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SYNOPSIS

Retinopathy of Prematurity: A Preventable Cause of Childhood Blindness

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Abstract

Retinopathy of prematurity (ROP) is a preventable vasoproliferative disorder affecting the developing retina of preterm infants and remains a leading cause of childhood blindness worldwide. With rising neonatal survival in low- and middle-income countries like Nigeria, ROP incidence has increased, often due to inadequate screening and unregulated oxygen therapy. This review highlights the evolving epidemiology of ROP, particularly in Nigeria, and underscores key risk factors such as prematurity, oxygen misuse, sepsis, and poor weight gain. The paper outlines the pathogenesis, classification based on the International Classification of ROP (ICROP), and current management strategies, including laser therapy and anti-VEGF injections. Screening guidelines, especially Nigeria-specific protocols, are reviewed to emphasise timely detection. Prevention is anchored in optimised neonatal care and the "POINTS of Care" framework: Pain control, Oxygen management, Infection control, Nutrition, Temperature regulation, and Supportive care. Strengthening policy implementation, health system capacity and caregiver awareness is vital to reducing ROP-related blindness in Nigeria and similar contexts.

Keywords: Oxygen therapy, Preterm Infants, Retinopathy of Prematurity, Screening Guidelines.

Introduction

Retinopathy of prematurity (ROP) is a multifactorial, vasoproliferative disease of the developing retina that affects preterm infants, leading to severe visual impairment or blindness.[1] First described in 1942 by Terry as retrolental fibroplasia, ROP remains one of the most typical causes of visual morbidity and blindness globally, particularly among preterm infants who require intensive neonatal care.[2,3] Presently, developing countries are experiencing an epidemic of ROP, which is due to higher survival rates of preterm babies as a result of improved neonatal care and neonatal survival, with little or no information about ROP screening services.[1] In Nigeria, ROP screening services have been evolving over the last decade with increasing awareness.[4]

Epidemiology

Retinopathy of prematurity has occurred in three epidemic waves: the first in the 1940s–50s due to unmonitored oxygen use in relatively mature infants; the second in the 1960s–70s with increased survival of extremely preterm infants in high-income countries; and the third from the 1990s in middle-income countries, where improved neonatal care often lacked adequate screening and oxygen regulation, leading to ROP in even larger infants.[5] There is a wide variation in the incidence of ROP, ranging from 9% to 47.5%, varying with country, region, and neonatal care standards.[6–13] Recent U.S. data show a rising incidence of ROP from 2003 to 2019, disproportionately affecting Black, Hispanic, and low-income infants.[14] In 2019, the global age-standardised prevalence of vision loss due to ROP in individuals under 20 was 86.4 per 100,000, including 31.6 per 100,000 for blindness, and contributed to 10.6 years lived with disability (YLDs) per 100,000. Although the overall burden has slightly declined since 1990, the prevalence of ROP-related vision loss has continued to rise—especially among males and in low-SDI regions

such as South Asia and Southern sub-Saharan Africa.[15] The prevalence of ROP in Africa is estimated at 30%.[16] In Nigeria, ROP screening/treatment coverage has been poor due to inadequate human and financial resources.[17] Despite limited available data, reported prevalence rates of ROP in Nigeria vary widely, ranging from 13.5%,[18] and 15%[19] to as high as 47.2%.[20] As part of the evolving epidemiology of ROP in Nigeria, recent data from Abuja revealed significant gaps in screening and service provision, particularly in private healthcare settings. Despite approximately 2,500 preterm admissions annually in the Federal Capital Territory (FCT), most of which occur in private hospitals, ROP screening remains grossly inadequate, placing many infants at risk of preventable blindness. A case series from 2020 to 2023 reported five instances of ROP-related blindness in infants who had all received neonatal care in private facilities without any ROP screening.[21] In addition, a nationwide 2016-2020 survey of paediatric ophthalmologists documented 18 ROP-blind children (mean GA 28 weeks, mean BW 1.17 kg), 90 % of whom had never been screened and one-third of whom were born in private hospitals.[22]

Embryology of the retina and phases of ROP development

Development of retinal vasculature begins around the 16th week of gestation and reaches maturation at about the 40th week. Thus, preterm infants are born with immature retinal vasculature.[3] The pathogenesis of ROP is biphasic.[23]

Phase I – Vaso-cessation (Birth to 30–32 weeks gestation):

Premature birth exposes the underdeveloped retina to supplemental oxygen in the NICU, leading to retinal hyperoxia. This suppresses VEGF production, halting normal vessel growth and causing vessel constriction. As a result, parts of the retina are deprived of adequate blood supply and oxygen.

Phase II – Vasoproliferation (After 30–32 weeks gestation):

As the infant grows, retinal oxygen demand increases. The resulting relative hypoxia stimulates VEGF production and release of other growth factors, leading to abnormal blood vessel growth at the border between vascularised and avascular retina and intravitreal neovascularisation marked by a ridge formation.[24 25]

Risk factors

Prematurity is the primary risk factor for ROP, with lower gestational age (GA) strongly associated with higher incidence and greater severity of the condition.[26] Gestational age of <30 weeks and birth weight of <1500g have been identified as the two most important risk factors for the development of ROP.[27]

Another important risk factor is the prolonged administration of oxygen without adequate monitoring. The switch from a relatively hypoxic in-utero environment to a hyperoxic state following exposure to oxygen at birth leads to inhibition of VEGF and other events that lead to ROP.[27]

Other risk factors include the presence of comorbidities such as Respiratory Distress syndrome, anaemia, sepsis, perinatal asphyxia and poor weight gain[28]. Maternal factors include advanced age, multiple pregnancy, anaemia, preeclampsia, infections and smoking.[29]

Factors that influence the progression of ROP include blood transfusion, Bronchopulmonary dysplasia and anomalies of the central nervous system such as intraventricular haemorrhage and periventricular leukomalacia.[28]

Increased incidence of ROP in developing countries has been attributed to factors such as increased survival of preterm infants due to improved access to neonatal care, presence of other modifiable risk factors such as unrestricted exposure to supplemental oxygen, infection, blood transfusion and poor weight gain; low level of awareness and low uptake/availability of screening programmes and delay initiation of treatment.[30]

Protective factors

Human breast milk is rich in numerous factors that are protective against the development of ROP. IGF-1 and long-chain polyunsaturated fatty acids in human milk promote retinal vascularisation and normal retinal vascular development. Also, the presence of antioxidants in breast milk has been reported to prevent the development of ROP.[31] Thus, practices that promote exclusive breastfeeding should be supported.

Classification

Since its first publication in 1984,[32] the International Classification of ROP (ICROP) has provided a

common language for describing ROP location, stage and severity, underpinning research, cross-centre communication and treatment decisions. The third edition (ICROP 3, 2021) refines this framework in four key areas.[33]

Zone (Location of ROP): ROP zones are anatomically classified into three regions: Zone I, the posterior pole defined by a circle centred on the optic disc extending to twice the distance from the disc to the macula; Zone II, extending from the edge of Zone I to the ora serrata nasally; and Zone III, comprising the temporal crescent of the retina not included in Zone II (Figure 1). Additionally, the updated ICROP guidelines introduce a “notch” qualifier for eyes that appear anterior in most sectors but extend posteriorly in one to two clock hours. In such cases, the eye is classified according to the more posterior zone, labelled as "secondary to the notch," to ensure this subtle posterior involvement is not overlooked.

Severity of ROP: This is classified into five stages based on the progression of retinal changes: Stage 1 presents as a demarcation line between the vascularised and avascular retina; Stage 2 involves a ridge forming at this demarcation line; Stage 3 is characterised by extraretinal neovascularisation, with new vessels extending into the vitreous; Stage 4 denotes partial retinal detachment; and Stage 5 represents total retinal detachment, indicating the most advanced and vision-threatening stage of the disease. Total retinal detachment is graded as 5A (open funnel, optic nerve visible), 5B (closed funnel, optic nerve obscured) or 5C (5B plus anterior-segment anomalies such as shallow chamber or corneal opacity) to align descriptions with what can be seen at the slit-lamp or under anaesthesia.

Plus-spectrum disease: Assessment is confined to Zone I vessels. Plus disease is diagnosed when arterial tortuosity and venous dilatation are present in at least two quadrants, signalling severe, active disease; pre-plus disease shows vascular abnormalities that fall short of full plus criteria. Ancillary signs such as iris vessel engorgement, poor pupil dilation, peripheral congestion or vitreous haze denote advanced pathology but are not required for diagnosis.

Aggressive-ROP (A-ROP): The entity formerly termed aggressive-posterior ROP is renamed A-ROP to emphasise its rapid course irrespective of precise posterior location. Hallmarks are precipitous stage 3 with plus disease, anomalous shunting or looping vessels, and flat neovascularisation without a ridge; it should be managed with the urgency previously reserved for AP-ROP.

Extent: The extent of ROP is quantified by the number of clock hours (out of 12) over which the retina is affected.

Other descriptors include an indication of whether regression is complete or incomplete, spontaneous or post-treatment, and note any persistent avascular retina (PAR) by zone and extent. Reactivation after anti-VEGF therapy is classified with the usual zone-stage labels plus the term "reactivation." At the same time, long-term sequelae—late detachment, retinoschisis, macular or vascular anomalies and secondary angle-closure glaucoma are recorded when present.

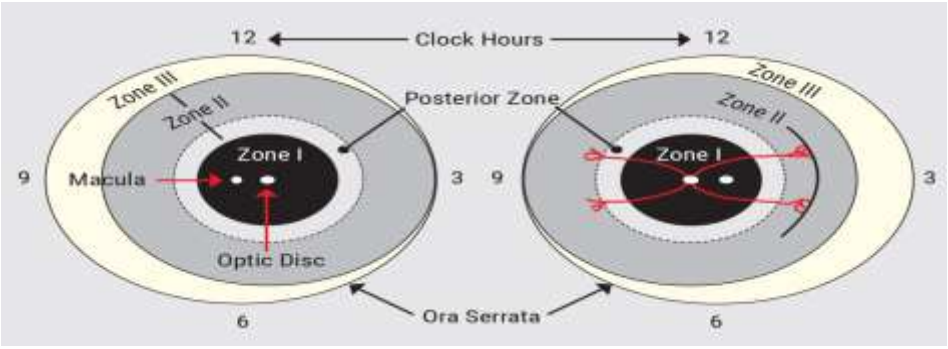


Figure 1: ROP Zone Classification (Source: Chiang *et al.*[33])

Treatment and Management of ROP

Treatment decisions in ROP are guided by disease severity, location, and presence of plus disease, following established criteria such as those from the Early Treatment for Retinopathy of Prematurity (ETROP) study.

Indications for Treatment (ETROP Criteria).[34]

Treatment is indicated for Type 1 ROP, which includes:

Zone I, any stage with plus disease

Zone I, stage 3 without plus disease

Zone II, stage 2 or 3 with plus disease

Treatment Strategies

Indications for the treatment of ROP and preferred treatment modalities are shown in Figure 2.

Observation: Mild cases (Stages 1 and 2 without plus disease) often resolve spontaneously and require close monitoring rather than immediate intervention.

Laser Photocoagulation: Considered the gold standard for threshold ROP, laser treatment ablates the avascular peripheral retina to reduce VEGF production, thereby halting disease progression.

Anti-VEGF Therapy: Intravitreal injections (such as bevacizumab and ranibizumab) are particularly effective in posterior and aggressive ROP. They inhibit abnormal vessel growth and are often used in zone I disease. However, they require long-term follow-up due to the risk of late reactivation and potential systemic effects, which remain under investigation.

Surgical Intervention: In advanced stages (4 and 5), surgical procedures are necessary to address retinal detachment. Such treatments include lens-sparing vitrectomy, lensectomy with vitrectomy and scleral buckling (in select cases). These are aimed at reattaching the retina and preserving whatever vision remains.

Screening and Diagnosis

According to the American Academy of Paediatrics:[36]

Timely screening is vital for early detection and management:

Eligibility:

- Infants with a gestational age ≤30 weeks or birth weight ≤1500 grams,
- Infants with a gestational age >30 weeks or birth weight >1500 - 2000 grams, if: clinical course is unstable
- hypotension requiring inotropic support,
- oxygen supplementation for more than a few days,
- oxygen therapy without saturation monitoring.

Timing: Initial examination is recommended at 4-6 weeks postnatal age or 31-33 weeks postmenstrual age, whichever is later.

Methodology: Indirect ophthalmoscopy is the standard, with retinal imaging adjuncts enhancing diagnostic accuracy.

Nigerian Guidelines for ROP Screening[4]

Eligibility for Screening

Screen all preterm infants who meet any of the following criteria:

- Gestational Age (GA) ≤ 34 weeks
- Birth Weight < 2.0 kg
- Larger or more mature infants (up to 37 weeks GA) if one or more of the following high-risk conditions are present:
- Prolonged or unmonitored oxygen therapy
- Recurrent apnoea episodes
- Blood transfusions
- Respiratory Distress Syndrome (RDS)
- Intraventricular haemorrhage
- Confirmed or suspected neonatal sepsis
- Unknown gestational age

Clinical concern or high index of suspicion by the managing paediatrician, especially in infants with stormy or complicated neonatal courses

- Timing of First Screening
- The initial ROP examination should be done at 3 to 4 weeks postnatal age or any time before discharge from the Special Care Baby Unit (SCBU) or Neonatal Intensive Care Unit (NICU)—whichever occurs first.
- Follow-up Screening and Scheduling
- Subsequent screening visits should follow a schedule based on retinal findings and ROP staging, as per the ophthalmologist's recommendation.

