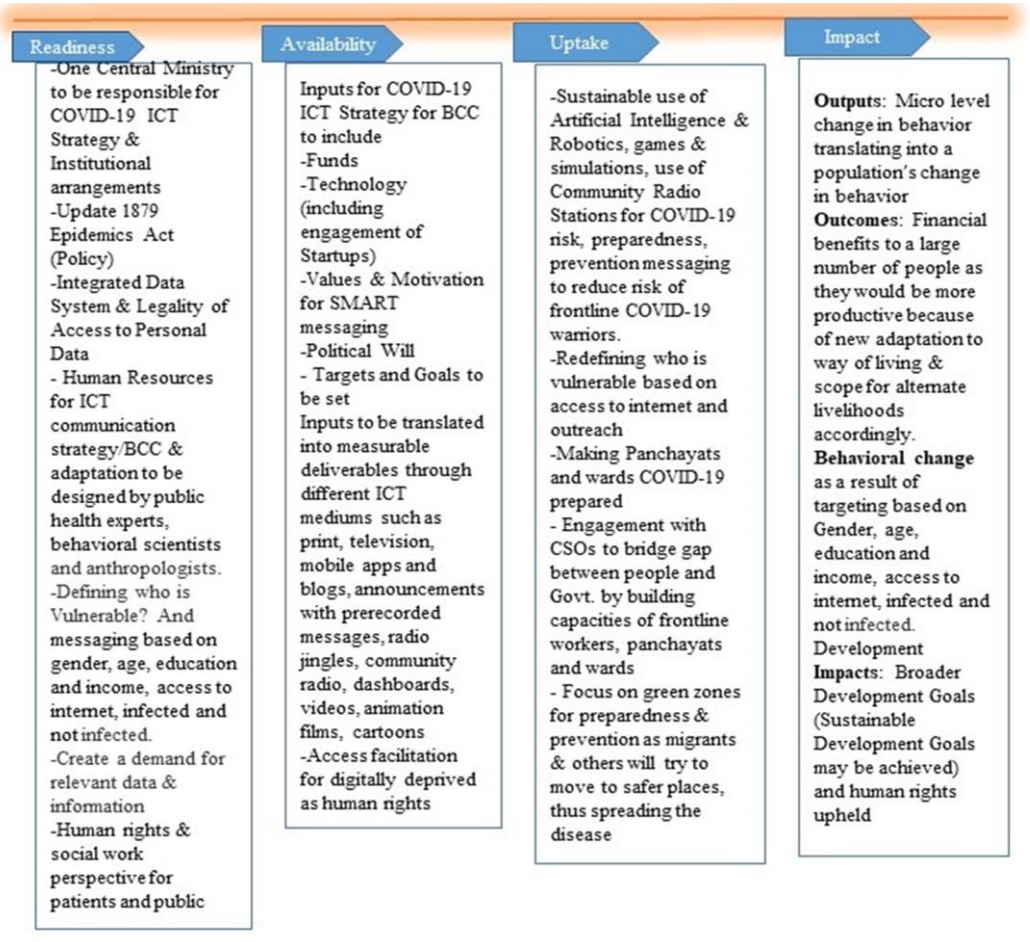

Figure 2: Application of Heeks' ICT4D Value Chain to COVID-19 Containment via ICTs resulting in behaviour Change and Better Adaptation, Proposed by authors (2020).

Lastly, it is important to engage right human resources for ICT communication strategy for behaviour change and adaptation to be designed by public health experts, behavioural scientists, anthropologists & social workers. Conceptualization of messages based on gender, age, education and income, access to internet, infected and not infected can best be understood and deciphered by them.

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