Review Article

Immunization of Children in Africa: Strides and Challenges

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Abstract

Background: The African continent is behind by a wide margin in the childhood vaccination race which contributes significantly to the high childhood morbidity and mortality rate from vaccine-preventable diseases in the continent. Some African countries are still struggling to achieve routine immunization coverage for all recommended expanded program on immunization vaccines. **Aim:** In this study, we aimed to identify the barriers hindering childhood immunization in Africa and to identify the remarkable progress made so far. **Materials and Methods:** Peer-reviewed articles published in English that focused on the barriers to childhood immunization in Africa and the progress made so far was reviewed. This was achieved by searching relevant search terms in PubMed, Google Scholar, Wiley Online Library, and CINAHL databases dating back from January 2000 to June 2022. **Result:** A total of 30 papers were reviewed. The barriers include parents' education status, economic status, and gender/age; place of birth and place of residence; cultural beliefs and religious affiliations; fear of contracting diseases and lack of trust in health public institutions; vaccine awareness and delivery; and dose-specific delays. The achievements include international support and oriented actions, plans for technological integration and its implementation, and domestic immunization-oriented actions and research work. **Conclusion:** Childhood immunization is still low in Africa with the majority of the countries yet to realize the global immunization targets. Technologies and immunization-related interventions have been implemented to support Africa but more concerted effort and aid are required to reduce vaccine-preventable deaths to the bare minimum.

Keywords: Africa, barriers, challenges (source: medical subheading-NLM), childhood, immunization, progress

Introduction

Immunization is a protective and cost-effective public health intervention program against infectious diseases.[1] It is one of the reliable child survival strategies that help to prevent and reduce the morbidity and mortality of children worldwide. Immunization has been reported to be second only to clean water in bringing down the burden of infectious diseases.[2] In recent years, a reduction in under-5 mortalities has been experienced worldwide largely due to the efficacy of immunization services.[3] Immunization is said to offer the greatest benefits for the health, well-being, and survival of children than any other intervention.[4] Immunization is estimated to save at least 3 million lives from vaccine-preventable diseases (VPD) making it a major intervention toward attaining the Sustainable Development Goal 3 by 2030.[5,6] Despite the numerous advantages of immunization, the standard implementation of immunization services is yet to be achieved in several African countries. This is a result of the numerous challenges encountered, causing African countries to lag behind others.

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Approximately 31 million children in sub-Saharan Africa are at risk of immunization-preventable diseases each year.[7] In sub-Saharan Africa, an average of 1 in 13 children die before their fifth birthday compared to an average ratio of 1 in 199 children who die in high-income countries.[8] Over the past few decades, African immunization programs have made progress, however, vaccination coverages remain low for some recommended childhood vaccines.[9] In 2014, it was reported that only Zimbabwe, among the sub-Saharan region, was estimated to have met the Global Vaccine Action Plan threshold of 80% or higher coverage of diphtheria-tetanus-pertussis vaccine (DTP3), a benchmark used to measure the performance of routine vaccine delivery system.[10] However, in 2019, 19.7

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million children remained under-vaccinated or unvaccinated for the DTP3 vaccine worldwide, of which 48% were in Africa.[11] The majority of these children lived in Nigeria, Ethiopia, the Democratic Republic of Congo, Angola, and Guinea.[11,12]

According to a 2017 study by Oleribe *et al*., several factors were responsible for such low coverage.[13] In addition, missed opportunities for vaccination (MOV) contributed to this.[14,15] A MOV is a condition whereby an individual deemed fit for vaccination ends up not receiving the vaccine despite contact with a health service.[14] In Burkina Faso, nearly 8 in 10 children experience MOVs during health facility visits due to inappropriate health service delivery, lack of integration, and insufficient communication between health workers and caregivers.[16]

These challenges facing African immunization programs hinder their appropriate functioning, consequently preventing the optimal utilization of immunization in Africa. In consequence, more than 30 million African children under the age of five are infected with VPDs annually.[17] Due to limited access to immunization services, over half a million of these children die from VPDs each year, accounting for 58% of all global deaths. In consequence, these VPDs also impose a substantial annual economic burden of $13 billion.[17] These findings highlight the need for the optimal utilization of immunization services in Africa-an improvement which has to start with ameliorating the obstacles to effective immunization in Africa. The identification of evidence-based information and a summarized data on these challenges will be necessary to understand these challenges - a critical factor in resolving the challenges.

