

The Impact of COVID-19 on Measles-Containing Vaccines (MCV1 and MCV2) Utilization in Benadir Region, Somalia

Abdirahman Omar Abdi

Independent Research

Email: drcadde88[at]hotmail.com

Abstract: *This study aims to examine the impact of the COVID-19 pandemic on the utilization of Measles-Containing Vaccines 1 (MCV1) and 2 (MCV2) in the Benadir Region of Somalia. The COVID-19 pandemic has disrupted healthcare systems worldwide, and routine immunization programs have been particularly affected. Understanding the effects of the pandemic on vaccine utilization is crucial for devising strategies to mitigate potential outbreaks of vaccine-preventable diseases. Preliminary findings indicate a substantial decline in MCV1 and MCV2 utilization during the COVID-19 pandemic. The number of vaccinations administered during the pandemic period (2020-2021) was significantly lower compared to the pre-pandemic period (2019). The decline in vaccine utilization can be attributed to various factors, including disruptions in healthcare services, fear of visiting health facilities, and resource reallocation to COVID-19 response efforts. Moreover, routine immunization programs play a crucial role in preventing these diseases, and a decrease in vaccine utilization can lead to a loss of herd immunity and subsequent outbreaks. It is essential to address the barriers to vaccination and implement strategies to restore and strengthen routine immunization services.*

Keywords: COVID-19, Impact, MCV1, MCV2, utilization, Benadir Region, Somalia

1. Introduction

Worldwide healthcare systems have been severely impacted by the infrequent coronavirus disease outbreak (COVID-19), which has disrupted many regular healthcare services, including vaccination programs, in Somalia, specifically in the Benadir Region, the utilization of Measles-Containing Vaccines 1 (MCV1) and 2 (MCV2) has likely been affected by the COVID-19 pandemic, (Smith, J., Johnson, A., & Ahmed, M. (2022)). Immunization campaigns were essential for preventing and controlling vaccine-preventable illnesses like measles, which can have serious effects, especially for children and other vulnerable groups. Nonetheless, the COVID-19 pandemic has interfered with the provision of standard medical services, such as vaccinations, for a number of reasons, such as resource reallocation, travel limitations, and hospital avoidance anxiety. Understanding how COVID-19 has affected the use of MCV1 and MCV2 in the Benadir Region is essential for figuring out the difficulties immunization programs encounter and creating plans to stop future outbreaks of diseases that can be prevented by vaccination. This article objective is to assess the extent of the impact and explore the factors contributing to changes in MCV1 and MCV2 utilization during the COVID-19 pandemic in the Benadir Region of Somalia. Additionally, this research will provide valuable insights into the specific challenges faced by the Benadir Region and help inform strategies to strengthen the immunization program and protect the population, especially children, from vaccine-preventable diseases in the post-pandemic period.

1.1 Background

The COVID-19 pandemic has had a profound impact on healthcare systems worldwide, disrupting routine healthcare services and posing challenges to immunization programs.

In Somalia, the Benadir Region faces similar consequences, including potential disruptions in the utilization of Measles-Containing Vaccines 1 (MCV1) and 2 (MCV2) due to the pandemic. Immunization programs are crucial for preventing and controlling vaccine-preventable diseases, such as measles, which can cause significant morbidity and mortality, particularly among children. However, the COVID-19 pandemic has presented numerous challenges to the delivery of routine immunization services. These challenges include reduced access to healthcare facilities, limited availability of vaccines, diversion of resources to COVID-19 response efforts, and community hesitancy or fear of seeking healthcare services. To understand the impact of COVID-19 on the utilization of MCV1 and MCV2 in the Benadir Region, it is essential to examine the specific contextual factors and barriers that may have influenced vaccine uptake during the pandemic. As a result of identifying and addressing these challenges, public health authorities can develop targeted strategies to mitigate potential outbreaks of vaccine-preventable diseases and ensure the continuation of routine immunization services, (J., Johnson, 2022)). The COVID-19 pandemic has had a profound impact on healthcare systems worldwide, disrupting routine healthcare services and posing challenges to immunization programs. In Somalia, like many other countries, the Benadir Region has experienced the effects of the pandemic on healthcare delivery, including potential disruptions in the utilization of Measles-Containing Vaccines 1 (MCV1) and 2 (MCV2). Measles is a highly contagious viral disease that can lead to severe complications and even death, especially among young children. Immunization programs, including the administration of MCV1 and MCV2, are crucial for preventing measles outbreaks and protecting vulnerable populations. However, the COVID-19 pandemic has presented unprecedented challenges to maintaining routine immunization services, (World Health Organization. (2020).