- Follow-up screenings should be conducted on the same day as the neonatologist's outpatient review to ensure coordinated care.

Figure 2: Indication for treatment of ROP and preferred treatment modalities (source: Sanghi *et al.*[35])

A dedicated screening day and time should be arranged between ophthalmology and NICU teams to facilitate both initial and follow-up eye examinations.

Pain management in ROP screening

During ROP screening, topical anaesthesia should be complemented with oral paracetamol for pain relief.[37] Non-pharmacological methods, such as administering EBM or sweet oral solutions and using comfort measures, are also recommended to ease the infant's

discomfort. In addition, other approaches such as soothing touch, supportive nesting, appropriate positioning, calming music, and multisensory or developmental interventions have shown potential to ease discomfort during ROP screening.[38]

Prevention

Preventing ROP involves a multifaceted approach targeting known risk factors, early detection, and timely intervention. Optimising neonatal care is paramount. Practices include antenatal corticosteroids, judicious use of oxygen therapy with strict monitoring to avoid hyperoxia, maintaining adequate nutritional support, especially promoting the use of breast milk, and preventing infections and other neonatal complications such as sepsis and respiratory distress syndrome. These preventive strategies are encapsulated in the "POINTS of Care" framework,[39] which emphasises six critical components: Pain control, Oxygen management, Infection control, Nutrition, Temperature regulation, and Supportive care—all of which are essential in minimising the risk and severity of Retinopathy of Prematurity in preterm infants.

Careful titration and continuous monitoring of supplemental oxygen are integral to ROP prevention. At delivery and afterwards, giving 100% oxygen is not necessary for preterm babies. Ideally, there should be equipment to mix air and oxygen (blenders) in the delivery room and neonatal units for preterm infants. Maintaining peripheral oxygen saturation (SpO_2) within a safe range—typically 88 %–94 %—is crucial, as levels ≥ 95 % can injure developing retinal vessels (and harm lungs and brain), whereas sustained levels ≤ 88 % risk cerebral hypoxia.[40] Accordingly, pulse-oximeter alarms should be set to alert staff whenever SpO_2 rises to 95 % or higher or falls to 88 % or lower, ensuring prompt adjustment of oxygen delivery from the moment of birth.[39]

Screening protocols must be established and consistently implemented for all at-risk infants, particularly those born ≤30 weeks gestational age or weighing ≤1500 g. Timely ROP screening, starting at 4–6 weeks postnatal age or 31–33 weeks postmenstrual age, is critical. Expanding awareness, building capacity among neonatal and ophthalmic care providers, and integrating ROP services into routine neonatal care—particularly in private and under-resourced settings—can reduce the burden of avoidable blindness. National guidelines, policy frameworks, and resource allocation should support equitable access to ROP screening and treatment services across all levels of healthcare.

Conclusion

Retinopathy of prematurity remains a significant yet preventable cause of childhood blindness, especially in low- and middle-income countries experiencing increased survival of preterm infants without corresponding advancements in screening and treatment infrastructure. Understanding its epidemiology, pathophysiology, risk factors, and classification is essential for timely diagnosis and appropriate management. With advancements in neonatal care and therapeutic options such as laser photocoagulation and anti-VEGF therapy, outcomes have improved markedly. However, challenges such as inadequate screening, limited resources, and low awareness persist, especially in regions like Nigeria. Strengthening screening programs, improving neonatal practices, ensuring early detection, and initiating timely treatment are essential strategies to mitigate the burden of ROP-related vision loss. Integrating preventive strategies with policy and system-level interventions will be key to eliminating preventable blindness from ROP.

References

1. Tsai ASH, Acaba-Berrocal L, Sobhy M, Cole E, Ostimo S, Jonas K, *et al.* Current Management of Retinopathy of Prematurity. *Curr Treat Options Peds* 2022; 8:246–61.
2. Rashidian P, Karami S, Salehi SA. A review on retinopathy of prematurity. *Med Hypothesis Discov Innov Ophthalmol* 2025;13(4):201-22.
3. Fevereiro-Martins M, Marques-Neves C, Guimarães H, Bicho M. Retinopathy of prematurity: A review of pathophysiology and signaling pathways. *Surv Ophthalmol* 2023;68(2):175-210.
4. Ademola-Popoola DS, Fajolu IB, Gilbert C, Olusanya BA, Onakpoya OH, Ezisi CN, *et al.* Strengthening retinopathy of prematurity screening and treatment services in Nigeria: a case study of activities, challenges and outcomes 2017-2020: *BMJ Open Ophthalmol* 2021;6:e000645.
5. Hong EH, Shin YU, Cho H. Retinopathy of prematurity: a review of epidemiology and current

treatment strategies. *Clin Exp Pediatr* 2022;65(3):115-26.

6. Gerull R, Brauer V, Bassler D, Laubscher B, Pfister RE, Nelle M; Swiss Neonatal Network & Follow-up Group. Incidence of retinopathy of prematurity (ROP) and ROP treatment in Switzerland 2006-2015: a population-based analysis. *Arch Dis Child Fetal Neonatal Ed* 2018;103(4):F337-F342.
7. Holmström G, Tornqvist K, Al-Hawasi A, Nilsson Å, Wallin A, Hellström A. Increased frequency of retinopathy of prematurity over the last decade and significant regional differences. *Acta Ophthalmol* 2018;96(2):142-8.
8. Blazon MN, Rezar-Dreindl S, Wassermann L, Neumayer T, Berger A, Stifter E. Retinopathy of Prematurity: Incidence, Risk Factors, and Treatment Outcomes in a Tertiary Care Center. *J Clin Med* 2024;13(22):6926.
9. Bas AY, Demirel N, Koc E, Ulubas Isik D, Hirfanoglu İM, Tunc T; TR-ROP Study Group. Incidence, risk factors and severity of retinopathy of prematurity in Turkey (TR-ROP study): a prospective, multicentre study in 69 neonatal intensive care units. *Br J Ophthalmol* 2018;102(12):1711-6.
10. Kumar P, Bhriguvanshi A, Sigh SN, Kumar M, Tripathi S, Saxena S, *et al.* Retinopathy of prematurity in preterm infants: A prospective study of prevalence and predictors in Northern India. *Clin Epidemiol Glob Health* 2023;20:101230.
11. Ndyabawe I, Namiiro F, Muhumuza AT, Nakibuka J, Otiti J, Ampaire J, *et al.* Prevalence and pattern of retinopathy of prematurity at two national referral hospitals in Uganda: A cross-sectional study. *BMC Ophthalmol* 2023;23:478.
12. Braimah IZ, Enweronu-Laryea C, Sackey AH, Kenu E, Agyabeng K, Ofori-Adjei ID, *et al.* Incidence and risk factors of retinopathy of prematurity in Korle-Bu Teaching Hospital: a baseline prospective study. *BMJ Open* 2020;10(8):e035341.
13. Onyango O, Sitati S, Amolo L, Murila F, Wariua S, Nyamu G, et al. Retinopathy of prematurity in Kenya: prevalence and risk factors in a hospital with advanced neonatal care. *Pan Afr Med J* 2018;29:152.
14. Bhatnagar A, Skrehot HC, Bhatt A, Herce H, Weng CY. Epidemiology of Retinopathy of Prematurity in the US From 2003 to 2019. *JAMA Ophthalmol* 2023;141(5):479-85.
15. Wang S, Liu J, Zhang X, Liu Y, Li J, Wang H, *et al.* Global, regional and national burden of retinopathy of prematurity among childhood and adolescent: a spatiotemporal analysis based on the Global Burden of Disease Study 2019. *BMJ Paediatr Open* 2024;8(1):e002267.
16. Ezeanosike OB, Ezeanosike E, Akamike IC, Okedo-Alex IN, Woldeamanuel YW. Prevalence and risk factors of retinopathy of prematurity in Africa: A systematic review and meta-analysis. *Niger J Paediatr* 2021;48:114-21.
17. Kennedy NU, Ademola-Popoola DS. Coverage and Challenges of Retinopathy of Prematurity Screening and Treatment in Nigeria: Perspectives of Ophthalmologists and Paediatricians. *Niger J Ophthalmol* 2020;28(2):61-9.
18. Adegbehingbe SA, Oluwafemi RO. Retinopathy of prematurity: Screening programme for preterm infants in Ondo State, South-West, Nigeria. *Int J Res Med Sci* 2024:12(6):1857–62.
19. Fajolu IB, Rotimi-Samuel A, Aribaba OT, Musa KO, Akinsola FB, Ezeaka VC, *et al.* Retinopathy of prematurity and associated factors in Lagos, Nigeria. *Paediatr Int Child Health* 2015;35(4):324-8.
20. Adio AO, Ugwu RO, Nwokocha CG, Eneh AU. Retinopathy of Prematurity in Port Harcourt, Nigeria. *ISRN Opthalmol* 2014;2014:481527
21. Muhammad R, Oketa EB, Nomhwange ER. High incidence of retinopathy of prematurity blindness among babies born at private hospitals in Nigeria capital city- A growing concern. *Trans Ophthalmol Soc Niger* 2023;8:1.
22. Ademola-Popoola DS, Onakoya AO, Ezisi CN, Okeigbemen VW, Aghaji AE, Musa KO, *et al.* Case series of retinopathy of prematurity blindness in Nigeria: A wakeup call to policy makers, hospitals, ophthalmologists and paediatricians. *Niger Postgrad Med J* 2021;28(4):303-6.
23. Qayyum S. Development of retinopathy of prematurity. *Community Eye Health* 2018;31(101):S3.
24. Hartnett ME. Discovering Mechanisms in the Changing and Diverse Pathology of Retinopathy of Prematurity: The Weisenfeld Award Lecture. *Invest Ophthalmol Vis Sci* 2019;60(5):1286-97.
25. Filippi L, Gulden S, Cammalleri M, Araimo G, Cavallaro G, Villamor E. Retinopathy of prematurity in the era of precision neonatology: from risk stratification to targeted therapies. *World J Pediatr* 2025;25.
26. Gilbert C, Malik ANJ, Nahar N, Das SK, Visser L, Sitati S, *et al.* Epidemiology of ROP update - Africa is the new frontier. *Semin Perinatol* 2019;43(6):317-22.

27. Bezman BL, Tiutiuca C, Totolici G, Carneciu N, Bujoreanu FC, Ciortea DA, *et al.* Latest Trends in Retinopathy of Prematurity: Research on Risk Factors, Diagnostic Methods and Therapies. *Int J Gen Med* 2023;16:937-49.
28. Chang JW. Risk factor analysis for the development and progression of retinopathy of prematurity. *PloS One* 2019;14:e0219934.
29. Kubrey SS, Maravi P, Kushwaha N, Sharma P, Dubey A, Kumar K. Influence of maternal factors on retinopathy of prematurity: A cross-sectional Study from a tertiary care centre. *Indian J Clin Exp Ophthalmol* 2023;9:359-64
30. Chan R, Jonas KE, Litch J, Campbell JP, Yap V. Prevention and Screening of Retinopathy of Prematurity (ROP). Do No Harm Technical Brief 2018.10.13140/RG.2.2.36770.76488.
31. Prasad M, Ingolfsland EC, Christiansen SP. Modifiable Risk Factors and Preventative Strategies for Severe Retinopathy of Prematurity. *Life (Basel)* 2023;13(5):1075.
32. The Committee for the Classification of Retinopathy of Prematurity An international classification of retinopathy of prematurity. *Arch Ophthalmol* 1984; 102:1130-4
33. Chiang MF, Quinn GE, Fielder AR, Ostmo SR, Paul Chan RV, Berrocal A, *et al.* International Classification of Retinopathy of Prematurity, Third Edition. *Ophthalmol* 2021;128(10):e51-e68.
34. Early Treatment For Retinopathy Of Prematurity Cooperative Group. Revised indications for the treatment of retinopathy of prematurity: results of the early treatment for retinopathy of prematurity randomized trial. *Arch Ophthalmol* 2003;121(12):1684-94.
35. Sanghi G, Gangwe A, Das P. Evidence based management of retinopathy of prematurity: More than meets the eye. *Clin Epidemiol Global Health* 2024;26:101530.
36. Fierson WM; American Academy of Pediatrics Section on Ophthalmology; American Academy of Ophthalmology; American Association for Pediatric Ophthalmology and Strabismus; American Association of Certified Orthoptists. Screening Examination of Premature Infants for Retinopathy of Prematurity. Pediatrics. 2018;142(6):e20183061. https://doi.org/10.1542/peds.2018-3061 Erratum in: Pediatrics. 2019;143(3):e20183810.
37. Thirunavukarasu AJ, Hassan R, Savant SV, Hamilton DL. Analgesia for retinopathy of prematurity screening: A systematic review. *Pain Pract.* 2022;22(7):642-51.
38. Fajolu IB, Dedeke IOF, Ezenwa BN, Ezeaka VC. Non-pharmacological pain relief interventions in preterm neonates undergoing screening for retinopathy of prematurity: a systematic review. *BMJ Open Ophthalmol* 2023;8(1):e001271.
39. Deorari A, Darlow BA. Preventing sight-threatening ROP: a neonatologist's perspective. *Community Eye Health*. 2017;30(99):50-2
40. Zeng Z. Comprehensive prevention strategies for retinopathy of prematurity: a literature review. *Front Nurs* 2023;10:175-81.