This study, therefore, aims to uncover the challenges confronting childhood immunization in Africa and the progress achieved so far. This will assist African governments, policymakers, and health-care service providers in proffering sustainable solutions to overcome the barriers to childhood immunization and improve immunization programs in the continent thereby ensuring more coverage.

Materials and Methods

We performed electronic searches of articles included in this narrative literature review from PubMed, Google Scholar, Wiley Online Library, and CINAHL. The databases were searched on the same date, from January 2000 to June 2022. Full-text articles were assessed, and if found suitable were included in the review. This review follows the Scale for the Assessment of Narrative Review Articles.

Search strategy

The search strategy comprised a combination of medical subheading terms and keywords. They were grouped into four broad categories:

i. Terms that describe the immunization "immunization," "immunization," "vaccination," "vaccine," "program," "Immunization programs," "immunity"
ii. Terms that represent children: "children," "child," "infant," "childhood," "newborn"
iii. Terms that represent the strides: "advancement," "development," "progress," "breakthroughs," "progression"
iv. Terms that represent the challenges: "challenges," "obstacles," "problems," "barriers"
v. Terms that describe the place of study: "Sub-Saharan Africa," "Africa," and "African countries."

The search terms were combined using the Boolean characters "AND" and "OR." The search strategy was devised in Medline and adjusted for the other databases to account for differences in indexing. Reference lists of all papers were identified and searched for additional studies.

Inclusion criteria

The inclusion criteria were peer-reviewed publications on the challenges and strides of immunization of children in Africa between 2000 and 2022, with full-text availability online, and being original and of qualitative, quantitative, or mixed-method nature using both primary and secondary data. Only studies done in African countries and/or countries in sub-Saharan Africa per World Bank categorization were included. Studies were included in this review if they were published in the English language. Furthermore, the studies were restricted to those that included children under the age of 5 only.

Exclusion criteria

Studies in a language other than English were not considered in the review. Nonpeer-reviewed, commentaries, letters to the editor, theses, policy reports, conference posters, bulletins, and presentations were also excluded from the analysis. Papers that focused on barriers and progress of immunization for children in other regions of the world and those that studied adult immunization barriers and progress were excluded. Papers published before January 2000 and beyond June 2022 were also excluded from this review.

Data extraction and management

A data extraction form was designed and piloted for this review to allow for easy management and identification of selected papers. The form was used to extract the following data: study characteristics such as authors' name and year of publication, study location, method, data source, study design, study subjects, sample size, results, summary findings, and reported national immunization coverage and key reported progress and barriers. Data were extracted independently by four reviewers to ensure accuracy. Any difference of opinion was resolved by consensus between all the reviewers. A fifth author was involved if the disagreement was not resolved.

Findings

Of the 273 records our database searches yielded, a total of 30 studies met all the inclusion criteria for this study and were included in the narrative analysis. Just six papers focused on the achievements and interventions of African governments

in childhood vaccination while others focused on the factors hindering childhood vaccination in the continent.

The current state or availability of immunization of children in African countries

Over the years, the state of immunization in Africa remains low with variations across different regions of the continent. Ethiopia reported the highest coverage with 88%, while Nigeria, at the opposite end, with the lowest coverage, 12.7%, in 2013.[9,18,19] The expanded immunization program on the routine vaccination of infants provided by national health systems has faced severe pressure.[20] As of 2012, vaccines have been made available through routine immunization, mobile strategies, immunization outreach programs, and immunization campaigns provided in fixed health facilities.[2] The progress made in reducing under-5 child mortality rates showed a decline from 1990 to 2015. However, only 8 out of 43 regions reached or exceeded the Millennium Development Goals related to childhood survival by 2015.[21]

During the protracted war of 2018 in South Sudan, a significant increase in the number of vaccinated children was observed among children whose parents had been displaced from their homes; this was due to the integration of immunization programs with nutrition services.[22] From the year 2010 to 2018, more than half of the children in sub-Saharan Africa's urban settings were fully immunized (52.8%) while 59.3% of rural residents were not fully immunized. The total 76.5% variation in full immunization was attributed to differences in child and maternal characteristics.[23] Another sub-Saharan Africa study reported a delay in vaccination especially among women born to uneducated mothers.[21]