Moreover, the pandemic has led to disruptions in healthcare systems, including reduced access to healthcare facilities, limitations in the availability of vaccines, and the diversion of resources and healthcare personnel to COVID-19 response efforts. Additionally, fear of contracting the virus, movement restrictions, and community hesitancy have further hindered the utilization of immunization services. Finally, by identifying these challenges and addressing them through targeted interventions, such as strengthening the cold chain system, enhancing community engagement, and ensuring the availability of vaccines, it is possible to minimize the long-term impact of the pandemic on routine immunization and prevent outbreaks of vaccine-preventable diseases like measles in the Benadir Region.

2. Literature Review

The COVID-19 pandemic has disrupted healthcare systems globally, with substantial implications for routine immunization programs. Studies undertaken in several countries have highlighted the impact of the pandemic on the utilization of measles-containing vaccines (MCV1 and MCV2). This literature review aims to provide a comprehensive overview of the existing research on the impact of COVID-19 on MCV1 and MCV2 utilization in the Benadir Region of Somalia.

Several studies conducted in different countries have reported a decline in routine immunization coverage during the COVID-19 pandemic. A study conducted in Nigeria found a significant reduction in MCV1 and MCV2 coverage during the pandemic, attributed to factors such as healthcare service disruptions, fear of COVID-19 infection, and diversion of resources to pandemic response efforts (Uzoigwe et al., 2020). Similarly, a study from India reported a decline in MCV1 and MCV2 coverage, with disruptions in immunization services and hesitancy among caregivers being the primary contributing factors (Bhatnagar et al., 2021). In the context of Somalia, limited studies specifically focusing on the Benadir Region's MCV1 and MCV2 utilization during the pandemic were found. However, a study conducted in Somalia by Warsame et al. (2020) highlighted the overall impact of the pandemic on routine immunization services. The study reported a significant decline in the number of children receiving routine immunizations, including MCV1 and MCV2. Barriers such as fear of COVID-19 infection, transportation challenges, and reduced availability of essential immunization supplies were identified as contributing factors. The literature also emphasizes the importance of maintaining routine immunization services despite the challenges posed by the pandemic. A study by Abbas et al. (2021) emphasized the critical need to prioritize routine immunization to prevent outbreaks of vaccine-preventable diseases, including measles. The study highlighted the potential consequences of decreased vaccine coverage, including an increased risk of measles outbreaks and associated morbidity and mortality. To address the challenges faced by immunization programs during the pandemic, various strategies have been proposed. These include implementing catch-up vaccination campaigns, strengthening cold chain systems to ensure vaccine availability, enhancing community engagement and

communication to address vaccine hesitancy, and prioritizing the safety of both healthcare workers and caregivers during immunization sessions (Bhatnagar et al., 2021; Uzoigwe et al., 2020). Finally, the available literature suggests that the COVID-19 pandemic has had a significant impact on the utilization of MCV1 and MCV2 in various settings. While specific studies focusing on the Benadir Region of Somalia are limited, the existing evidence highlights the need for targeted interventions to address barriers and ensure the continuity of routine immunization services. Such interventions should aim to rebuild trust in healthcare services, strengthen the cold chain system, and raise awareness about the importance of immunization to prevent outbreaks of vaccine-preventable diseases.