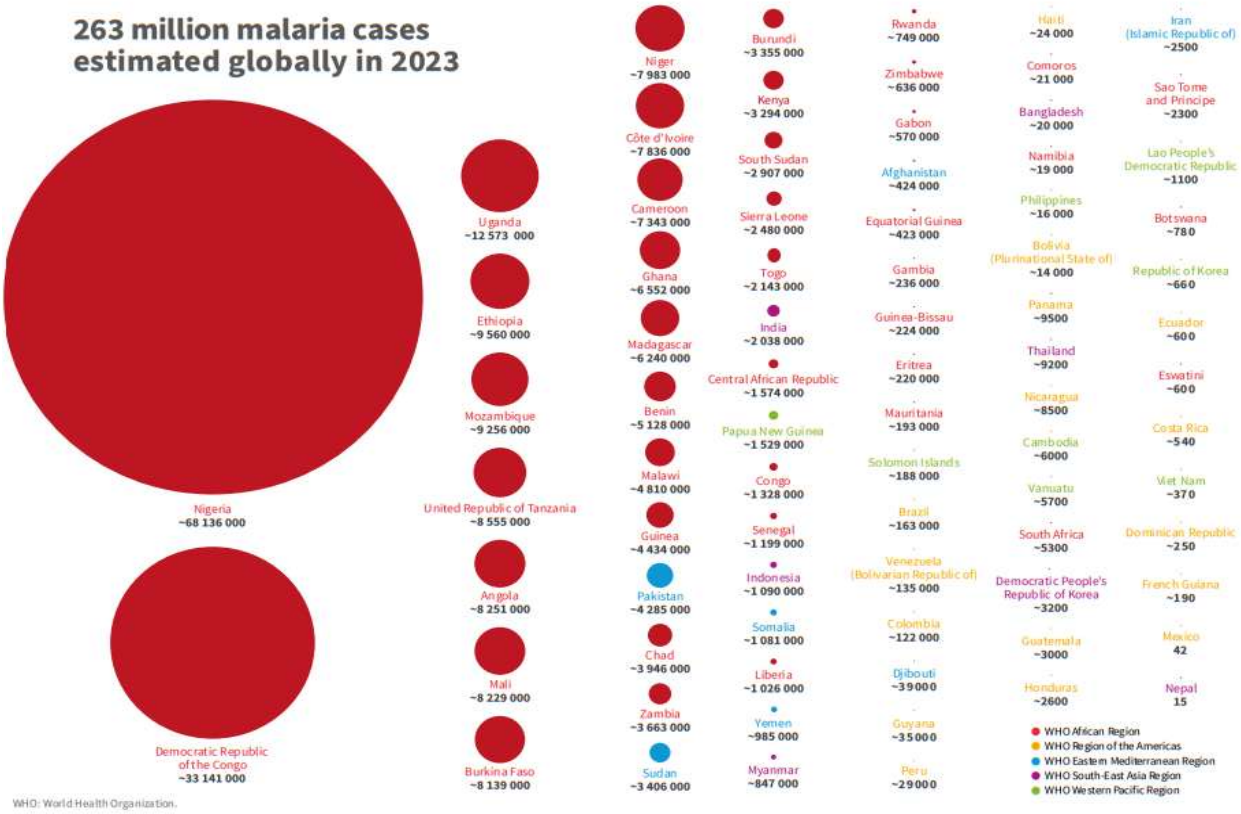
EXCERPTS FROM THE 2025 PAN WEBINAR SERIES

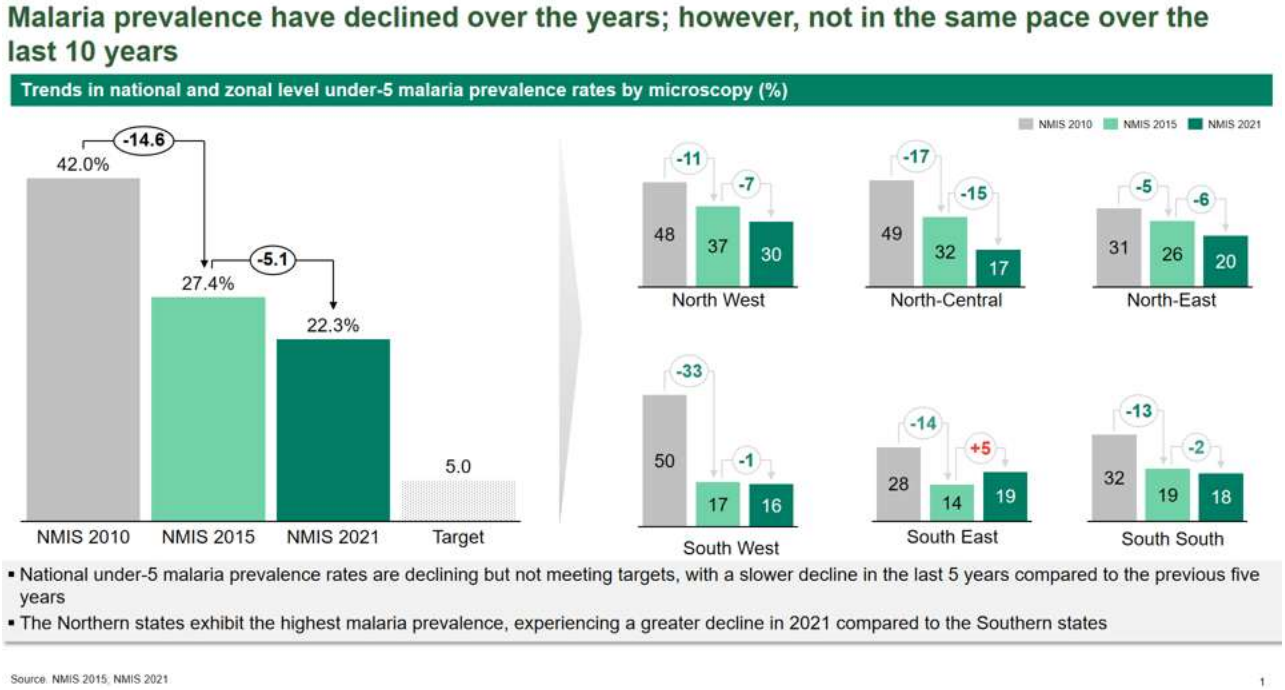
Accelerating the Final Lap of Malaria Elimination in Nigeria: The Role of Paediatricians

Mokuolu OA
Strategic Advisor to the Honourable Minister of Health on Malaria,
Federal Ministry of Health, Abuja

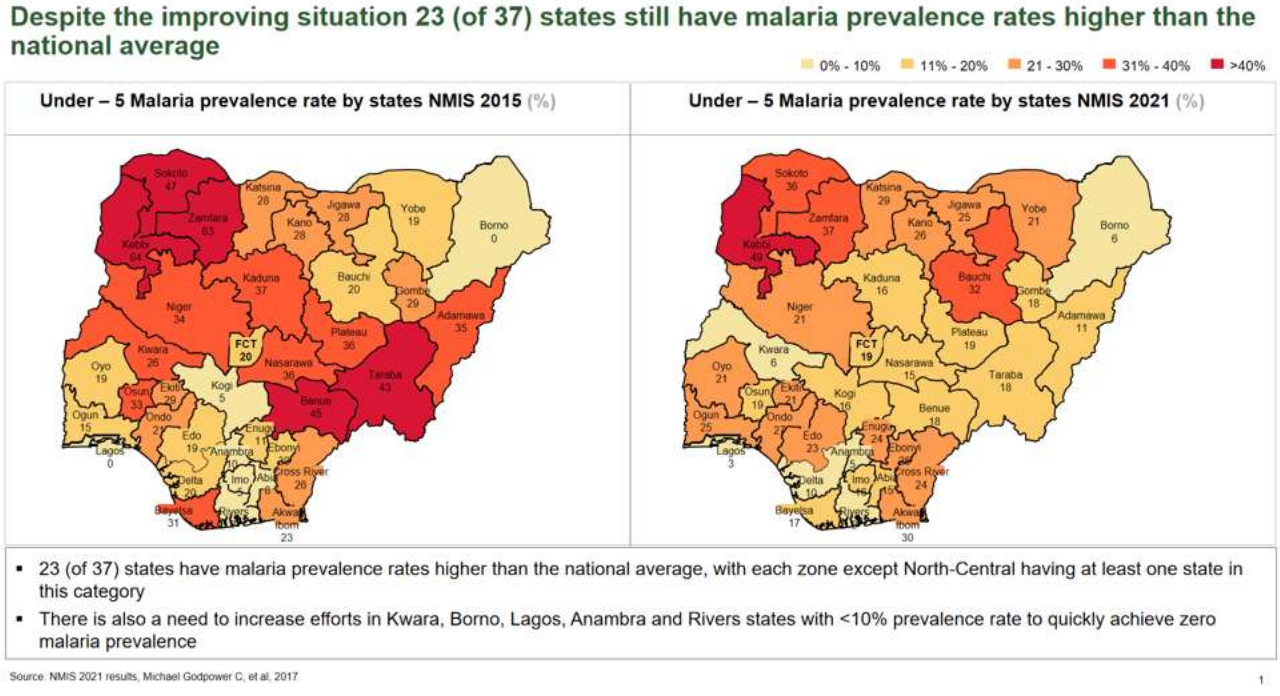
Introduction
Overview of Malaria Situation in Nigeria

World Malaria Report 2024

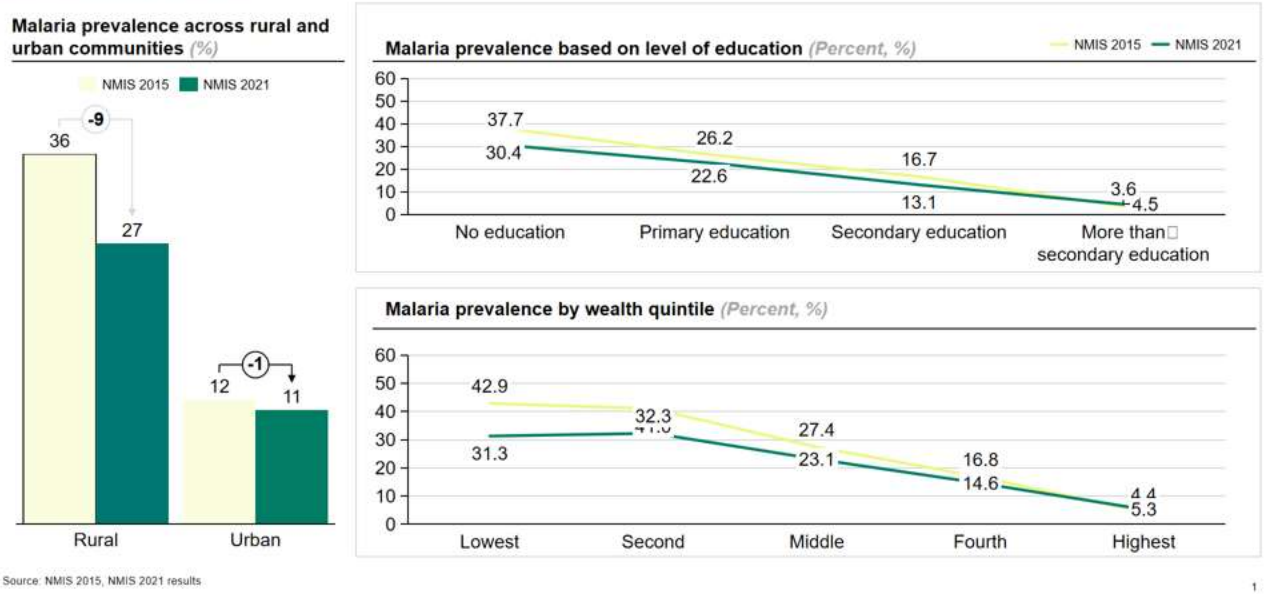




Source. NMIS 2015; NMIS 2021



Prevalence is higher in rural communities and decreases with an increase in the level of education and wealth quintile



Source: NMIS 2015, NMIS 2021 results

1

Severe Malaria Study

No of states: 31

Zone	Freq	Percent
North Central	653	8.7
North East	2238	29.8
North West	2536	33.8
South East	565	7.5
South South	797	10.6
South West	721	9.6
Total	**7510**	**100.0**

Sex	Freq	Percent
Male	4248	56.6
Female	3262	43.4
Total	7510	100.0

Father Education	Freq	Percent
Tertiary	1980	26.4
Secodary	2501	33.3
Primary	1094	14.6
None	1935	25.8
Total	7510	100.0

