

The Impact of COVID-19 on Digital Health and Care in Saudi Arabia

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Abstract: Background: The Saudi Ministry of Health (MOH) recently established a COVID-19 mitigation strategy. The MOH strategy includes the use of digital health technology platforms (DHTPs).

Methodology: Data visualisation techniques have recently been used to provide critical information to citizens via electronic platforms. Users can interact with data, interpret it, and make informed decisions by using data visualisation tools.

Results: In public health and clinical practice, digital dashboards offer numerous benefits and optimisation opportunities. Total cases, total recovery, and activity have increased in Saudi Arabia since the beginning of the COVID-19 period.

Conclusion: There was a widespread infodemic in response to COVID-19, disseminating a massive amount of misinformation and statistics. Some countries, however, such as Saudi Arabia, have implemented web-based communication solutions. On the COVID-19 dashboard, users discovered up-to-date, accurate, and trustworthy information about coronavirus cases.

Keywords: COVID-19, Digital health, Digital health in Saudi Arabia, The impact of COVID-19 on Digital health, (DHTPs) in Saudi Arabia.

1. INTRODUCTION

Coronavirus (COVID-19) has already infected over 186 countries, claimed thousands of lives, and rendered thousands more incapacitated. Responses to the pandemic have varied dramatically, and the disruption caused by the COVID-19 outbreak has increased demand for healthcare professionals.[1]

The Saudi Ministry of Health (MOH) recently established a COVID-19 mitigation strategy. The MOH strategy includes the use of digital health technology platforms (DHTPs) for long-distance follow-up and COVID-19 outbreak control.[2]

During the pandemic, it was clear that many outpatient clinics in Saudi Arabia's primary and tertiary hospitals incorporated DHTPs, which facilitated practical monitoring, management, and delivery of non-urgent medical care, thereby maintaining public measures such as self-isolation and social distancing.[3]

The robust infrastructure of both networks and technologies was the technical determinant of optimising DHTPs in Saudi Arabia. During the COVID-19 pandemic, the Saudi Ministry of Health effectively encouraged people to seek care through DHTPs rather than primary care clinics. DHTPs were critical to primary health care's role in triaging and mitigating the spread of COVID-19.[4]

Internet access is widely available in Saudi Arabia, allowing the healthcare system to continue to provide high-quality care to all patients in the private and public sectors.[5]

Quality in health care is a multifaceted concept that refers to how offered services increase the likelihood of desired health outcomes. Health care quality also includes providing correct care at the right time and in a coordinated manner, responding to service users' needs and preferences, and reducing damage and wasted resources in a continuous and dynamic process. [6] Quality of care is an approximation of health services to the population and has three dimensions: technical (accuracy of actions and the manner in which they are performed), interpersonal (social and psychological relationships between care providers and users), and organisational (conditions under which services are provided, including globalisation and continuity of care, coverage, coordination of actions, access, and accessibility to services). [7]

2. LITERATURE REVIEW

The impact of the novel coronavirus (SARS-CoV2) can be seen from a variety of perspectives, including the economy, health care, socio-cultural dimension, polity, and so on. Among these, health care is a major focus in areas such as vaccine development, treatment options, digital health, health resource management, policies and regulations.[8]

During the outbreak, there was a rapid shift from traditional health care operations to digital health operations in a few countries, as well as a rapid increase in digital health adoption in some countries that had already deployed digital health. Saudi Arabia, for example, has been rapidly adopting digital health technologies for managing health care operations and improving service and delivery quality.[9]

According to the Global Strategy [10], digital health is "the body of knowledge and practice associated with the development and application of digital technologies to improve health." Its vision is to improve health for everyone, everywhere by accelerating the development and adoption of person-centric digital health solutions that are appropriate, accessible, affordable, scalable, and sustainable for preventing, detecting, and responding to epidemics and pandemics, developing infrastructure and applications that enable countries to use health data to promote health and well-being, and achieving the health-related Sustainable Development Goals.