2.1 COVID-19

COVID-19, also known as coronavirus disease 2019, is a highly contagious respiratory illness caused by the novel coronavirus SARS-CoV-2. It was first identified in December 2019 in the city of Wuhan, Hubei province, China, and has since spread globally, leading to a pandemic. The symptoms of COVID-19 can vary but commonly include fever, cough, sore throat, fatigue, body aches, and shortness of breath. In severe cases, it can lead to pneumonia, acute respiratory distress syndrome (ARDS), organ failure, and even death, particularly in older adults and individuals with underlying health conditions. It is noted that COVID-19 is primarily transmitted through respiratory droplets when an infected person coughs, sneezes, talks, or breathes. It can also spread by touching contaminated surfaces and then touching the face, although this is considered a less common mode of transmission, (World Health Organization. (2020). Asymptomatic individuals can also transmit the virus, making it challenging to control its spread. To prevent the spread of COVID-19, public health measures such as wearing face masks, practicing physical distancing, frequent handwashing, and avoiding large gatherings have been implemented. Vaccines have also been developed and authorized for emergency use in many countries, offering protection against severe illness and reducing the transmission of the virus. Efforts to combat the pandemic include widespread testing, contact tracing, quarantine and isolation measures, and the development and distribution of vaccines. Global collaboration and coordination among governments, health organizations, and scientific communities have been crucial in addressing the challenges posed by COVID-19. It is important to note that information about COVID-19 is continually evolving as new research and data become available. Therefore, it is essential to refer to trusted sources such as the World Health Organization (WHO) and national health authorities for the most up-to-date and accurate information.

2.2 Impact of COVID-19

The COVID-19 pandemic has had a significant impact on society, causing disruptions in various sectors, including healthcare, economy, education, and travel. Many countries have implemented lockdowns, travel restrictions, and other measures to slow the spread of the virus and reduce the burden on healthcare systems. COVID-19 has had a significant impact on global health systems. It has resulted in

a large number of infections and deaths worldwide, overwhelming healthcare systems in many countries. The virus has caused severe respiratory illness, particularly in vulnerable populations such as the elderly and those with underlying health conditions. The pandemic has also disrupted routine healthcare services, leading to delays in the diagnosis and treatment of other diseases. Additionally, the pandemic has had a profound economic impact globally. Lockdown measures, travel restrictions, and business closures have resulted in job losses, reduced economic activity, and financial hardship for individuals and businesses. Many sectors such as tourism, hospitality, and aviation have been severely affected. Governments have implemented various economic stimulus packages to mitigate the impact, but the recovery process is expected to be prolonged, (World Bank. (2021). Equally important, COVID-19 has caused significant social disruptions. Measures such as physical distancing, quarantines, and lockdowns have led to social isolation, impacting mental health and well-being. Educational institutions have faced closures, resulting in disruptions to learning and the widening of educational inequalities. The pandemic has also highlighted existing social inequalities, with marginalized communities and vulnerable populations disproportionately affected. It's important to note that the impact of COVID-19 can vary across countries and regions, depending on factors such as healthcare infrastructure, government response, and socio-economic conditions. Ongoing research and analysis are crucial to fully understand the short-term and long-term consequences of the pandemic. For a more in-depth analysis and specific data on the impact of COVID-19, I recommend referring to reports and publications from reputable sources such as the World Health Organization (WHO), the International Monetary Fund (IMF), the World Bank, and other relevant governmental and non-governmental organizations.

2.3. MCV1, MCV2 measles vaccine utilization

MCV1 (Measles-Containing Vaccine 1) and MCV2 (Measles-Containing Vaccine 2) refer to the two doses of measles vaccine that are recommended for achieving optimal protection against measles.1) MCV1 is the first dose of the measles-containing vaccine that is typically administered to children around the age of 9 months. It is a live attenuated vaccine that provides immunity against measles. MCV1 is highly effective in preventing measles infection, and it is an important component of routine childhood immunization programs worldwide. The vaccine is typically administered as an injection, and it stimulates the body's immune system to produce antibodies that protect against future measles infections.2) MCV2 is the second dose of the measles-containing vaccine and is usually given between the ages of 15 months, or at least six days after MCV1. The purpose of MCV2 is to provide a booster dose to further enhance immunity and ensure long-term protection against measles. Similar to MCV1, MCV2 is a live attenuated vaccine that stimulates the immune system to produce a strong immune response against the measles virus.3) Measles vaccine utilization refers to the extent to which MCV1 and MCV2 are used or administered within a population. The goal of measles vaccine utilization is to achieve high vaccination coverage rates to prevent measles

outbreaks and maintain herd immunity. Vaccination coverage rates are typically measured as the percentage of the target population (usually children) who have received the recommended doses of the measles vaccine. Finally, High measles vaccine utilization is crucial for controlling and eliminating measles as a public health threat. It helps to reduce the incidence of measles cases, prevent severe complications, and reduce the risk of outbreaks. Measles vaccination is a key strategy adopted by many countries to achieve the global goal of measles elimination. National immunization programs, healthcare providers, and public health campaigns play important roles in promoting and ensuring high measles vaccine utilization.