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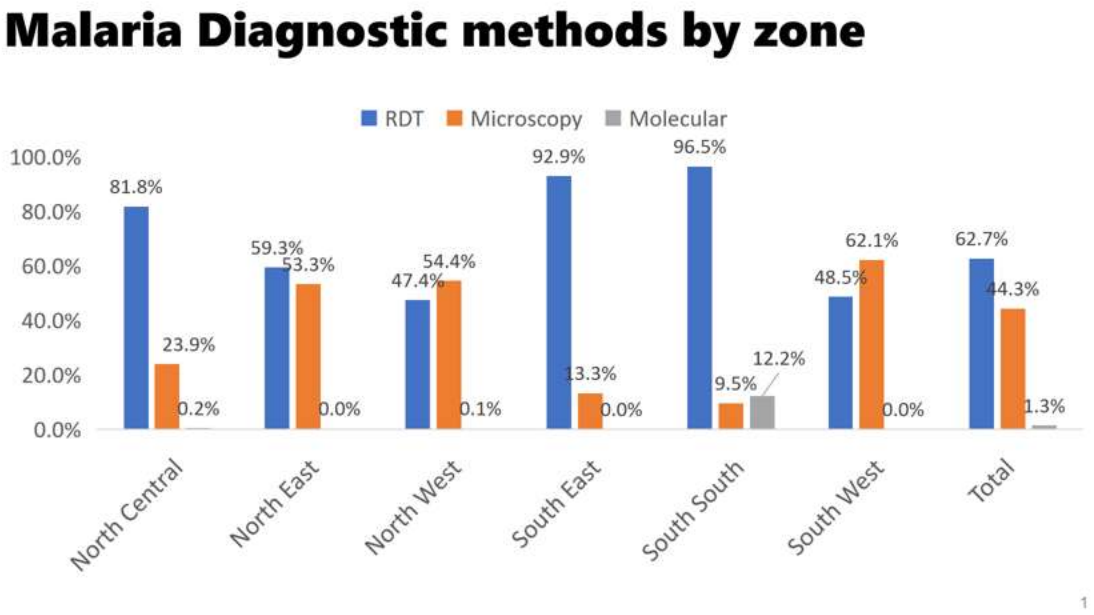
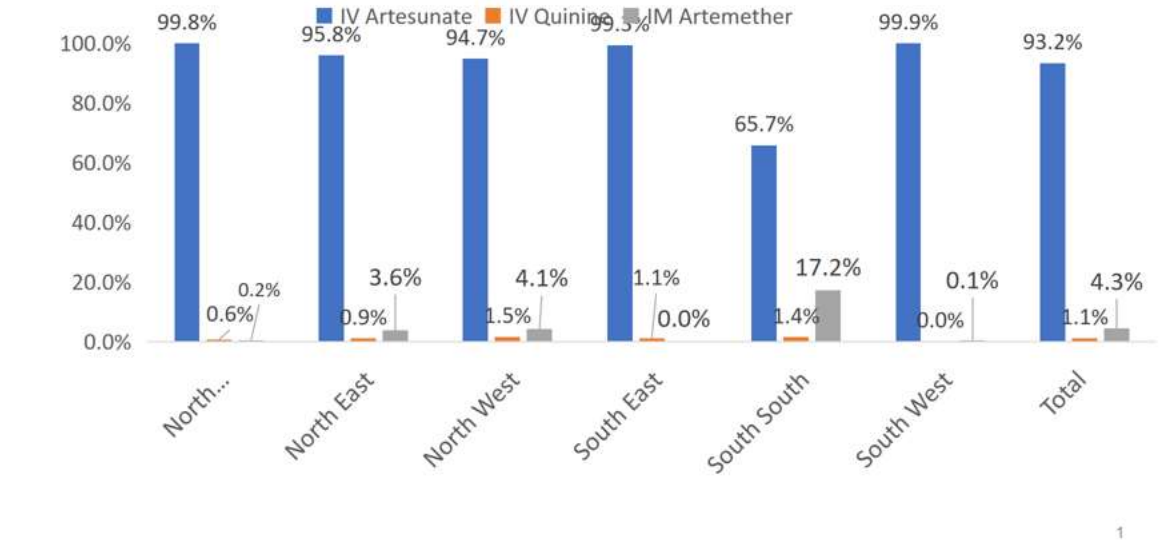
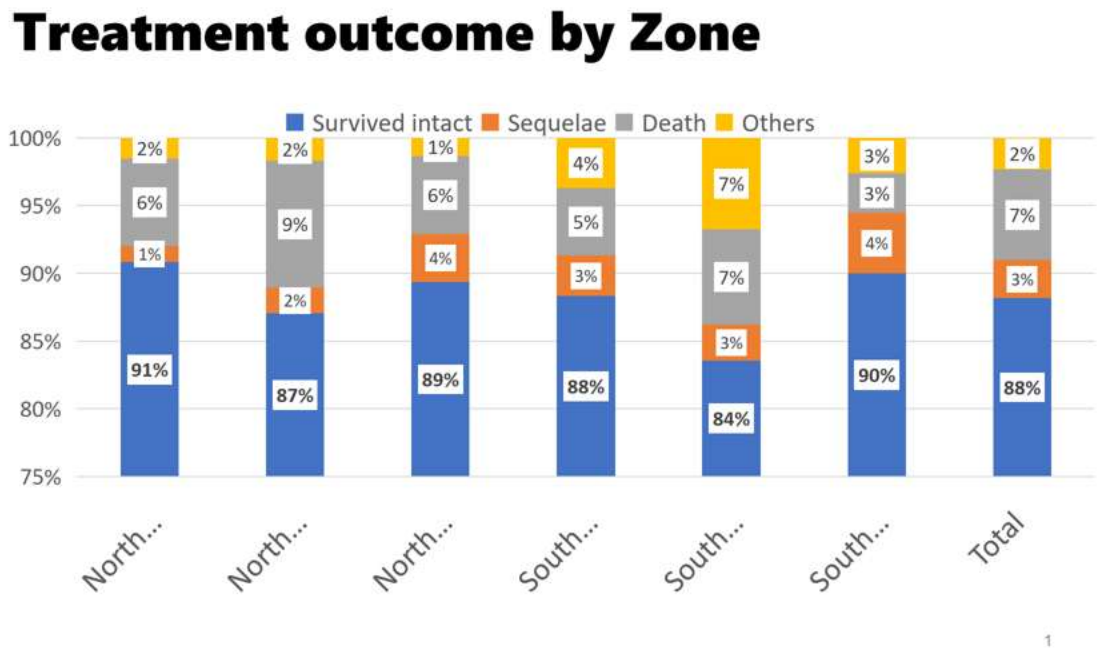

Malaria Diagnostic methods by zone
RDT
Microscopy
Molecular
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
81.8%
23.9%
0.2%
59.3%
53.3%
0.0%
47.4%
54.4%
0.1%
92.9%
13.3%
0.0%
96.5%
9.5%
12.2%
48.5%
62.1%
0.0%
62.7%
44.3%
1.3%
North Central
North East
North West
South East
South South
South West
Total


Severe Malaria Treatment Drug by Zone
IV Artesunate
IV Quinine
IM Artemether
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
99.8%
0.6%
0.2%
95.8%
0.9%
3.6%
94.7%
1.5%
4.1%
99.3%
1.1%
0.0%
65.7%
1.4%
17.2%
99.9%
0.0%
0.1%
93.2%
1.1%
4.3%
North...
North East
North West
South East
South South
South West
Total

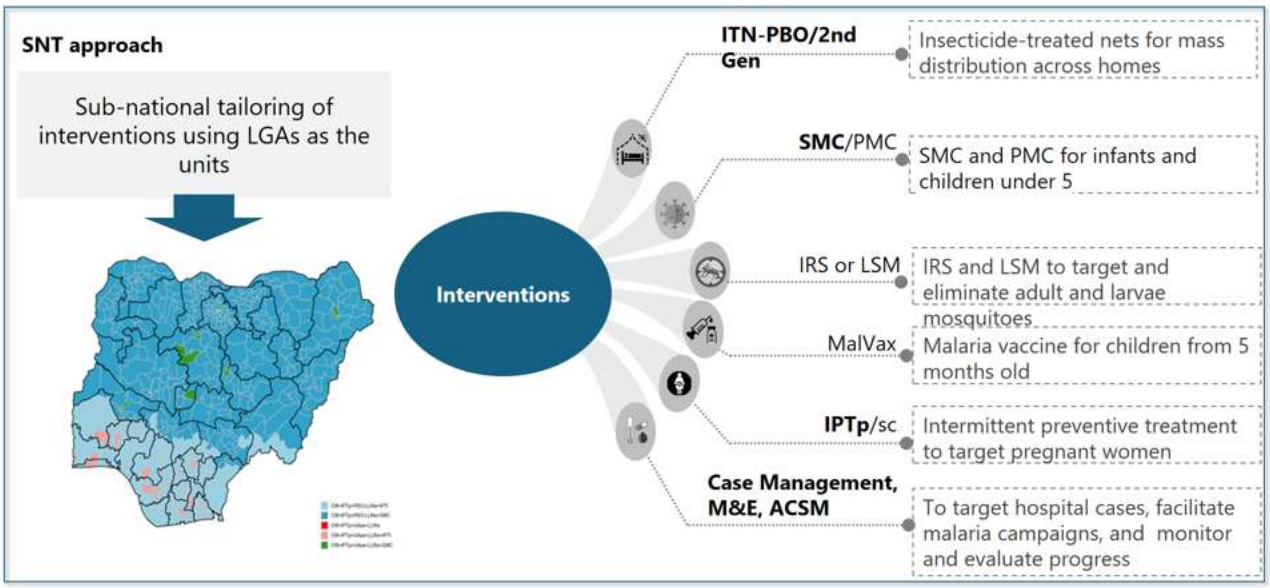


MALARIA RESPONSES AND INDICATORS

Current Tools for Case Management of Malaria

Diagnosis	Treatment	Chemoprevention	Prophylaxis
• **Light Microscopy** • Thin film • Thick Film • **Rapid Diagnostic Tests** • PfHRP-2 • pLDH • Aldolase	• **Uncomplicated malaria**: Oral ACTs – AL,ASAQ, ASPY, DHP • **Severe Malaria:** • ***IV-IM Artesunate***, • IM Artemether, • IM Quinine • Follow-on ACT • **Pre-referral:** RAS (Rectal Artesunate among children<6yrs), IV-IM Artesunate	• **Pregnant Women: Sulphadoxine-Pyrimethamine (SP)**, 4+ doses by D.O.T. • ***Seasonal Malaria Chemoprevention* for U5**: SP+Amodiaquine, 3 doses x 4 mo. p.a. • **Perennial Malaria Chemoprevention for U5**: SP+Amodiaquine, 5 doses with RI p.a.	• **Non-immune groups** • Immigrants • SCD • **Malaria Vaccine**

At the sub-national level, a 3-step approach is being utilized to design tailored approaches for effective malaria interventions



Tools for Prevention -Vector Control

- ITNs/LLINs – Dual AI, PBO
- Indoor Residual Spraying
- Environmental Management
  - Larval Source Reduction
  - Drainages (New Data)

Tools for Prevention -Chemoprevention

Intermittent Preventive Treatments

- *IPTp (SP-IPT)*
- *PMC*
- *IPTsc*
- *SMC (AQ-SP) high seasonal transmission areas*

Chemoprophylaxis

Malaria Vaccines (RTS,S/AS01 and R_21)

Efficacy and Safety of the RTS,S/AS01 Malaria Vaccine during 18 Months after Vaccination: A Phase 3 Randomized, Controlled Trial in Children and Young Infants at 11 African Sites

The RTS,S Clinical Trials Partnership*

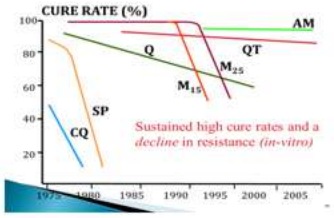
July 2014

Efficacy and safety of RTS,S/AS01 malaria vaccine with or without a booster dose in infants and children in Africa: final results of a phase 3, individually randomised, controlled trial

April 24,2015

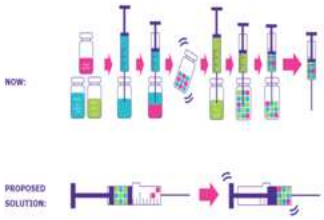
Tools for Treatment

- Uncomplicated Malaria
  - *ACTs –AL, AA, AM, DHP, ASPy*
- Reducing Transmission
  - *Primaquine (Low Transmission Areas)*
- Treatment of other Species
- Severe Malaria
  - *Artesunate Injection*
  - *Cipagamin (trials ongoing)*



Multiple first-line therapies as part of the response to antimalarial drug resistance

An implementation guide



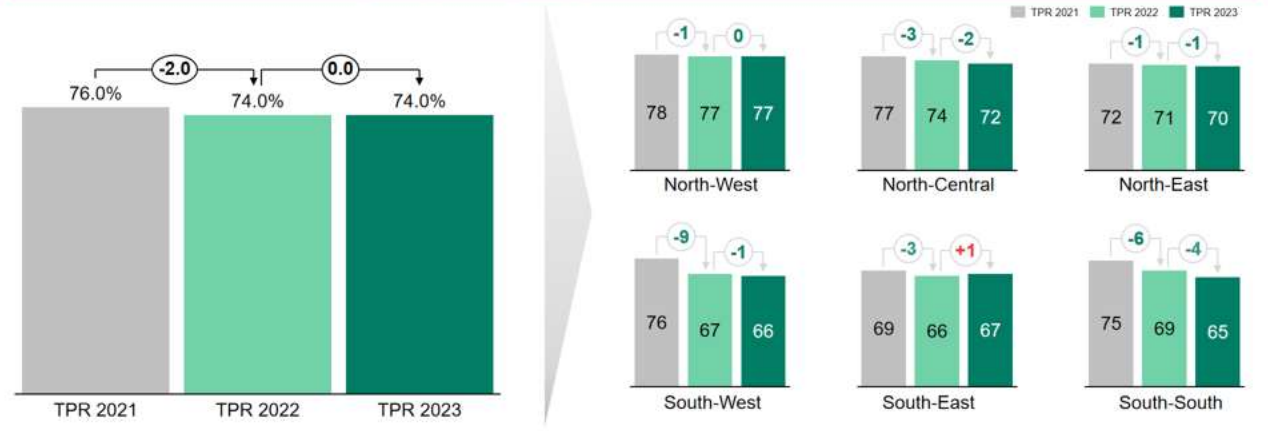
Innovations in Treatment

- Excellent Documentations
  - Guidelines
  - Handbooks
  - Supplements

MALARIA SURVEILLANCE - TEST POSITIVITY RATE

Malaria test positivity rate have declined since 2021; however, the South-east region has seen an increased in TPR in 2023 *(DHIS2 data analysis)*