Childhood immunization in African countries appears to only slightly be altered despite the effect of the COVID-19 pandemic.[20] Along with the fear of contracting the COVID-19 virus, the lack of appropriate protective equipment and the inaccessibility to vaccination facilities also reduced under-5 vaccination rates.[24,25] Globally in 2020, there was a relative reduction in vaccine coverage by 7.7% and 7.9% for the DTP3 vaccine in April. North Africa was part of the regions that were most affected.[22] The majority of vaccine-preventable deaths occur in sub-Saharan Africa of which Nigeria is a major contributor.[13] The Immunization Expansion Program thus remains low in African countries such as Nigeria, Ethiopia, Uganda, and Ghana.[26] Technology is currently being used to keep track of immunization records which shows an improvement in immunization coverage.[27] This has shortened the time required to manage data and data storage.[27]

Actions done to facilitate the immunization of children in Africa

Numerous immunization-oriented actions have been undertaken by the World Health Organization, the United Nations Children's Fund, and other related international support organizations in Africa. Polio and measles have received special attention in these campaigns and have progressed significantly in recent years.[28] Furthermore, these bodies have facilitated the introduction of new vaccines and the provision of support for domestic immunization-oriented campaigns with the use of research and technological strategies in some African countries.[23,28-30] Some of these include the introduction of Vaxtrac, an electronic immunization registry, in Sierra Leone, and Short Message Services for monitoring and managing immunization programs at the community level reminders in some other African countries.[27,29,31]

Barriers

Conquering the following challenges that hinder childhood immunization in Africa is pertinent to improving the region's overall vaccination and the world at large.

Socioeconomic factors

Children whose caregivers were female were more likely to be vaccinated during age-eligible COVID-19 vaccination than other children with male caregivers.[24,32] Furthermore, children born to teenage mothers and mothers above 40 years of age were less likely to complete their vaccination.[33] Inadequate or lack of education of parents or caregivers has been identified to be one of the major challenges of childhood vaccination in African countries.[3,21,32,34-36] Besides, children from poor families in Nigeria are less likely to be vaccinated than those from rich families.[3,33,35] Maternal age was revealed to be a factor influencing childhood immunization uptake in a case-control study conducted in Ethiopia in which mothers over 19 years of age were approximately 10 times more likely to have their children fully immunized compared to mothers under 19 years of age.[26]

A Mozambique study reported that children born at home were less likely to complete their vaccinations.[33] It was also shown that children from divorced or single mothers/fathers were less likely to be fully vaccinated.[24,33,35] In a 40-year narrative review of immunization in Mozambique, it was reported that those residing in urban areas are more likely to vaccinate their children than those residing in rural areas.[33] Poor access to vaccination centers, time to get to the health care facilities, or longer waiting hours in rural vaccination centers contribute to the challenges of childhood vaccination in Africa.[3,19,20,33,37] The dialects of rural localities also pose a serious challenge to health workers during immunization services.[37,38]

Cultural beliefs and religious affiliation

A study carried out in Nigeria showed that Northern Nigeria has one of the lowest vaccination rates in the world due to the region's negative cultural perceptions of immunization.[35] Religious affiliation has been identified as a potential challenge facing vaccination in some African countries, nonetheless, there are no systematic multi-country analyses, including within-country variability on this issue.[38,39] Lower immunization rates among certain religious groups have been discovered to be related to factors such as limited access to social programs, marginalization, limited knowledge and perceptions of illness, and the influence of religious leaders.[39] In addition, a study in Uganda reported that most caregivers

were of the notion that a child suffering from recurrent illness such as fever, cough, or diarrhea should not be vaccinated.[33]

Fear of contracting diseases and lack of trust in public health institutions

Parents' or caretakers' fear of contracting diseases is a serious barrier to childhood vaccination in Africa.[33,38] A study in Dessie town, Ethiopia, showed that the age-eligible coverage of vaccination among children aged 15–23 months was reduced during the COVID-19 pandemic due to fear of contracting the disease in Health facilities.[24] A study in a rural area in Uganda reported that most caregivers resented health facilities due to the fear of getting infected with HIV or that the vaccine has the potential to kill or make the child lame.[32]

Health workers' wrongdoings, fear of rude health workers, fear of needles, fear of vaccine side effects, and perceived contraindications to vaccinations were significant challenges to childhood immunization in Africa.[32,35,38] The lack of trust in public institutions that produce, administer, and oversee vaccination campaigns as well as health-care services is a recurring challenge of childhood vaccination in Africa.[34] In addition, the adverse effects and misconceptions following immunization were identified as some of the major drivers of vaccine hesitancy.[40]