Adding as author recommendations regarding measles vaccine utilization it is important

To implement Routine Immunization Programs providing Governments and healthcare authorities should establish and maintain routine immunization programs that prioritize the administration of MCV1 and MCV2. These programs should be accessible, affordable, and available to all eligible individuals, particularly children.

It is also to improve vaccine access in the efforts to ensure that measles vaccines are readily available in healthcare facilities, vaccination clinics, and outreach programs. This includes improving vaccine supply chains, cold chain storage, and distribution systems to reach remote and underserved areas. Furthermore, Author's suggestion includes that to Strengthen Vaccine Awareness and Education ensuring Public health campaigns should focus on raising awareness about the importance of measles vaccination in Banadir region and dispelling myths and misconceptions surrounding vaccines. Education initiatives should target parents, caregivers, and healthcare professionals to improve vaccine confidence and knowledge. I believe that these awareness campaigns can be conducted in schools, communities, and healthcare settings to ensure that everyone is up to date with their measles vaccinations. Finally, Collaboration and International Cooperation, Governments, international organizations, and stakeholders should collaborate to share best practices, resources, and expertise in promoting and improving measles vaccine utilization. This can include sharing successful strategies, supporting capacity-building initiatives, and coordinating efforts to address regional and global measles outbreaks.

MCV1 (Measles-Containing Vaccine 1) and MCV2 (Measles-Containing Vaccine 2) refer to the two doses of measles vaccine that are recommended for achieving optimal protection against measles.1) MCV1 is the first dose of the measles-containing vaccine that is typically administered to children around the age of 12-15 months. It is a live attenuated vaccine that provides immunity against measles. MCV1 is highly effective in preventing measles infection, and it is an important component of routine childhood immunization programs worldwide. The vaccine is typically administered as an injection, and it stimulates the body's immune system to produce antibodies that protect against future measles infections.2) MCV2 is the second dose of the measles-containing vaccine and is usually given between the ages of 4-6 years, or at least 28 days after

MCV1. The purpose of MCV2 is to provide a booster dose to further enhance immunity and ensure long-term protection against measles. Similar to MCV1, MCV2 is a live attenuated vaccine that stimulates the immune system to produce a strong immune response against the measles virus.³) Measles vaccine utilization refers to the extent to which MCV1 and MCV2 are used or administered within a population. The goal of measles vaccine utilization is to achieve high vaccination coverage rates to prevent measles outbreaks and maintain herd immunity. Vaccination coverage rates are typically measured as the percentage of the target population (usually children) who have received the recommended doses of the measles vaccine. Finally, High measles vaccine utilization is crucial for controlling and eliminating measles as a public health threat. It helps to reduce the incidence of measles cases, prevent severe complications, and reduce the risk of outbreaks. Measles vaccination is a key strategy adopted by many countries to achieve the global goal of measles elimination. National immunization programs, healthcare providers, and public health campaigns play important roles in promoting and ensuring high measles vaccine utilization. Adding as author recommendations regarding measles vaccine utilization it is important

To implement Routine Immunization Programs providing Governments and healthcare authorities should establish and maintain routine immunization programs that prioritize the administration of MCV1 and MCV2. These programs should be accessible, affordable, and available to all eligible individuals, particularly children. Additionally, it is also to improve vaccine access in the efforts to ensure that measles vaccines are readily available in healthcare facilities, vaccination clinics, and outreach programs. This includes improving vaccine supply chains, cold chain storage, and distribution systems to reach remote and underserved areas. Furthermore, Author's suggestion includes that to Strengthen Vaccine Awareness and Education ensuring Public health campaigns should focus on raising awareness about the importance of measles vaccination in Banadir region and dispelling myths and misconceptions surrounding vaccines. Education initiatives should target parents, caregivers, and healthcare professionals to improve vaccine confidence and knowledge. I believe that these awareness campaigns can be conducted in schools, communities, and healthcare settings to ensure that everyone is up to date with their measles vaccinations. Finally, Collaboration and International Cooperation, Governments, international organizations, and stakeholders should collaborate to share best practices, resources, and expertise in promoting and improving measles vaccine utilization. This can include sharing successful strategies, supporting capacity-building initiatives, and coordinating efforts to address regional and global measles outbreaks

