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Research Article

# Effect of Seasonal Malaria Chemoprevention and Data Management in Health Facilities in Three Study LGAs of Adamawa State, Nigeria

**Iniabasi N Nglass[1*], Lynda Ozor[1], Olatunde Olotu[1], Abdulfatai Momoh[1], Chima E Onuekwe[2], Collins Owili[2]**

*[1] World Health Emergency Programmes, North-east Nigeria, Nigeria; [2] World Health Organisation, Nigeria*

## ABSTRACT

Malaria remains a leading cause of ill health in Africa and Nigeria. From world malaria report, 2018 53 million annual cases in Nigeria (1 in 4 persons), contributing 25% global burden and 53% of cases in West Africa. In Nigeria alone, 81,640 deaths are recorded annually (9 deaths per hour), which accounts for 19% global malaria deaths (1 in 5 global malaria deaths) and 45% malaria deaths in west Africa. The Nigeria Malaria Strategic Plan (NMSP) 2014-2020 has as it goal-to reduce malaria burden to pre-elimination levels and bring malaria-related mortality to zero.

In North-East Nigeria, malaria transmission is perennial with a marked seasonal peak from July to November each year. Since malaria is highly endemic in the north-east, increasing the burden on health resources and elevating the risk of morbidity and mortality among the affected population, particularly children under five who are one of the vulnerable groups, Seasonal Mass Chemo-Prevention (SMC) during the rainy season to reduce morbidity and mortality in emergency settings was deployed in 2018 and the results were enormous 6.5% reduction in fever cases and confirmed malaria, when compared with previous years in children under five who benefited from SMC as obtained from the study of effect of SMC on malaria morbidity conducted in Adamawa State in 2018. To achieve a better impact on malaria control, a combination of preventive measures (robust surveillance, indoor residual spray, using insecticide-treated nets), effective case management and improved capacity of personnel is recommended.

**Keywords:** Seasonal malaria chemoprevention; Malaria morbidity; Malaria control; Children under five

## BACKGROUND OF THE STUDY

### North-east malaria situation

Malaria remains a leading cause of ill health in Africa and Nigeria. From world malaria report, 2018 53 million annual cases in Nigeria (1 in 4 persons), contributing 25% global burden and 53% of cases in West Africa. In Nigeria alone, 81,640 deaths are recorded annually (9 deaths per hour), which accounts for 19% global malaria deaths (1 in 5 global malaria deaths) and 45% malaria deaths in west Africa [1,2]. The Nigeria Malaria Strategic Plan (NMSP) 2014-2020 has as its goal is to reduce malaria burden to pre-elimination levels and bring malaria-related mortality to zero [3].

To achieve the NMSP goal, there are core interventions which are in line with the WHO key interventions currently recommended for the control of malaria and the Global Technical Strategy for Malaria (GTS) 2016-2030. They include (1) Integrated Vector Management (IVM)- The use of Long-Lasting Insecticidal Nets (LLINs), Indoor Residual Spraying (IRS), Larval Source Management (Larviciding and Environmental Management), Personal protective measures such as house screening, durable linings and the use of repellents. (2) Malaria Chemoprevention-Chemoprophylaxis for non-immune immigrants and at-risk groups, Intermittent Preventive Treatment in Pregnancy (IPTp), Seasonal Malaria Chemoprevention (SMC)-SPAQ, Others Malaria Vaccine and Bio-Technology once they become accessible. (3) Case Managemen-Diagnosis (Testing before Treatment), Treatment

**Corresponding author:** Iniabasi N Nglass, World Health Emergency Programmes, North-east Nigeria, Nigeria, Tel: +234 7035031254; E-mail: eeniabasi@gmail.com

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(Use of ACTs for uncomplicated Malaria and Injection artesunate for severe malaria), Health System Strengthening, Cross-cutting Interventions. (4) Surveillance-strengthen data management, strengthen EWARS and IDSR, Research and surveys [3-5].

According to Humanitarian Response Strategy for 2019-2021, 7.1million people are in need and 6.2 million are targeted. Out of this 6.2 million targeted, 5.3 million are in need of health and 5.0 million are targeted for health in North-East Nigeria. Despite recent improvements from 2018, insecurity remains to be a challenge limiting access to the functional health facilities. Easily preventable and treatable diseases such as malaria, acute respiratory infection and diarrheal diseases account to the greatest proportion of morbidity and mortality among the vulnerable population [6].

WHO developed a framework for addressing the malaria scourge in the area in consultations with the Global Malaria Programme and other humanitarian and development partners, Federal and State Ministries of Health (Table 1) [4,5].

**Table 1:** synopsis of the recommended interventions.

| Chemoprevention | Vector control | Case management | Surveillance |
|---|---|---|---|
| •SMC to all <5 children<br>•IPTp to all pregnant women MDA to partially accessible population | •IRS at all IDP camps<br>•LLIN Mass distributio n | •Increase access to RDTs, ACTs | •Strengthen EWARS, IDRS<br>•Conduct baseline and end line prevalence surveys |

In Nigeria, malaria transmission is Perennial, with seasonal peaks in March to September in the South and August to November in North. Some states in Northern region in Sahelian belt, are eligible for SMC. Across the Sahel sub-region most childhood malaria mortality and morbidity occur during the rainy season, which is generally short. Giving effective malaria treatment at intervals during this period has been shown to prevent illness and death from malaria in children. Therefore, in March 2012 WHO recommended a new intervention against plasmodium falciparum: SMC for children aged 3-59 months (under 5), Children under five are the most vulnerable to malaria illness and likely to die from severe infection. Their growth and development are most affected by repeated attacks of malaria and the development of anemia. This strategy was adopted by the National Malaria Elimination Programme within its strategic plan 2013-2014 and again in the 2014-2020 NMSP, it is being implemented by the national, state ministries of health and partners in the country [3,6-8].