During the COVID-19 response, many countries in the Region advanced digital health facilities, applications, and services that were extremely useful in all response phases and use cases, including surveillance, prevention, diagnostics, therapeutics, follow-up, contact tracing, communication, and community engagement. These applications are summed up in a 2022 inter-agency survey on health innovations in response to the COVID-19 pandemic.[11]

Strengthening access to health services that are not otherwise easy to provide via traditional health systems (for example, extended health promotion agenda, personalised care); improving access to services for hard-to-reach populations (marginalised groups and people in remote areas); establishing a robust governance system for digital health.[12]

The Saudi government is focusing on data sharing in a variety of industries, one of which is healthcare due to its importance. It is critical to identify the strengths and weaknesses of current dashboards. In Saudi Arabia, data visualisations and dashboards are rarely studied. As a result, the purpose of this paper is to investigate the usability and utility of data sharing and visualisation by examining the COVID-19 dashboard developed by the Saudi Arabian Ministry of Health (MOH).[13]

While COVID-19 continues to ravage the world, Saudi Arabia recognises it as a major human-centered health crisis. As a result, Saudi Arabia has implemented numerous safety measures for all citizens since the outbreak, and the pandemic has piqued our government's interest in digitalization. For example, the Saudi Ministry of Health has created numerous excellent platforms and health applications for the general public, such as the Tawakkalna, Tabaud, and COVID-19 dashboards. Each app and platform serves a distinct function, particularly the COVID-19 dashboard, which effectively visualises COVID-19 cases across a country. Furthermore, it is accessible to anyone at any time, with the Saudi Ministry of Health (MOH) continuously updating the cases.[14]

The term "visualisation" refers to "the representation and presentation of data that exploits our visual perception abilities to amplify cognition". The visualisation technique is used to gain insight into large and complex datasets. Dashboards are defined by some as visual displays that summarise pertinent information, allowing an observer to monitor and comprehend the overall operation of a system.[15]

The use of data visualisation has numerous advantages. Data visualisation, for example, makes data more accessible to a wider audience. Furthermore, it becomes easier to detect relationships that would otherwise be hidden when visualised. Furthermore, visualisations facilitate the integration of multiple data sources by bringing together data of various types and scales into a single view. Integration of data is critical in many fields, particularly public health and health informatics. Furthermore, because of their influence on human cognition, visualisations improve decision-making, learning, and analytical reasoning. Furthermore, a large amount of data can be displayed instantly, and viewers can immediately discover emerging patterns and properties in the data, resulting in new insights. [16]

According to a recent study, almost all Saudis have Internet access, and the majority own smartphones [17]. Dashboards enable data visualisation and make it easy to analyse a wide range of data. As a result of the spread of COVID-19, Saudi Arabia's Ministry of Health (MOH) established a dashboard. This platform is an effective tool for sharing information about disease cases across the country. Because of the recent emergence of the Coronavirus, there is a need to raise public awareness. [18] As a result, the Ministry of Health ensures that the COVID-19 dashboard is simple to use and accessible to all citizens with internet access. COVID-19 has had an impact on the social, economic, and political spheres worldwide.

However, there is a significant lack of facts, data, and statistics on the precise impacts on the majority of people.[19]

3. METHODOLOGY

Data visualisation techniques have recently been used to provide critical information to citizens via electronic platforms. Users can interact with data, interpret it, and make informed decisions by using data visualisation tools.[20]

Exploration of data and information is the focus of visualisation Hand-drawing was used in the early stages of data visualisation, followed by photo-etching, and now computer technology, such as computer graphics and software, is used. The advancement of computer software has resulted in extremely advanced data visualisation. This enables users to manipulate large amounts of data for exploration and examination more quickly and cheaply. In today's society, data visualisation is commonly associated with computer science and technological device[21]

4. RESULTS

In public health and clinical practice, digital dashboards offer numerous benefits and optimisation opportunities. Total cases, total recovery, and activity have increased in Saudi Arabia since the beginning of the COVID-19 period. The graph below allows users to quickly determine the trends of the cases. Dashboard visualisations of information, for example, may be linked to other systems via interfaces so that data can be transferred automatically. This ensures that the information displayed is correct. A colour or other visual feature can also draw the attention of the viewer to important information.