Trends in national and zonal level test positivity rates by RDT (%)



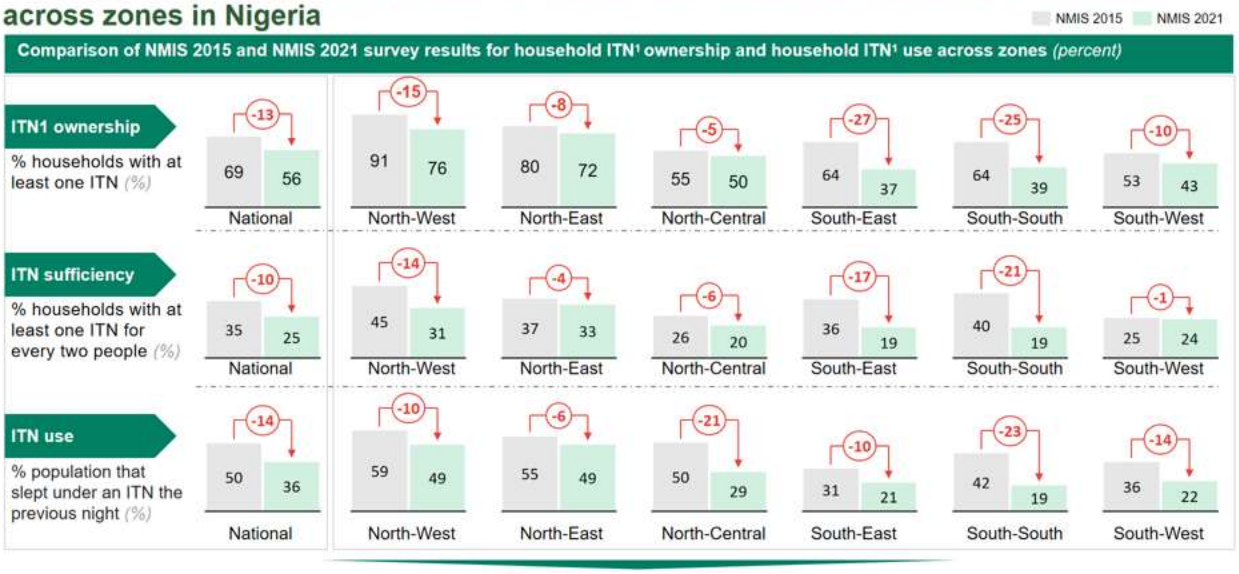
- Although the South-East has a lower TPR than most regions, it has started an incremental trend in 2023. Additional care needs to be provided to prevent further increase in the TPR
- The South-South region has experienced a greater downhill movement in their TPR while the North-West and North-East regions

1. % point difference
Source: DHIS2, SCIDaR analysis

1

MALARIA PREVENTION - ITN

The ownership, sufficiency, and use of ITNs across households has largely decreased across zones in Nigeria

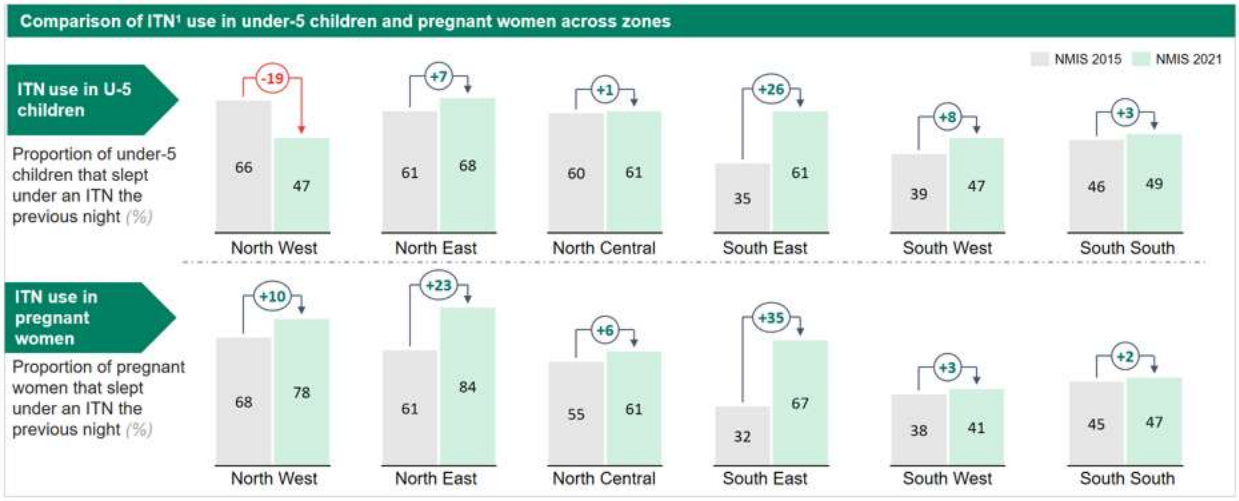


- The North-West, South-East and South-South zones experienced a higher decrease in ITN ownership and sufficiency than other zones in the country
- ITN use decreased at a higher magnitude than ITN ownership in North-Central and South-West regions

Source: NMIS 2015, NMIS 2021

1

There was an increase in the use of ITNs by children and pregnant women across zones except in the North western region

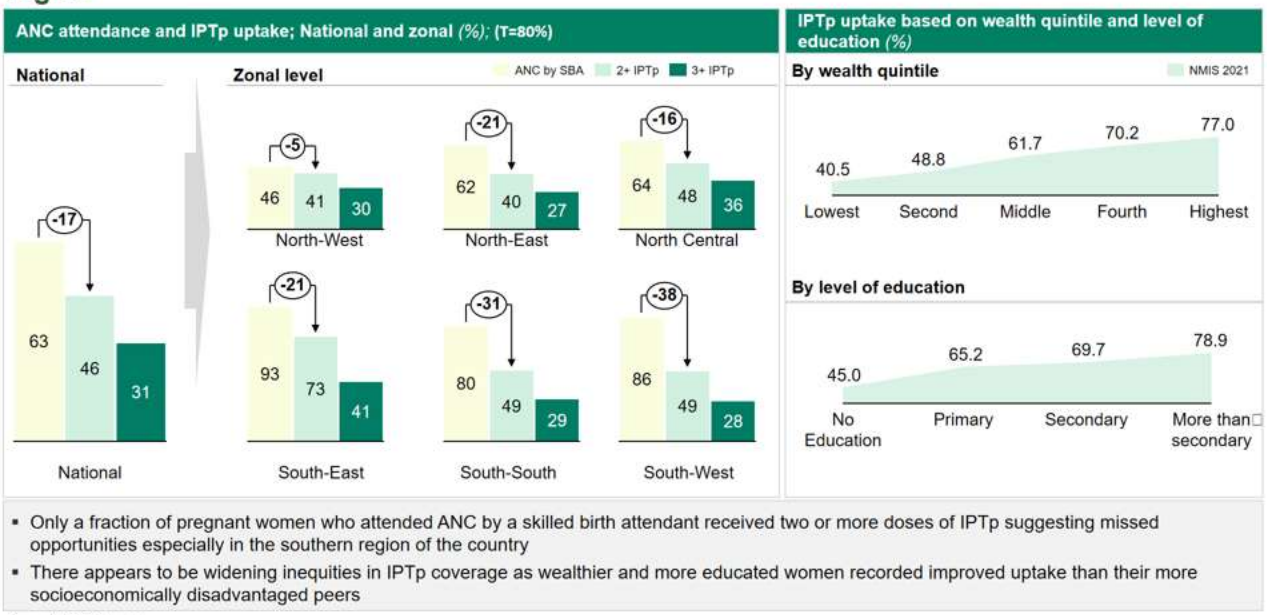


This increase in ITN use suggests that more people are aware of the need to protect the vulnerable group from malaria infection as a result of multiple Behavioral Change Communication (BCC) interventions implemented over the years

Source: NMIS 2015, NMIS 2021

1

Nigeria's underperforms in IPTp uptake, with higher missed opportunities in the southern region

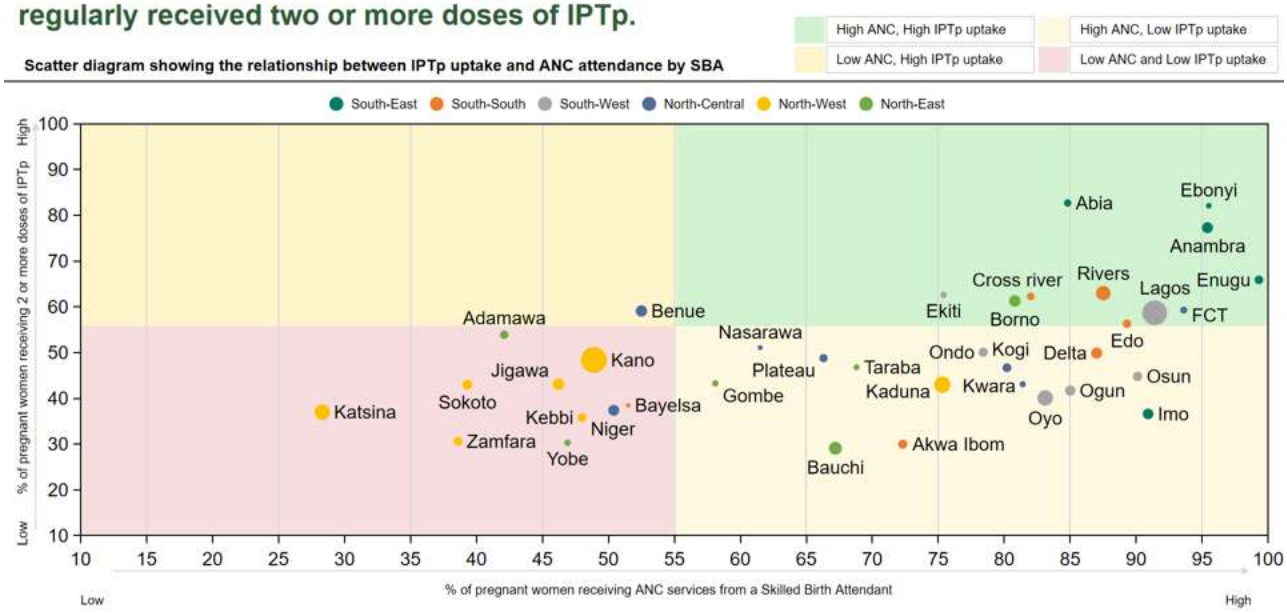


- Only a fraction of pregnant women who attended ANC by a skilled birth attendant received two or more doses of IPTp suggesting missed opportunities especially in the southern region of the country
- There appears to be widening inequities in IPTp coverage as wealthier and more educated women recorded improved uptake than their more socioeconomically disadvantaged peers

Source: NMIS 2021 results

1

In 11 out of 37 states in the country, a high proportion of women who attended ANC visits regularly received two or more doses of IPTp.



Source NMIS 2021 results

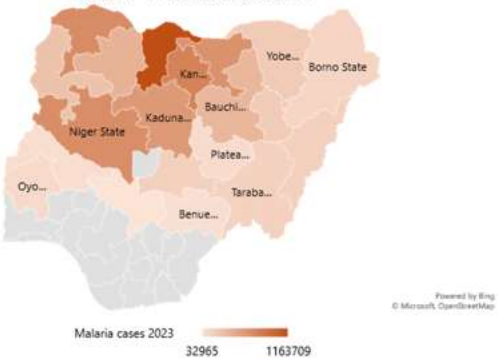
1

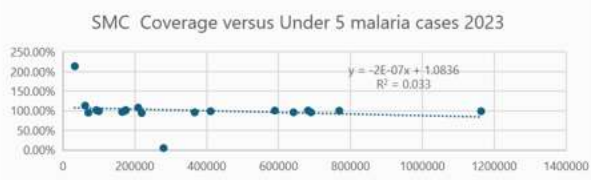
MALARIA PREVENTION - SMC

SMC coverage across the states was high, except in Kebbi State; however, under-5 malaria cases are higher in the North-West and Central regions.