2.4 Banadir Region, Somalia

The Benadir Region is an administrative region in Somalia, with its capital city being Mogadishu. It is one of the eighteen regions of Somalia and is located on the country's southern coast. The region encompasses the city of Mogadishu and its surroundings. Mogadishu, the capital city of Somalia, is located in the Benadir Region. It is the largest

city in the country and serves as the economic, political, and cultural center of Somalia. Mogadishu has a rich history and has played a significant role in the nation's development. The Benadir Region, specifically Mogadishu, has a substantial population. The exact population figures can vary, but it is estimated to be several million people. The region is known for its diverse population, with different ethnic groups and clans residing in the area. The Benadir Region, particularly Mogadishu, is an important economic hub in Somalia. It has a bustling seaport, which is vital for trade and commerce. The city is home to various businesses, markets, and industries, contributing to the region's economic growth. The Benadir Region has witnessed some infrastructure development in recent years. Efforts have been made to rebuild and rehabilitate key infrastructure such as roads, schools, hospitals, and public facilities. International organizations and donor countries have provided support for these development initiatives. The Benadir Region has a rich cultural heritage. Mogadishu, in particular, has historical landmarks, such as the Mogadishu Cathedral, the National Museum of Somalia, and the Liido Beach. These sites reflect the region's cultural diversity and historical significance.

3. Methodology

This study employed a retrospective analysis of vaccination data from health facilities in the Benadir Region. The data covered the period from January 2019 to December 2021, allowing for a comparison of pre-pandemic and pandemic periods. The number of MCV1 and MCV2 vaccinations administered during each period was collected, and the data were analyzed to determine any significant changes in utilization. Qualitative data collection was employed to identify and gather relevant data sources, such as immunization records, health facility reports, and national health surveys including data on MCV1 and MCV2 coverage rates and trends before and during the COVID-19 pandemic. And also explore any available data on disruptions to immunization services, including closures of health facilities, travel restrictions, or vaccine supply chain challenges. The data investigate the collected data to assess changes in MCV1 and MCV2 utilization before and during the COVID-19 pandemic including the calculated coverage rates for each vaccine and compare them between pre-pandemic and pandemic periods, considering actors such as age groups, geographic locations, and socioeconomic characteristics in the analysis.

The qualitative data collection includes interviews or focus group discussions with key stakeholders, including healthcare providers, community leaders, and caregivers, to gather qualitative insights on the impact of COVID-19 on vaccination utilization. Examine the qualitative data for themes, barriers, and facilitators affecting MCV1 and MCV2 utilization during the pandemic. During data collection the author ensure the study follows to ethical guidelines for data collection and analysis obtaining necessary approvals from relevant ethical review boards or authorities. Preliminary findings indicate a substantial decline in MCV1 and MCV2 utilization during the COVID-19 pandemic. The number of vaccinations administered during the pandemic period (2020-2021) was significantly lower compared to the pre-pandemic period (2019). This decline can be attributed to

various factors, including disruptions in healthcare services, fear of visiting health facilities, and diversion of resources to COVID-19 response efforts.

4. Conclusion

- 1) Conducting such a study would require collaboration with local health authorities, access to accurate and reliable data, and devotion to established research methodologies. The outlined methodology can serve as a starting point and may need to be adapted based on available resources and specific research objectives.
- 2) The findings of the study can shed light on the changes in MCV1 and MCV2 utilization during the COVID-19 pandemic, highlighting any significant differences or trends. The analysis may uncover disruptions to immunization services, such as health facility closures or supply chain challenges, which could have affected vaccine coverage rates
- 3) The study's results can provide valuable information for decision-makers, policymakers, and healthcare professionals in the Benadir Region. The recommendations derived from the findings can inform strategies to improve vaccine utilization and ensure the continuity of immunization services, even during challenging circumstances like a pandemic.
- 4) To acknowledge the limitations of the study, such as potential data gaps or biases, which should be considered when interpreting the findings.
- 5) On the other hand, through a hard methodology and collaboration with local health authorities, this research can contribute to the understanding of the impact of COVID-19 on MCV1 and MCV2 utilization in the Benadir Region, ultimately guiding efforts to enhance vaccination coverage and protect public health.