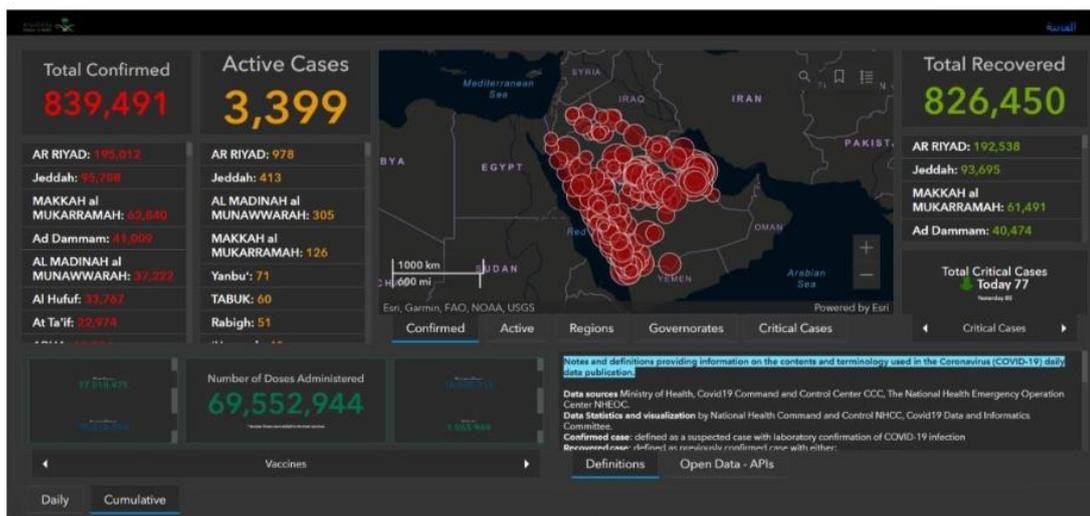


Fig. (1): Saudi Arabia dashboard Interfaces for COVID-19

The COVID-19 dashboard provided users with up-to-date, accurate, and trustworthy information about coronavirus cases. Obtaining this information is critical to the virus's eradication. Controlling the virus will necessitate providing people with accurate and relevant information on a consistent basis. As a result, using technology to communicate about COVID-19 with all stakeholders has proven to be a successful strategy.

5. DISCUSSION

Saudi health officials have successfully optimised and maintained a strategy to reduce the spread of the COVID-19 virus using various digital technologies such as mobile health applications, artificial intelligence, and machine learning. In Saudi Arabia, rapid digital response has been facilitated by government support and consideration of users and technology determinants. Despite this success, more work is needed to sustain the use of DHTPs and investigate the experience of artificial intelligence in guiding clinical practice. We also need to expand the interconnected network between primary and tertiary health care facilities so that electronic medical records can be shared with other healthcare facilities for better interpretation and management.[22]

We can conclude that actionable dashboards are required to facilitate effective audience decision-making. Dashboards are critical for monitoring the COVID-19 pandemic, but understanding its stages is required to maintain their value. Furthermore, more proficiency in using communication features effectively is required. COVID-19 dashboard developers should make better use of public health and communication experts to ensure data is easily accessible to the general public. Furthermore, as Hu et al. point out, there are significant differences in the messages and data templates used in producing epidemic surveillance summaries and verified case reports, which may need to be updated in the aftermath of pandemics or catastrophic events.[23]

6. CONCLUSIONS

Since the pandemic, nations have been concerned about the COVID-19 virus and its symptoms. There was a widespread infodemic in response to COVID-19, disseminating a massive amount of misinformation and statistics. Some countries, however, such as Saudi Arabia, have implemented web-based communication solutions. On the COVID-19 dashboard, users discovered up-to-date, accurate, and trustworthy information about coronavirus cases.[24]

Several future points should be considered. First, because COVID-19 dashboards are highly dynamic, it is necessary to examine how they have evolved. Second, a broader set of indicators may improve monitoring of COVID-19 and its economic and social consequences. Next, interoperability of health, social, and economic data sources is critical for future measurement and control of the epidemic. Finally, additional features for these dashboards are required to facilitate their use by people with disabilities during such pandemics.[25]

REFERENCES

- [1] Hassounah M, Raheel H, Alhefzi M. Digital response during the COVID-19 pandemic in Saudi Arabia. *J Med Internet Res.* 2020;22(9):e19338. doi:10.2196/19338
- [2] Nurunnabi M. The preventive strategies of COVID-19 pandemic in Saudi Arabia. *J Microbiol Immunol Infect.* 2021;54(1):127–128. doi:10.1016/j.jmii.2020.07.023.
- [3] Monaghesh, E.; Hajizadeh, A. The role of telehealth during COVID-19 outbreak: A systematic review based on current evidence. *BMC Public Health* 2020, 20, 1193.
- [4] Khan, A.A.; Alsofayan, Y.M.; Alahmari, A.A.; Alowais, J.M.; Algwizani, A.R.; Alserehi, H.A.; Assiri, A.M.; Jokhdar, H.A. COVID-19 in Saudi Arabia: The national health response. *East. Mediterr. Health J.* 2021.
- [5] Gunasekeran, D.V.; Tseng, R.M.W.W.; Tham, Y.-C.; Wong, T.Y. Applications of digital health for public health responses to COVID-19: A systematic scoping review of artificial intelligence, telehealth and related technologies. *NPJ Digit. Med.* 2021, 4, 40.
- [6] Alomari, M.O.; Jenkins, J. Exploring the Attitudes of patients towards using the seha application (Telehealth) in Saudi Arabia during the Coronavirus epidemic. *ABC J. Adv. Res.* 2021, 10, 9–22.
- [7] Middleton B, Bloomrosen M, Dente MA, Hashmat B, Koppel R, Overhage JM et al. American Medical Informatics Association. Enhancing patient safety and quality of care by improving the usability of electronic health record systems: recommendations from AMIA. *J Am Med Inform Assoc.* 2013;20(e1):e2–8. doi:10.1136/amiajnl-2012-001458.

