Children and adolescents in African countries should also be vaccinated for COVID-19

Nadia A Sam-Agudu, Nana Kofi Quakyi, Refiloe Masekela, Alimuddin Zumla, Jean B Nachela

INTRODUCTION

Since the onset of the COVID-19 pandemic in December 2019, scientists have worked expeditiously to develop effective treatments and vaccines for clinical management and prevention of COVID-19. Drugs such as remdesivir, dexamethasone and, more recently, molnupiravir have had modest to impressive results in reducing risk of hospital admission, time to discharge, morbidity and/or mortality.1–3

COVID-19 vaccine development and evaluation in clinical trials has been rapid, with safe, effective vaccines being available within 12 months into the pandemic. There are several RNA, DNA, viral vector, inactivated and protein subunit COVID-19 vaccines approved for use.4 Table 1 shows the most widely used approved vaccines across each vaccine type.5 None of these vaccines are currently manufactured in any African country; however, participants in a few African countries have been enrolled in adult and, more recently, paediatric trials for these vaccines.6,7 Global, equitable access to safe and effective vaccines for all age groups is critical to ending the COVID-19 pandemic.

GLOBAL COVID-19 VACCINE APPROVALS FOR CHILDREN AND ADOLESCENTS

There is evidence, mostly from high-income countries, to show that children and adolescents under the age of 18 years (hereafter referred to as ‘children’) can acquire and transmit SARS-CoV-2 infection and experience severe COVID-19, including multisystem inflammatory syndrome in children (MIS-C) and Long COVID-19 syndrome.8–10 Globally, children under 5 years of age represent only 2% of reported COVID-19 cases and 0.1% of deaths, whereas 5–14-year-olds represent 7% and 0.1%, and 15–24-year-olds represent 15% and 0.4% of cases and deaths, respectively.8 However, available data indicate that infants under 1 year of age have disproportionately high mortality,10 and adolescents and young people are increasingly representing higher proportions of the COVID-19 case load.11 Currently, six widely used COVID-19 vaccines have received emergency use authorisation or full approval for children under 18 years of age in at least one country12–19 (table 1). These include the USA’s Pfizer-BioNTech and Moderna (approved outside the USA) vaccines for adolescents ≥12 years of age,12,14 Pfizer-BioNTech vaccine for 5–11-year-olds,15 China’s Sinovac and Sinopharm vaccines for 3–17-year-olds16,18 and India’s Covaxin for children as young as 2 years old19 (table 1). At the time of writing, full vaccination is considered as receiving the one (Johnson and Johnson) or two dose (all others) primary series of currently available first generation COVID-19 vaccines.20 To date, 10 vaccines have been approved by the WHO for emergency use listing in adults,21 six of which have
approval for paediatric indication in at least one country (tables 1 and 2). Consequently, COVID-19 vaccine coverage for children is rising in some countries; in the USA, for example, 53% of 12–17-year-olds were fully vaccinated and 25% of 5–11 year-olds were partially vaccinated by early January 2022. By that same time point, population-wide full vaccination rates in high-income countries have reached approximately 60%–90%, and third dose boosters are being scaled up for adults and more recently, adolescents 12 years and older in some countries.

THE CASE FOR COVID-19 VACCINATION AMONG CHILDREN IN AFRICAN COUNTRIES

As has been for adults, the COVID-19 vaccination situation is quite different for children in African countries, vis-à-vis globally. Currently, most of the countries with the highest rates of full COVID-19 vaccination in Africa are island nations or in Northern Africa, for example, the Seychelles (79%), Mauritius (72%), Morocco (62%), Tunisia (50%) and Cabo Verde (46%). In a recent position statement, the WHO acknowledges that the majority of evidence in COVID-19 among children is from high-income countries, and recommends that ‘countries should consider the individual and population benefits of immunizing children and adolescents in their specific epidemiological and social context when developing their COVID-19 immunization policies and programs’. This recommendation thus puts the onus on countries to conduct their own local research to guide decision-making on paediatric COVID-19 vaccination policy. Steep inequity in access to vaccines and low rates of vaccination in high-risk adult populations need to be considered vis-à-vis vaccinating overall lower risk paediatric populations in Africa. However, benefits to vaccinating children include minimising school closures, the academic and psychological impacts of disruptions in education and intergenerational transmission. Moreover, children in African countries also bear high burdens of both communicable (eg, HIV, tuberculosis) and non-communicable diseases (eg, sickle cell disease, asthma), which would render them at risk for higher morbidity and mortality if coinfected with SARS-CoV-2.24 To date, only 11 African countries have approved COVID-19 vaccination among children under 18 years (table 2 and figure 1).