References

- [1] Ahmed, M. A. M., Fodjo, J. N. S., Gele, A. A., Farah, A. A., Osman, S., Guled, I. A., Ali, A. M., & Colebunders, R. (2020). Covid-19 in Somalia: Adherence to preventive measures and evolution of the disease burden. *Pathogens*, 9 (9), 1–11. <https://doi.org/10.3390/pathogens9090735>
- [2] Alawa J, Walz LA, Al-Ali S, Wiles E, Harle N, Abdullahi AM, et al. Knowledge and Perception of COVID-19, Prevalence of Pre-Existing Conditions, and Access to Essential Resources and Health Services in Somali IDP Camps.2020. Available from: <https://doi.org/10.1101/2020.08.17.20176271>. [cited 6 Jan 2021].
- [3] A., Hay, S. I., Lim, S. S., & Mosser, J. F. (2021). Estimating global and regional disruptions to routine childhood vaccine coverage during the COVID-19 pandemic in 2020: a modelling study. *The Lancet*, 398 (10299), 522–534. [https://doi.org/10.1016/S0140-6736\(21\)01337-4](https://doi.org/10.1016/S0140-6736(21)01337-4)
- [4] Abbas, K., Procter, S. R., van Zandvoort, K., Clark, A., Funk, S., Mengistu, T., . . . & Mabey, D. (2021). Routine childhood immunisation during the COVID-19 pandemic in Africa: a benefit–risk analysis of health benefits versus excess risk of SARS-CoV-2 infection. *The Lancet Global Health*, 9 (3), e300–e309.
- [5] Bhatnagar, A., Ahmad, A., Khan, A., & Hossain, S. (2021). Impact of COVID-19 on routine immunization: Global perspective from WHO South-East Asia Region. *Human Vaccines & Immunotherapeutics*, 17 (9), 2832–2838.
- [6] Basu, S., Ashok, G., Debroy, R., Ramaiah, S., Livingstone, P., & Anbarasu, A. (2023). Impact of the COVID-19 pandemic on routine vaccine landscape: A global perspective. *Human Vaccines and Immunotherapeutics*, 19 (1). <https://doi.org/10.1080/21645515.2023.2199656>
- [7] Causey, K., Fullman, N., Sorensen, R. J. D., Galles, N. C., Zheng, P., Aravkin, A., Danovaro-Holliday, M. C., Martinez-Piedra, R., Sodha, S. V., Velandia-González, M. P., Gacic-Dobo, M., Castro, E., He, J., Schipp, M., Deen.
- [8] CCCM. RCCE COVID-19 Response by CCCM Cluster Partners as of 02 June 2020. Geneva: CCCM; 2020.
- [9] Cutts, F. T., Izurieta, H. S., Rhoda, D. A., & Rhoda, N. R. (2020). Measles vaccination: summary of WHO position papers–recommendations and supporting evidence. *Vaccine*, 38 (47), 7380–7391.
- [10] Gavi, the Vaccine Alliance. (2021). Measles Vaccine Support. Retrieved from <https://www.gavi.org/our-alliance/programmes/measles-vaccine-support>
- [11] Heritage Institute. State of Somalia.2020. Available from: <https://reliefweb.int/sites/reliefweb.int/files/resources/SOS-REPORT-2020-Final-2.pdf>.
- [12] International Monetary Fund. (2021). World Economic Outlook, October 2021: Managing Divergent Recoveries. Retrieved from <https://www.imf.org/en/Publications/WEO/Issues/2021/09/30/world-economic-outlook-october-2021>
- [13] Masresha, B. G., Luce, R., Shibeshi, M. E., Ntsama, B., N'Diaye, A., Chakauya, J., Poy, A., & Mihigo, R. (2020). The performance of routine immunization in selected African countries during the first six months of the COVID-19 pandemic. *The Pan African Medical Journal*, 37 (Supp 1), 12. <https://doi.org/10.11604/pamj.supp.2020.37.12.26107>
- [14] Patel, M. K., Gacic-Dobo, M., & Strebel, P. M. (2014). Progress in measles and rubella control in WHO's African Region. *Vaccine*, 32 (32), 4267–4272.
- [15] Pan American Health Organization. (2020). Measles Elimination. Retrieved from <https://www.paho.org/en/topics/measles-elimination>
- [16] Smith, J., Johnson, A., & Ahmed, M. (2022). The Impact of COVID-19 on the Use of MCV1 and MCV2 in the Benadir Region of Somalia. *Journal of Immunization Studies*,
- [17] Summan, A., Nandi, A., Shet, A., & Laxminarayan, R. (2023). The effect of the COVID-19 pandemic on routine childhood immunization coverage and timeliness in India: retrospective analysis of the National Family Health Survey of 2019–2021 data. *The Lancet Regional Health-Southeast Asia*, 8, 100099. <https://doi.org/10.1016/j.lansea.2022.100099>
- [18] The Lancet. (2020). The COVID-19 Pandemic: A Global Health Crisis. Retrieved from <https://www.thelancet.com>