SMC coverage (2023)

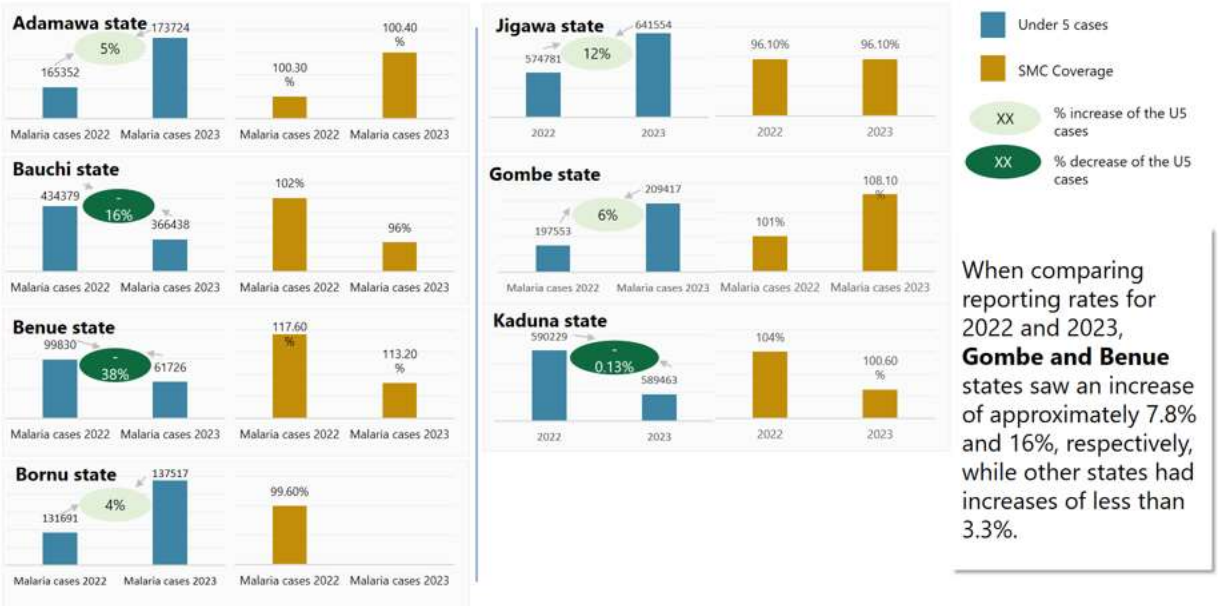
Under-5 Malaria cases





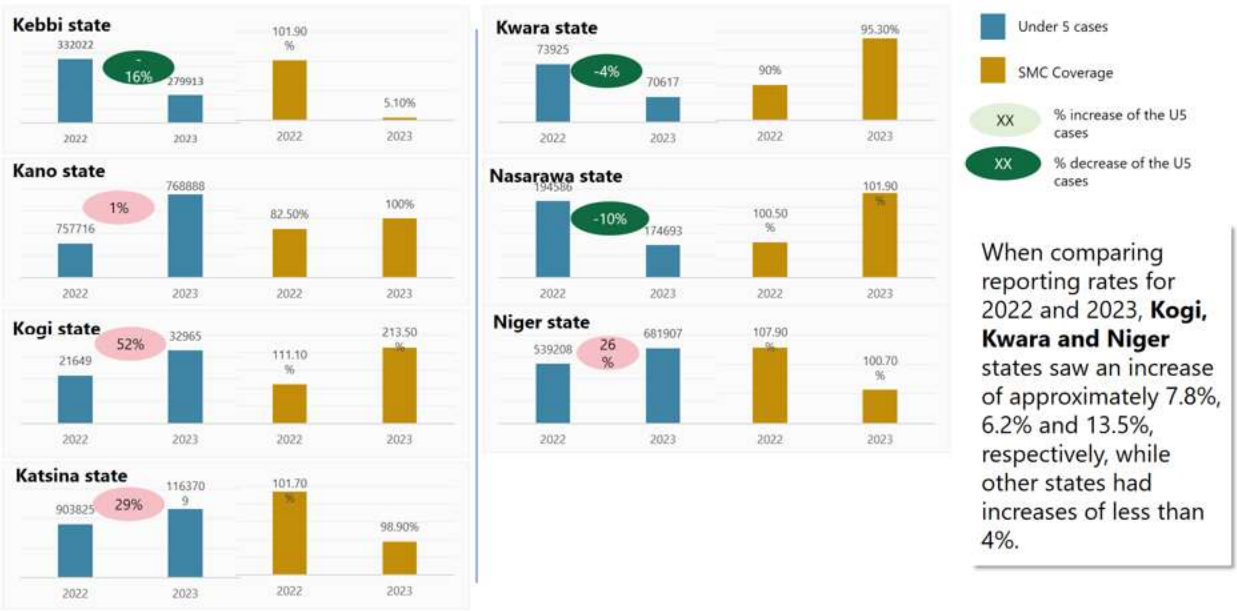
*Borno state SMC coverage for 2023 wasn't reported
Sources: NMDR, National Health Information System

Although the SMC states reported high coverage, only 9 out of 20 states saw a reduction in U5 cases between 2022 & 2023, with Benue State recording the highest reduction (1/3)



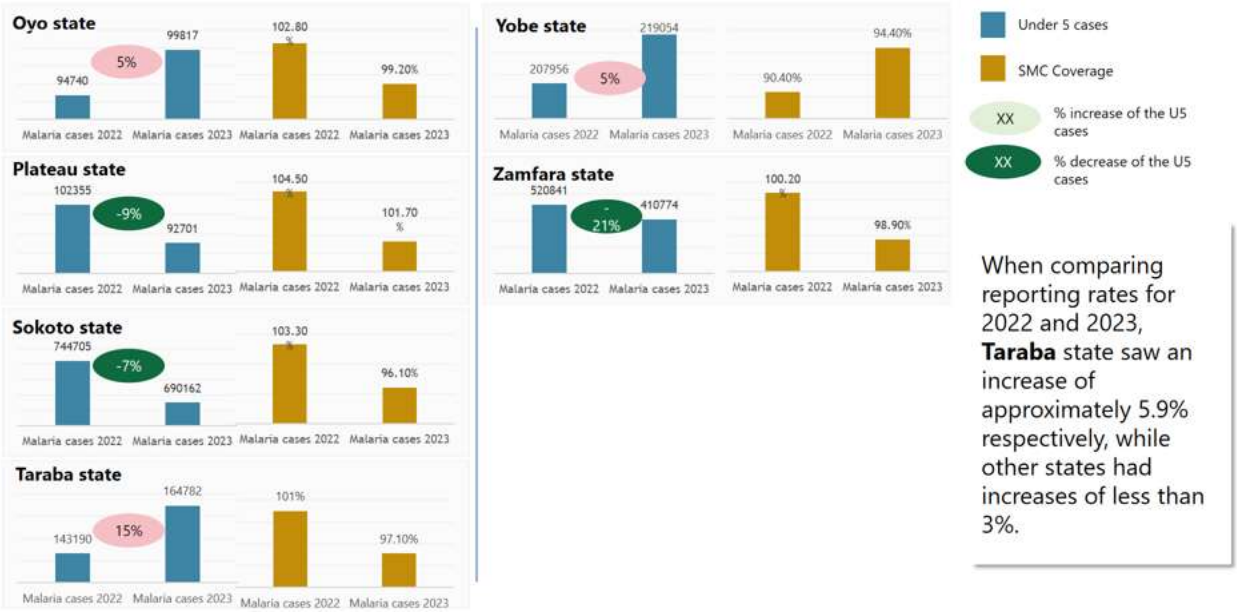
When comparing reporting rates for 2022 and 2023, **Gombe and Benue** states saw an increase of approximately 7.8% and 16%, respectively, while other states had increases of less than 3.3%.

Although the SMC states reported high coverage, only 9 out of 20 states saw a reduction in U5 cases between 2022 & 2023, with Benue State recording the highest reduction (2/3)

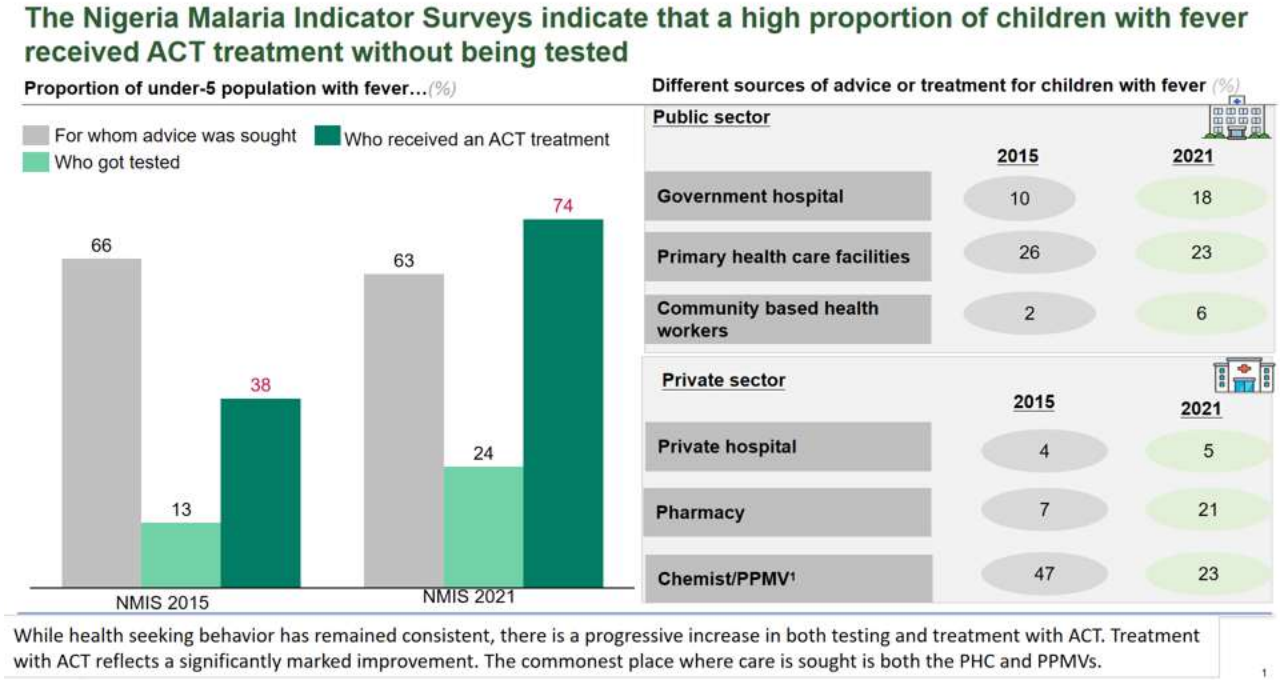


When comparing reporting rates for 2022 and 2023, **Kogi, Kwara and Niger** states saw an increase of approximately 7.8%, 6.2% and 13.5%, respectively, while other states had increases of less than 4%.

Although the SMC states reported high coverage, only 9 out of 20 states saw a reduction in U5 cases between 2022 & 2023, with Benue State recording the highest reduction (3/3)



When comparing reporting rates for 2022 and 2023, **Taraba** state saw an increase of approximately 5.9% respectively, while other states had increases of less than 3%.



Challenges to Malarial Elimination

Challenges

- Data
  - ✓ Inadequate disease surveillance systems
  - ✓ Accuracy, validity and utilization
- Biological Factors
  - ✓ Emergence of artemisinin partial resistance in other African countries
  - ✓ Resistance to key insecticides
- Quality of Care
  - ✓ Testing and compliance to test results
  - ✓ Management of severe malaria and supportive services
- Resources and waning donor contributions
  - ✓ Limited coverages
  - ✓ Limited spectrum of interventions
  - ✓ IMPACT states
  - ✓ Barriers of access
- Political Will
  - ✓ Hitherto, this has been very low
  - ✓ New Ministerial initiative and EMC
- Socio-economic
  - ✓ Perceptions about interventions like LLINs
  - ✓ Health seeking behaviours
- Environmental Challenges
  - ✓ Developmental concerns
  - ✓ Climate change
  - ✓ Complex operating environment
  - ✓ Diversities in our geography
- Programming Challenges
  - ✓ Adopting changes in protocol
  - ✓ Implementation arrangement

CONTINUUM OF MALARIAL CONTROL TO ELIMINATION

Definition of Levels of Activity (WHO, 2017)

Level of Activity	Definition
Malaria control	Reducing the disease burden to a level at which it is no longer a public health problem
Malaria elimination	The interruption of local transmission (reduction to zero incidences of Indigenous cases [vs. locally acquired]) of a specified malaria parasite species in a defined geographic area as a result of deliberate efforts. Continued measures to prevent re-establishment of transmission are required.
Malaria eradication	Permanent reduction to zero of the worldwide incidence of malaria infection.