The African Forum for Research and Education in Health (AFREhealth) COVID-19 Research Collaboration on Children and Adolescents recently published results of a retrospective study conducted in six African countries. This study included 469 children and adolescents aged 3 months to 19 years hospitalised between March and December 2020 in East (Kenya, Uganda), West (Ghana, Nigeria), Central (Democratic Republic of the Congo) and Southern Africa (South Africa). Approximately 25% of children presented with comorbidities; 3.8% were suspected or confirmed to have MIS-C, and 39 (8.3%) died in hospital. Among

**Table 1** Major COVID-19 vaccines approved by at least one country, and paediatric age indications*

| Vaccine type       | Vaccine name       | Manufacturer and country               | Initial age indications (years) | Paediatric age indication (years) | Earliest approval date for children (country) |
|--------------------|--------------------|----------------------------------------|--------------------------------|----------------------------------|---------------------------------------------|
| messenger RNA (mRNA) | BNT162b2          | Pfizer-BioNTech (USA/Germany)          | ≥16                            | 12–15 5–11                     | 10 May 2021 (USA)29 October 2021 (USA)13 |
| mRNA-1273          | Moderna (USA)      |                                        | ≥18                            | 12–17                           | 23 July 2021 (European Union)19            |
| Viral vector       | Ad26.COV2.S        | Johnson & Johnson/ Janssen (USA/Belgium)| ≥18                            | –                               | –                                           |
| AZD1222            | Oxford-AstraZeneca (UK) |                                        | ≥18                            | –                               | –                                           |
| Covishield         | Serum Institute of India (India) |                                        | ≥18                            | –                               | –                                           |
| Sputnik Light      | Gamaleya (Russia)  |                                        | ≥18                            | –                               | –                                           |
| Sputnik V          | Gamaleya (Russia)  |                                        | ≥18                            | –                               | –                                           |
| Inactivated virus  | BBIBP-CovV         | Sinopharm (China)                      | ≥18                            | 3–17                            | 18 August 2021 (China)17                  |
| CoronaVac          | Sinovac (China)    |                                        | ≥18                            | 3–17                            | 6 June 2021 (China)18                     |
| Covaxin            | Bharat Biotech (India) |                                        | ≥18                            | 2–17                            | 12 October 2021 (India)15                 |
| Protein based      | Corbevax           | Biological-E (India)                   | ≥18                            | –                               | –                                           |
| Covovax            | Serum Institute of India (India) |                                        | ≥18                            | –                               | –                                           |
| NVX-CoV2373        | Novavax (USA)      |                                        | ≥18                            | –                               | –                                           |
| DNA                | ZyCoV-D            | Zydus Cadila (India)                   | ≥12                            | 12–17                           | 20 August 2021 (India)35                 |

*As of 14 January 2022.
the children who died were 22 (32%) of the 69 children admitted to the intensive care unit (ICU), and 4 (22%) of the 18 with suspected/confirmed MIS-C. In multivariable ordinal logistic regression, factors independently associated with severe outcomes (oxygen requirement, ICU admission, mechanical ventilation and death) were age <1 year, hypertension, chronic lung disease and haematological disorders. This new evidence helps to address a pressing need for data to guide policy and practice for COVID-19 in African countries. The AFREhealth study provides multicountry, multiregional evidence of relatively high mortality rates among hospitalised children with COVID-19. Mortality in the AFREhealth study was 8.3%, severalfold higher than paediatric case fatality rates of 0.24% (in low and middle-income countries) and 0.01% (in high-income countries) reported in a systematic review by Kitano et al, and still higher than the global average of 0.1%-0.4% reported by the WHO.

The wide differences seen in paediatric COVID-19 case fatality rates between lower resource African settings and high-resource settings have also been seen among adults, as demonstrated by the high (~50%) mortality among critically ill adult patients with COVID-19 in the African COVID-19 Critical Care Outcomes Study. These findings infer the significant role that health infrastructure—or lack thereof—plays in modulating COVID-19 case fatality rates beyond the pathogenicity of circulating SARS-CoV-2 strains. The emerging evidence supports our call for African countries—especially those with the least resourced health infrastructure—to prioritise disease prevention and galvanise efforts to scale up COVID-19 vaccine supply and uptake, including among children.
its relatively young population, the African continent cannot achieve herd immunity without vaccinating children.