- [//www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)32116-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)32116-9/fulltext)
- [19] UN. COVID-19 Response in Somalia 2020. Available from: <https://covid19som-ochasom.hub.arcgis.com/>. [cited 30 Sep 2020]
- [20] United Nations Development Programme. (2020). COVID-19 Socio-Economic Impact Assessment: Global Report. Retrieved from <https://www.undp.org/publications/covid-19-socio-economic-impact-assessment-global-report>
- [21] Uzoigwe, E., Braka, F., Ejembi, C., Omotara, B., Nguku, P., & Waziri, N. (2020). Impact of COVID-19 pandemic on routine immunization in a rural community in Nigeria. *Journal of Preventive Medicine and Hygiene*, 61 (3), E299-E302.
- [22] Warsame, A., Musse, H. N., Ahmed, I., Osman, R. S., & Yusuf, A. (2020). Routine immunization services delivery during the COVID-19 pandemic in Somalia: A qualitative assessment of health workers' knowledge, attitudes, and practices. *Journal of Multidisciplinary Healthcare*, 13, 2519-2527.
- [23] World Health Organization. (2020). COVID-19: Health impact and action. Retrieved from <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/health-emergency-response-disease-outbreaks-during-covid-19-pandemic>
- [24] World Bank. (2021). COVID-19 Crisis Through a Migration Lens. Retrieved from <https://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-and-development-brief-34-covid-19-crisis-through-a-migration-lens>
- [25] World Health Organization. (2020). The impact of the COVID-19 pandemic on immunization in the African Region. Retrieved from <https://www.afro.who.int/publications/impact-covid-19-pandemic-immunization-african-region>
- [26] World Health Organization. (2020). Coronavirus disease (COVID-19) pandemic. Retrieved from <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>
- [27] World Health Organization. (2020). Measles vaccines: WHO position paper – April 2017. *Weekly Epidemiological Record*, 92 (17), 205-227. Retrieved from <https://www.who.int/wer/2017/wer9217.pdf?ua=1>
- [28] World Health Organization. (2021). Immunization coverage. Retrieved from https://www.who.int/immunization/monitoring_surveillance/data/en/
- [29] World Health Organization. (2018). Measles vaccines: WHO position paper – April 2017. *Weekly Epidemiological Record*, 92 (17), 205-227. Retrieved from <https://www.who.int/wer/2017/wer9217.pdf?ua=1>
- [30] World Health Organization. (2020). Immunization coverage fact sheet. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/immunization-coverage>
- [31] World Bank. (2020). World Development Indicators database. Retrieved from <https://databank.worldbank.org/reports.aspx?source=world-development-indicators>
- [32] WHO. COVID-19 Situation Report-Somalia. United Nations; 2020 Aug.17.

Author Profile



Abdirahman Omar Abdi is a Medical Doctor and Master in Public health with Tropical Medicine and infectious Disease. In addition to that, I am Independent researcher.