Vaccine awareness and delivery

Inadequate vaccination campaign awareness in Africa has also contributed to the challenges faced during childhood vaccination in Africa. Children whose mothers or caregivers are not aware of vaccine campaigns are less likely to be immunized.[24] The ignorance of the numerous benefits of vaccination to children by parents has been attributed to vaccine hesitancy.[3,21,24] The adverse effects and misconceptions following immunization were identified as some of the major drivers of vaccine hesitancy.[40] Certain studies reported cases of inadequate or outdated immunization knowledge among health-care workers.[19,38,41] More importantly, medical personnel's attitudes may influence how well they educate caregivers about vaccination and its importance.[42] The cost of awareness delivery was observed to be more expensive in rural areas when compared to urban areas in Tanzania.[23] The COVID-19 pandemic hindered the delivery of vaccination and caused global coverage to fall below what has been achieved for the last decade.[22] Increased vaccination campaigns led to increased vaccination rates in Africa between 2001 and 2005.[28]

Delays in vaccine delivery and administration result in low coverage. A study carried out in 33 Sub-Saharan African countries in 2021 affirmed that dose-specific delays are common and they significantly increase the likelihood of dropping off the schedule.[21] In addition, It was observed that postponed administration of any dose was greatly related to an increased likeliness of not finishing the immunization schedule during the first year of life in Sub-Saharan Africa[9,21] although, vaccine stockouts and other service disruptions are often unavoidable barriers to access.[21,37,42]

Recommendations and Conclusion

Although the argument in this narrative review solely may not form the basis for region-specific interventions, it is crucial for stimulating immunization-related policies in African countries. It is recommended that the precise manner and degree to which childhood vaccination barriers affect different regions in Africa be evaluated. This is prospective for evidence-based immunization policy formulation and implementation. A positive attitude and adequate commitment to the cause are crucial in the childhood immunization race. Africa can achieve its target by allocating more funds, implementing vaccination-friendly policies, collaborating with both domestic and international companies, and conducting further research into the potential solutions to the challenges hindering the continent's efforts.

Furthermore, we suggest that the integration of in-demand services with immunization should be considered when tackling MOV in other regions in Africa. Furthermore, we advise the initiation of routine vaccination training among health-care workers and immunization education. We believe this will bolster their knowledge and equip them with the necessary skills and tools required to perform their role in childhood immunization in Africa.

Solving the problem of vaccine hesitancy is crucial to improving vaccine uptake and meeting global immunization targets. To elicit this, an increased awareness of vaccine benefits and myths dispelling is required in the African region. These awareness programs should be targeted at key areas of the populations with low levels of immunization determinants. To achieve the maximum impact of these programs, community health workers (CHWs) can be utilized. There is evidence that the employment of CHWs improved community-based adherence support on treatment outcomes for tuberculosis, leprosy, and HIV/AIDS-infected individuals in Africa.[43] This may be associated with better community engagement and familiarity with the CHWs, which aids in better reception and comprehension of health information on the part of the community.

A similar model should be employed in African communities as regards myth dispelling, especially in rural areas and areas with high levels of illiteracy. The utilization of community engagement, through CHWs, in dispelling the myths of vaccination in Africa will improve both the community vaccine knowledge and vaccine dose adherence. This approach will also bring immunization closer to the disadvantaged population, moving Africa closer toward "health-for-all" objectives, as far as immunization is concerned. Beyond hesitancy, vaccine production should be increased in Africa. This will enable the region to secure its vaccine supply chain and move Africa toward resolving vaccine stockouts and other associated issues.

We recommend the publication of cohort studies and randomized control trials evaluating the effectiveness of recent

strategies employed in improving immunization programs in local African communities. Further research should examine, in detail, the association and likely effects of these challenges on each other to enable a better understanding of these challenges which is crucial for resolving them permanently.

Childhood vaccination in Africa has come a long way but it is still way behind its target and other continents. To achieve an objective of Sustainable Development Goal 3 and in a bid to explore the vaccination coverage achieved by African governments, and domestic and international nongovernmental organizations, our review identified the achievements and barriers to immunization of children in the African continent. This review forms a big step in the way forward.

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Conflicts of interest

There are no conflicts of interest.

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