- [8] Iyamu I, Xu AXT, Gómez-Ramírez O, Ablona A, Chang HJ, Mckee G et al. Defining digital public health and the role of digitization, digitalization, and digital transformation: scoping review. *JMIR Public Health Surveill.* 2021;7(11):e30399. doi:10.2196/30399
- [9] Q. Li, of data visualization," in *Embodying data*, Springer, 2020, pp. 17-47. A. L. Shparberg, "Google Books Ngram Viewer," *Charlest. Advis.*, vol. 23, no. 1, pp. 16-19, 2021.
- [10] *Global strategy on digital health 2020–2025*. Geneva: World Health Organization; 2021 (<https://apps.who.int/iris/handle/10665/344249>, accessed 7 June 2022).
- [11] D. Streeb, M. El-Assady, D. A. Keim, and M. Chen, "Why visualize? Untangling a large network of arguments," *IEEE Trans. Vis. Comput. Graph.*, vol. 27, no. 3, pp. 2220-2236, 2019.
- [12] T. Hulsen, "Sharing is caring-data sharing initiatives in healthcare," *Int. J. Environ. Res. Public. Health*, vol. 17, no. 9, p. 3046, 2020.
- [13] X. Lian, J. Huang, R. Huang, C. Liu, L. Wang, and T. Zhang, "Impact of city lockdown on the air quality of COVID-19-hit of Wuhan city," *Sci. Total Environ.*, vol. 742, p. 140556, 2020.
- [14] A. A. Alkhomees, S. A. Alrashed, A. A. Alzunaydi, A. S. Almohimeed, and M. S. Aljohani, "The psychological impact of COVID-19 pandemic on the general population of Saudi Arabia," *Compr. Psychiatry*, vol. p. 152192, 2020.
- [15] A. Alhur, "Exploring Saudi Arabia Individuals' Attitudes toward Electronic Personal Health Records," *J. Comput. Sci. Technol. Stud.*, vol. 4, no. 1, pp. 80-87, 2022.
- [16] A. Alhur and A. A. Alhur, "The Acceptance of Digital Health: What about Telepsychology and Telepsychiatry?," *J. Sist. Inf.*, vol. 18, no. 2, pp. 18-35, 2022.
- [17] K. Denecke and S. Nüssli, "Dashboard visualization of information for emergency medical services," *Integr. Citiz. Centered Digit. Health Soc. Care Citiz. Data Prod. Serv. Co-Creat*, vol. 275, p. 27, 2020.
- [18] K. Ahmed et al., "Novel approach to support rapid data collection, management, and visualization: during the COVID-19 outbreak response in the world Health organization African region: development of a data Summarization and visualization tool," *JMIR Public Health Surveill.*, vol. 6, no. 4, p. e20355, 2020.
- [19] K. II Yooa and B. J. Kronenfelda, "An evaluation of COVID-19 dashboards from cartographic and epidemiological perspectives," *Cartogr Geogr Inf SciCaGIS*, pp. 1-8, 2020.
- [20] F. Zuo et al, "An interactive data visualization and analytics tool to evaluate mobility and sociability trends during COVID-19," *ArXiv Prepr. ArXiv200614882*, 2020.
- [21] X. Zhang et al., "Multiplex network reconstruction for the coupled spatial diffusion of infodemic and pandemic of COVID-19," *Int. J. Digit. Earth*, vol. 14, no. 4, pp. 401-423, 2021.
- [22] G. Hu et al., "Information disclosure during the COVID-19 epidemic in China: City-level observational study," *J. Med. Internet Res.*, vol. 22, no. 8, p. e19572, 2020.
- [23] A. Vahedi, H. Moghaddasi, F. Asadi, A. Hosseini, and E. Nazemi, "Applications, features and key indicators for the development of COVID-19 dashboards: A systematic review study," *Inform. Med. Unlocked*, p. 100910, 2022.
- [24] S. A. Lauer et al., "The incubation period of coronavirus disease 2019 (COVID-19) from publicly reported confirmed cases: estimation and application," *Ann. Intern. Med.*, vol. 172, no. 9, pp. 577- 582, 2020.
- [25] A. Ballard, "Promoting performance information use through data visualization: evidence from an experiment," *Public Perform. Manag. Rev.*, vol. 43, no. 1, pp. 109-128, 2020.