CONSIDERATIONS FOR INCLUSION OF CHILDREN AND ADOLESCENTS IN VACCINE POLICY ACROSS AFRICA

While a case may be made for children to receive COVID-19 vaccines, policy making for African countries has to be made in consideration of unacceptably low adult vaccination rates in the setting of global inequities in accessing vaccines, poor risk communication and under-resourced health systems. As of 8 January 2022, full COVID-19 vaccine coverage across Africa was 9.6%, with approximately 52% of countries still below 10% coverage. Clearly, the WHO’s modest targets of 40% full vaccine coverage for all countries by the end of 2021 was not met, and the 70% target for June 2022 will likely not be attained for much of the continent. The emergence of the SARS-CoV-2 Omicron variant, first reported to WHO by South Africa on 24 November 2021, is likely to further delay the achievement of these targets by potentially redefining ‘full coverage’ in necessitating boosters for adequate protection.

To date, only a few African countries have approved paediatric COVID-19 vaccination, thus vaccine roll-out for children will continue to lag behind that of adults for much of the continent. For children who may not be targeted for vaccination at the same time as the rest of the population, at a minimum, we propose prioritisation similar to that for adults early in vaccine roll-out: those at highest risk of severe disease and death, and older adolescents (who are more likely to transmit infection) living with high-risk adults should also receive vaccines. Thus, high-risk children in African countries should be prioritised for COVID-19 vaccination regardless of their age; this population includes children with hypertension, chronic lung disease and haematological disorders, as reported by the AFREhealth study.

Paediatric COVID-19 vaccination can be prioritized using risk stratifications according to presence and number of comorbidities, and cohabitation or close contact with high-risk adults. Likewise, healthy adults living with and/or caring for high-risk children should also be encouraged to get vaccinated; this includes healthcare workers. Our recommendations are in line with an analysis from the Africa Centres for Disease Control and Prevention, which indicates that reaching 70% vaccine coverage for nearly all African countries will require inclusion and vaccination of children at least 10 years of age.

CONCLUSION

New, locally generated evidence indicates that COVID-19-related morbidity and mortality among children and adolescents in African countries may be much higher than among their counterparts in other regions of the world. The advent of the rapidly spreading Omicron variant and its as-yet unknown impact across Africa and among children is of additional concern. It is important to scale up the generation of rigorous local evidence across Africa through collection and reporting of national-level, age-disaggregated epidemiological data and the design and implementation of observational and interventional studies focused on...
paediatric COVID-19. Vaccination with currently available vaccines continues to be recommended for the eligible who can access them. Given the emerging evidence of paediatric vulnerability to severe COVID-19, it is imperative that policy makers and public health institutions include African children in their COVID-19 vaccine guidelines and procurement planning, especially for those at highest risk of severe disease and death. While COVID-19 vaccines are a game-changing public health tool, until the pandemic is under epidemic control, basic infection control methods such as mask wearing, hand sanitisation, good indoor ventilation, and physical distancing must be concurrently observed.

Author affiliations

1International Research Center of Excellence, Institute of Human Virology Nigeria, Abuja, Nigeria
2Institute of Human Virology, University of Maryland School of Medicine, Baltimore, Maryland, USA
3Department of Paediatrics, University of Maryland School of Medicine, Baltimore, Maryland, USA
4Department of Paediatrics and Child Health, University of Cape Coast School of Medical Sciences, Cape Coast, Ghana
5International Projects Unit, The Aurum Institute, Accra, Ghana
6Department of Health Policy and Management, New York University School of Global Public Health, New York, New York, USA
7Department of Paediatrics and Child Health, College of Health Sciences, University of KwaZulu Natal, Durban, KwaZulu Natal, South Africa
8Division of Infection and Immunity, University College London Medical School, London, UK
9NIHR University College London Hospitals Biomedical Research Centre, London, UK
10Center for Global Health, University of Pittsburgh, Pittsburgh, Pennsylvania, USA
11Center for Infectious Diseases, Stellenbosch University Faculty of Medicine and Health Sciences, Cape Town, Western Cape, South Africa

Twitter Nadia A Sam-Agudu @NASAdoc, Nana Kofi Quakyi @nkquakyi, Refiloe Masekela @bronzchigir and Alimuddin Zumla @AlimZumla

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ORCID ids

Nadia A Sam-Agudu http://orcid.org/0000-0001-5052-7730
Nana Kofi Quakyi http://orcid.org/0000-0002-1483-4001
Refiloe Masekela http://orcid.org/0000-0002-2006-1201
Alimuddin Zumla http://orcid.org/0000-0002-5111-5735
Jean B Nachega http://orcid.org/0000-0002-2862-4443

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