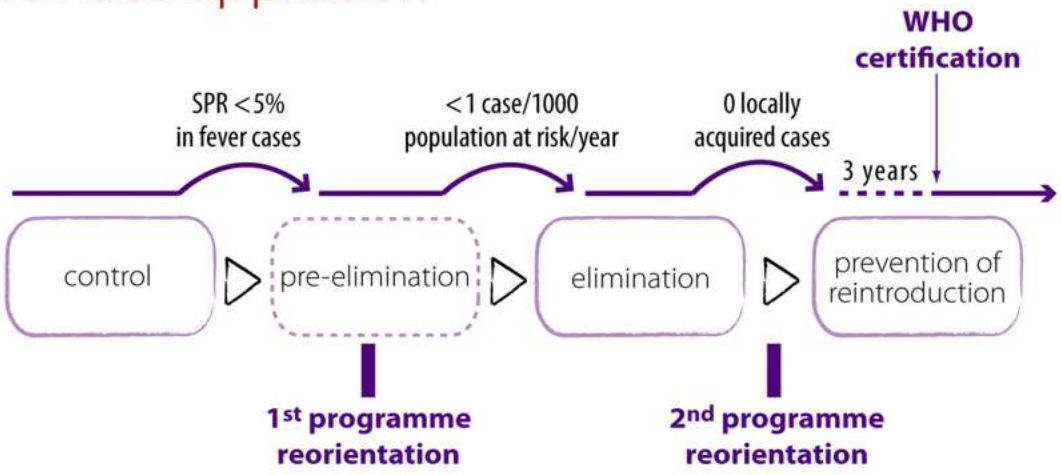
Objectives of stages the continuum

Stages	Key objectives
Control	Reduce mortality & morbidity to a defined level
Pre-elimination	1. Reduce mortality & morbidity to a defined level 2. Reduce transmission to a defined level
Elimination	Interrupt transmission and achieve zero local transmission a. Zero malaria transmission b. Zero malaria infection c. Zero malaria deaths
Post-elimination	Prevent re-introduction of local transmission

Other important definitions

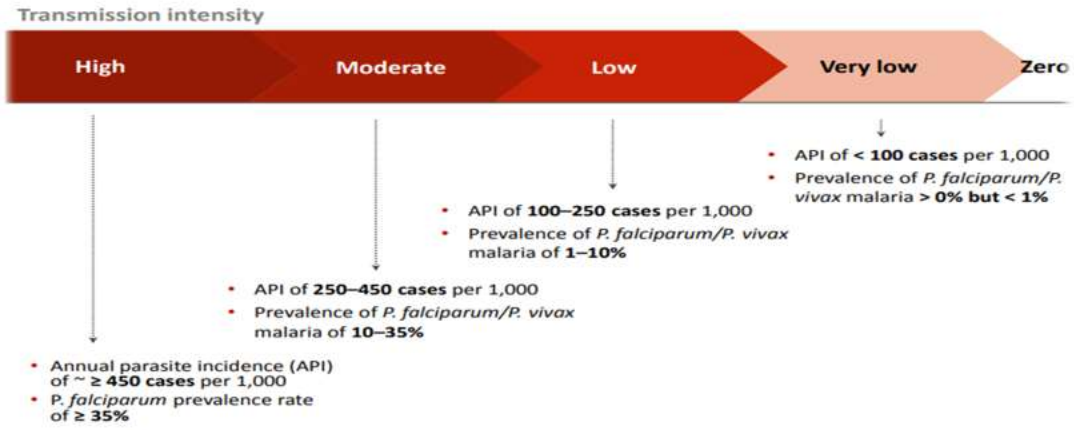
Parameter	Definition
Malaria Baseline	The malaria burden that would be present in a specific area if no control activities existed. This is also termed 'intrinsic malaria transmission level'
Coverage	A general term refers to the fraction of a specific area's population receiving a particular intervention. Individuals covered by an intervention may or may not use it appropriately.
Entomological Inoculation Rate	An indicator related to the number of infectious bites from a malaria mosquito an individual is exposed to in a given time period

Malaria control to elimination continuum – Previous approach



SPR: slide or rapid diagnostic test positivity rate

Currently the WHO recommend the use of the transmission intensity for the continuum from control to elimination



Countries certified Malaria free by WHO following interventions

Country	Year
Grenada	1962
Saint Lucia	1962
Hungary	1964
Spain	1964
Bulgaria	1965
Trinidad and Tobago	1965
Dominica	1966
Jamaica	1966
Cyprus	1967
Poland	1967
Romania	1967
Italy	1970
Netherlands (Kingdom of the)	1970
United States of America	1970
Mauritius	1973
Bosnia and Herzegovina	1973
Croatia	1973
Montenegro	1973
Portugal	1973

Country	Year
Republic of North Macedonia	1973
Serbia	1973
Slovenia	1973
Cuba	1973
La Réunion (France)	1979
Australia	1981
Singapore	1982
Brunei Darussalam	1987
United Arab Emirates	2007
Morocco	2010
Turkmenistan	2010
Armenia	2011
Maldives	2015
Kyrgyzstan	2016
Sri Lanka	2016
Uzbekistan	2018
Paraguay	2018
Algeria	2019
Argentina	2019

Country	Year
El Salvador	2021
China	2021
Azerbaijan	2023
Tajikistan	2023
Belize	2023
Cabo Verde	2024

Resurgence of malaria when interventions are interrupted

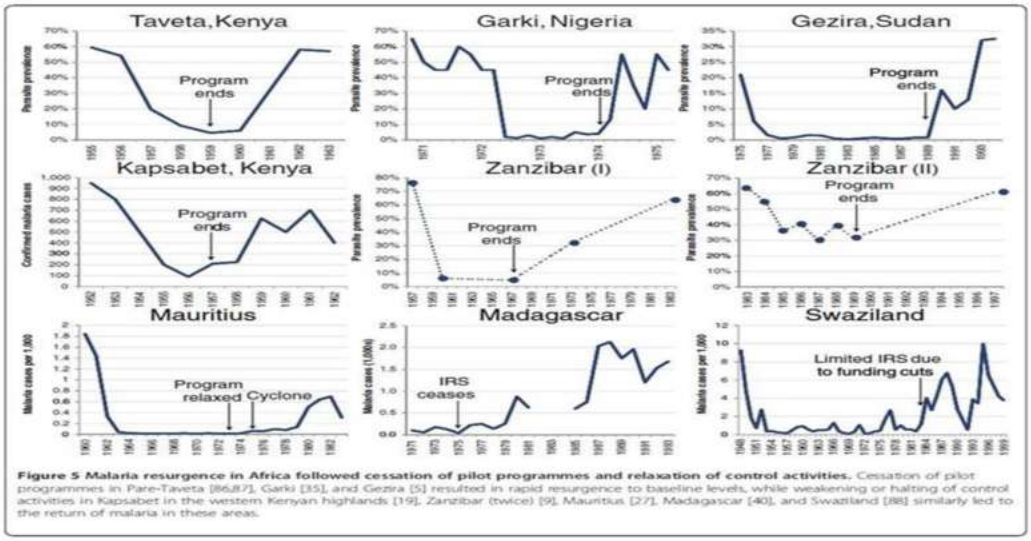


Figure 5 Malaria resurgence in Africa followed cessation of pilot programmes and relaxation of control activities. Cessation of pilot programmes in Pare-Taveta [86,87], Garki [35], and Gezira [5] resulted in rapid resurgence to baseline levels, while weakening or halting of control activities in Kapsabet in the western Kenyan highlands [19], Zanzibar (twice) [9], Mauritius [27], Madagascar [40], and Swaziland [88] similarly led to the return of malaria in these areas.

Rethinking and Accelerating Malaria Elimination in Nigeria

What is needed?

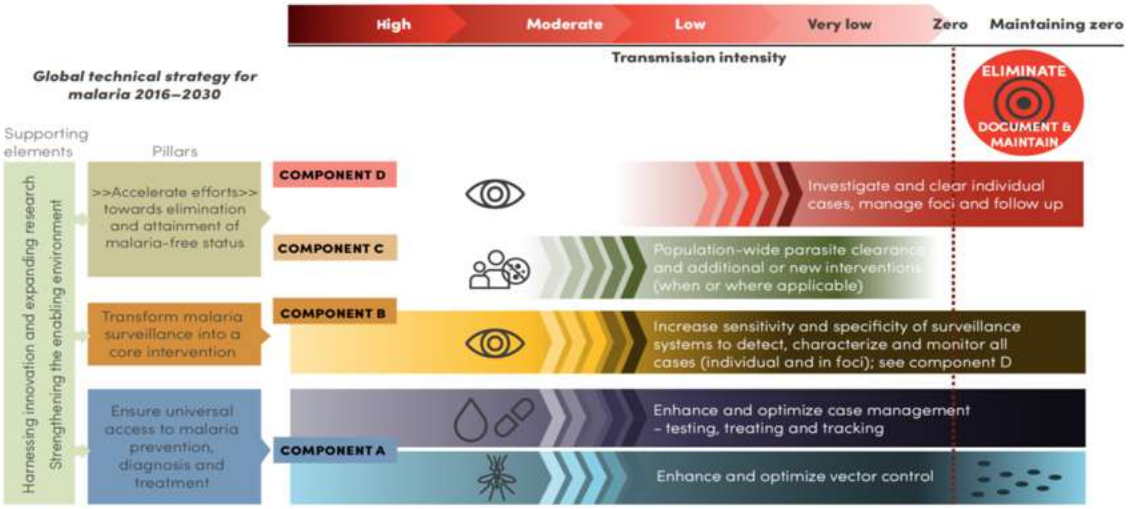
We need MORE of:

- Access to close the gaps in key interventions
- Diagnosis (Uptake and new)
- Artemisinin Resistance solution (New drugs)
- Insecticide Resistance solution (New compounds)
- Environmental manipulation and development – Roads, housing, wealth creation
- Improved surveillance
- New solutions – Vaccines
- Sustained funding
- Partnerships
- Innovative SBCC (domestication of approaches)
- Political Will at all levels of Governance

The Final Lap

- Complex though promising
- Improve data quality through strengthening of the routine data systems
- Subnational tailoring and use of new tools
- Strategic combination of intervention tools
- Increased resource mobilization
- Operational Research to guide decision making
- Multisectoral collaboration

Framework for Elimination based on the transmission intensity

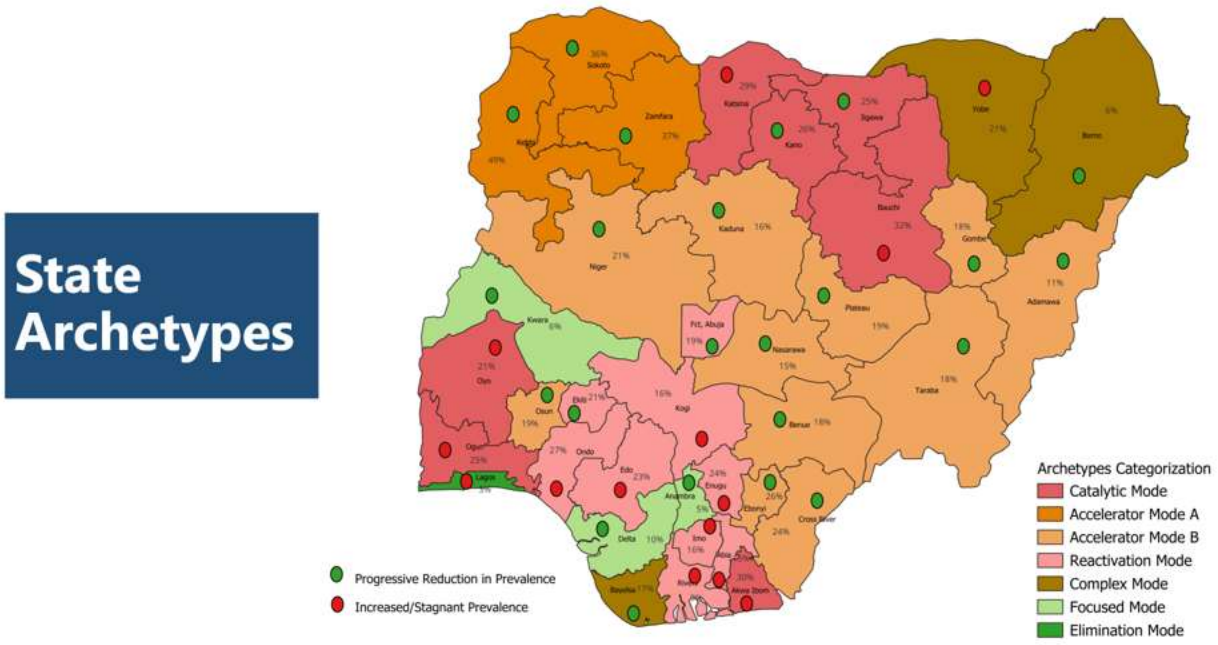


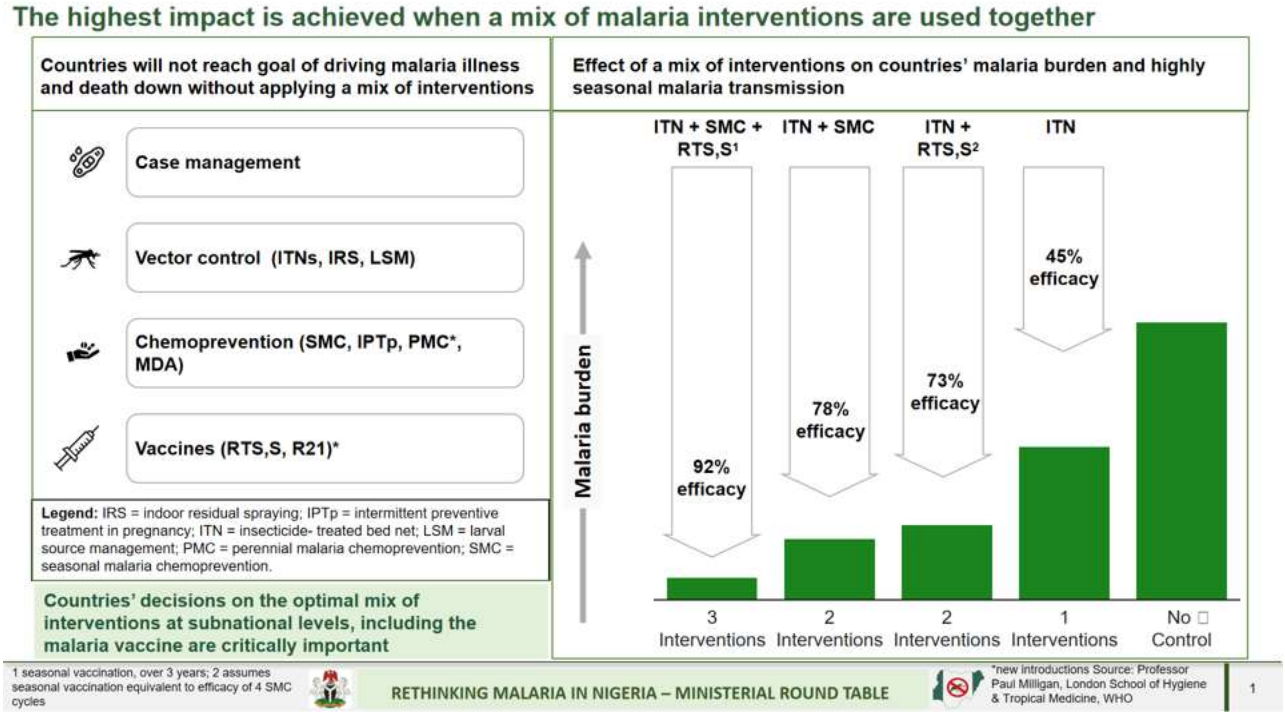
These interventions can be categorized along state-level archetypes

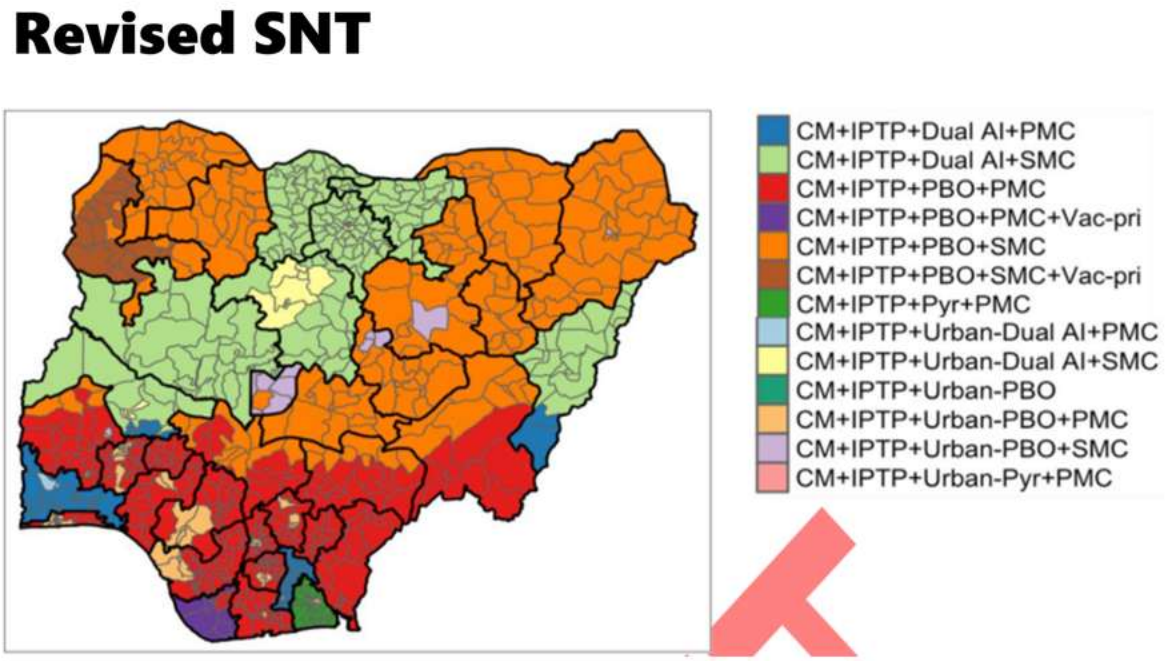
ARCHETYPES: Supports identifying and grouping states that share similar characteristics with the prevalence rate and burden of malaria to develop a strategic intervention

Archetype modes	Elimination	Catalytic	Accelerator	Reactivation	Focused	Complex
Description	▪ States with low disease prevalence	▪ Those with a very high burden but the periodic survey shows progress	▪ State with a high uptake of interventions but marginal progress from survey data	▪ State without significant mass interventions for more than five years	▪ States that have made great progress but with skewed distribution	▪ States that have significant challenges with access as a primary consideration.
States	▪ E.g. Lagos state	▪ E.g. Bauchi	▪ E.g Kebbi	▪ Enugu state	▪ Kwara state	▪ Bayelsa state

The situational analysis report was reviewed to categorize the 36 states and FCT into the 6 archetypes


State Archetypes
Progressive Reduction in Prevalence
Increased/Stagnant Prevalence
Archetypes Categorization
Catalytic Mode
Accelerator Mode A
Accelerator Mode B
Reactivation Mode
Complex Mode
Focused Mode
Elimination Mode


The highest impact is achieved when a mix of malaria interventions are used together
Countries will not reach goal of driving malaria illness and death down without applying a mix of interventions
Case management
Vector control (ITNs, IRS, LSM)
Chemoprevention (SMC, IPTp, PMC*, MDA)
Vaccines (RTS,S, R21)*
Legend: IRS = indoor residual spraying; IPTp = intermittent preventive treatment in pregnancy; ITN = insecticide- treated bed net; LSM = larval source management; PMC = perennial malaria chemoprevention; SMC = seasonal malaria chemoprevention.
Countries' decisions on the optimal mix of interventions at subnational levels, including the malaria vaccine are critically important
Effect of a mix of interventions on countries' malaria burden and highly seasonal malaria transmission
ITN + SMC + RTS,S¹
ITN + SMC
ITN + RTS,S²
ITN
Malaria burden
92% efficacy
78% efficacy
73% efficacy
45% efficacy
3 Interventions
2 Interventions
2 Interventions
1 Interventions
No Control
1 seasonal vaccination, over 3 years; 2 assumes seasonal vaccination equivalent to efficacy of 4 SMC cycles
RETHINKING MALARIA IN NIGERIA – MINISTERIAL ROUND TABLE
*new introductions Source: Professor Paul Milligan, London School of Hygiene & Tropical Medicine, WHO
1



Role of Paediatricians in Malaria Control

Diagnosis and Early Detection

Importance of Early Diagnosis

Early and accurate diagnosis of malaria significantly reduces morbidity and mortality rates in children affected by this disease.

Capacity development

Paediatricians must be trained to recognize malaria symptoms and utilize available diagnostic tests effectively.

They are to serve as key facilitators for training other categories of health workers

Use of Diagnostic Tests

Diagnostic tests are essential for timely and accurate identification of malaria in children.

Treatment and Management Protocols

Updated Treatment Guidelines

Paediatricians must follow the latest treatment guidelines to provide effective antimalarial therapy to children.

Timely Treatment Importance

Administering timely treatment can greatly enhance recovery rates and decrease the need for hospitalizations.

Antimalarial Therapy

Appropriate antimalarial therapy is crucial for managing malaria in children and preventing complications.

Community Awareness and Education

Role of Paediatricians

Paediatricians are vital in leading community initiatives focused on malaria prevention and treatment awareness.

Signs of Malaria

Educating parents about the signs of malaria is crucial in enabling timely medical intervention and saving lives.

Importance of Medical Care

Emphasizing the importance of seeking medical care when malaria symptoms appear can lead to better health outcomes in children.

Strengthening Health Systems

Research to support the system

Various types of research are needed to provide data to guide actions and policies towards malaria eliminations.

Improving Infrastructure

Investment in healthcare infrastructure enhances service delivery and supports malaria prevention and treatment efforts.

Availability of Essential Medicines

Ensuring the availability of essential medicines is critical for effective malaria treatment and health

Collaborative Efforts and Policy Advocacy

Importance of Collaboration

Collaboration among healthcare providers, government, and non-profits enhances the effectiveness of malaria policy advocacy efforts.

Role of Government Agencies

Government agencies play a vital role in formulating policies and mobilizing resources to combat malaria effectively.

Non-Profit Contributions

Non-profit organizations contribute significantly to resource mobilization and advocacy efforts against malaria.

Conclusions

- The country is on the path towards malaria elimination.
- It is a double-edged position; if we relax, we have a rebound; if we persist, we eliminate malaria – sooner than later.
- Paediatricians are vital to accelerating malaria elimination in Nigeria – with comprehensive roles across diagnosis, treatment, tracking, training and resourcing for malaria.

Answer TRUE or FALSE for each question

1. According to the 2024 World global report on malaria:
   a. There was a reduction in cases from the previous year
   b. The WHO African Region accounted for over 50% of cases worldwide
   c. Children <5 years accounted for 10%
   d. Nigeria is responsible for 1/3 of global malaria deaths

2. Concerning rapid diagnostic test for malaria:
   a. RDTs are not reliable; they give so many false Negative results
   b. Malaria Rapid Diagnostic Test are very useful and reliable for the diagnosis of malaria
   c. RDTs tend to perform better in febrile patients compared to asymptomatic individuals
   d. Restricting ACT treatment to MRDT-positive febrile children only did not result in significant adverse outcomes

3. Concerning the reporting of malaria microscopy results:
   a. Microscopy slides should be reported as malaria Positive or malaria negative
   b. When malaria parasites are seen clearly, they should be reported as +, ++, +++ or ++++
   c. Parasite quantification requires reporting of the number of parasite counted /µl of blood
   d. The parasite stage should be stated

4. What is the first-line treatment for severe malaria according to the current guidelines?
   a. IV Chloroquine
   b. IV Quinine
   c. PO Artemisinin-based Combination Therapy (ACT)
   d. IV Artesunate

5. Which of the following is/are correct?
   a. Before treatment, suspected malaria cases should have a prompt parasitological confirmatory test using only microscopy.
   b. An experienced health worker can consistently make a diagnosis of malaria from clinical symptoms.
   c. ACTs are not working effectively as drug resistance is high.
   d. Treat infants weighing < 5 kg with uncomplicated *P. falciparum* malaria with an ACT at the same mg/kg birth weight target dose as for children weighing 5 kg.

6. Recommended medicines of choice for the treatment of uncomplicated malaria in Nigeria include:
   a. Arthemeter-Lumefantrine (AL)
   b. Artesunate-Amodiaquine (AA)
   c. Dihydroartemisinine-Piperaquine (DHP)
   d. Alaxin-sulfodoxine

Key to the questions

Question	A	B	C	D
1	F	T	F	T
2	F	T	T	T
3	T	F	T	T
4	F	F	F	T
5	T	T	T	F

CLINICAL QUIZ

A clinical scenario and the corresponding clinical image are provided below. Please study the image and answer the questions.

A 3-year 4-month old girl was brought by her parents to a tertiary hospital with the history of recurrent mouth breathing and snoring of eight months duration. She has a history of frequent waking up at night with daytime sleepiness. The symptoms were noticed following an episode of upper respiratory tract infection. There was no history of fever during the present illness but she has had ear discharges twice in the past.

On examination, she looked well, not distressed but had adenoid facies, with nasal congestion and mouth breathing. Her weight and height were all within normal limits. Throat examination revealed mildly enlarged tonsils but there was no exudate. Oxygen saturation was 95% in room air. Other systemic examination findings were essentially normal. A lateral neck radiograph was done and the images are shown below.

Questions

Instruction: Select the most appropriate answer to each question from the options A to D as provided.

1. What is the most likely diagnosis in the 4-year old girl presenting with recurrent snoring, mouth breathing, frequent waking up at night with daytime sleepiness?
a. Deviated nasal septum
b. Adenoid hypertrophy
c. Allergic rhinitis
d. Nasal polyp
Correct answer: B.
The symptoms of recurrent snoring, mouth breathing, frequent waking up at night with daytime sleepiness are commonly seen in adenoid hypertrophy.

2. Which investigation is required as the gold standard in the diagnosis of the child's condition?
a. Lateral neck X- ray
b. Sleep polysomnography
c. Video fluoroscopy
d. Nasal endoscopy
Correct answer: D
Nasal endoscopy in addition to clinical examination are the gold standard in diagnosis.

3. Which imaging finding is most indicative of adenoid hypertrophy on X-ray?
a. Enlarged soft tissue shadow of the soft palate
b. Palatine soft tissue shadow enlargement at the inferior aspect of soft palate
c. Thickening of the posterior nasopharyngeal soft tissues with indentation of the nasopharyngeal air column
d. Narrowing of the tracheal air column
Correct Answer: C
Thickening of the posterior nasopharyngeal soft tissues with indentation of the nasopharyngeal air column. This can be quantified using the Fujioka

method (adenoid to nasopharyngeal ratio ANR). ANR > 0.73 is significant.
The above radiograph show thickening of the posterior nasopharyngeal soft tissue which is indenting the nasopharyngeal air column on posterior aspect. Paletine tonsils shadow is enlarged at inferior aspect of soft palate. Tracheal air column is normal

4. Which of the following complications can occur in a child with adenoid hypertrophy?
a. Recurrent ear infections
b. Recurrent vomiting
c. Difficulty swallowing
d. Post nasal drip
Correct Answer: A.
Recurrent ear infections which can lead to chronic otitis media can occur as a complication due to obstruction of the Eustachian tube by the enlarged adenoids.

5. Which of the following is an indication for adenoidectomy in children?
a. Significantly enlarged adenoid
b. Snoring
c. Significant obstruction
d. Adenoid facies
Correct Answer: C.
Surgery is indicated with obstructive symptoms or when medical treatment fails.

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