In Nigeria, the Sahel regions of northern states of the country where malaria transmission lasts less than four months present an opportunity for those at risk to benefit from the implementation of SMC. The northern region of Adamawa state is within this seasonal malaria transmission zone, it is also affected by the humanitarian crisis and is suitable for conducting an assessment of SMC.

## REVIEW OF LITERATURE

In March 2012 WHO recommended a new intervention against *Plasmodium falciparum*: SMC for children aged 3-59 months (under 5). In Areas:

- With moderate to high transmission (AEIR ≥ 10)
- where on average more than 60% of clinical malaria cases occur within a maximum of 4 months; these areas are characterized by more than 60% of the average annual rainfall falling within 3 months
- Where parasite resistance to SP is not high (defined as a prevalence of 540 mutation of ≤ 50%)

**Studies show that SMC:**

- Prevents approximately 75% of all malaria episodes
- Prevents approximately 75% of severe malaria episodes
- May result in a decrease in child mortality of around 1 in 1000
- Probably reduces the incidence of moderately severe anemia
- Reduce Hospital admissions associated with malaria parasitemia
- Provide Personal protection against clinical malaria for a period of approximately 35days following the administration of each dose [8-10]

Further studies as indicated below, also provided more evidence in the positive effect of SMC in reducing malaria morbidity and mortality.

Over the past years, studies have shown that providing healthy children with a monthly course of two existing malaria medicines (Sulfadoxine-Pyrimethamine (SP) and Amodiaquine (AQ)) during peak transmission season can prevent about 80% of severe and uncomplicated malaria cases. Researchers estimate that about 5 million cases of malaria and about 20,000 deaths from malaria could be

prevented annually if SMC were fully implemented. Based on these impressive results, the World Health Organization has conducted an evidence-based review. It has subsequently recommended SMC in those countries with seasonal transmission characteristics, and where the two-component drugs are both still effective against *Plasmodium falciparum* malaria. For children aged between 3 and 59 months in the Sahel sub-region, WHO recommends a single dose of SP, plus a three-day course of AQ, once a month, for 3 to 4 months during the malaria season [11].

A meta-analysis (pooled data from clinical studies) of 7 SMC studies, where a course of antimalarials was given periodically to children under 5 years during peak malaria season showed 80% reduction in clinical attacks of malaria and a similar reduction in the incidence of severe malaria. The SP+AQ combination used in most trials was well tolerated. In field trials testing SMC's efficacy in protecting children from malaria, and a large-scale effectiveness study in Senegal, SP+AQ was the preferred drug combination. This was for the following reasons: In clinical trials, SP+AQ gave greater protection than other drug combinations. The use of the two drugs in combination limits the risk for selection for resistance to either SP or AQ use as monotherapy [10,11].

SMC was also administered to more than 175,000 children between 3 and 59 months in southern Mali and in two areas of Chad. Preliminary results from the program show that the number of cases of simple malaria dropped by 65% in the intervention area in Mali, and by up to 86% in Chad. There was a significant decrease in cases of severe malaria as well [9,10].

A similar study conducted in Kano State of Nigeria on seasonal malaria chemoprevention packaged with malnutrition prevention in Kano northern Nigeria: A pragmatic trial (SMAMP study) with nested case-control conducted from August to November 2014. Showed that the odds of clinical malaria among those who received the intended intervention were lower in each study arm compared to children who did not receive interventions. This study also provides further evidence that SMC exposure is associated with reduced clinical malaria episodes, an important result to consider as SMC is scaled up across the Sahel [12].

## SMC implementation overview

WHO supported the Adamawa State Malaria Elimination Programme (SMEP) to deliver SMC to over 117,000 targeted children across three LGAs namely Michika (16 wards), Mubi North (11 wards) and Mubi South (3 wards). These LGAs comprise an estimated 40% of the eligible population of children in the state. SMC delivery was conducted during peak rainy season (August-November) using the existing EPI structures that delivers immunization campaigns at LGA, Ward, and settlement levels. Administration of Sulphadoxine-Pyrimethamine and Amodaquine (SP-AQ) was undertaken to children 3-59 months, one month apart up to a total of 4 cycles without knowing their parasite status.

SMC follows a house to house approach ensuring all children between 3 months and 59 months of age receive the medication. Community volunteers and CHEWs go house to house to deliver SP+AQ to targeted children in the presence of the guardians/caregivers using the directly observed treatment approach 9,10. The next two doses are handed over to the guardian with clear health messages on the usage and possible side effects given by trained distributors and supervised by CHEWs. The SMC team implementing the house to house administration documented the number of children reached using a tally sheet. The team supervisors directly monitored the performance of each team by compiling the tally sheets daily and comparing it against the planned target over the campaign period. The LGA team was responsible for providing technical oversight, compiling the data from the supervisors and analyzing performance at LGA level. Teams from WHO, NMEP, and SMOH provided technical support to the LGAs and were responsible for overseeing the activity implementation in the state.

## An overview of the study area (Mubi South, Mubi North, and Michika LGAs)

Adamawa is a state in northeast Nigeria, with Yola as its capital. It lies between 80° N and 11N and longitude 11.50 and 13.50 E. It was formed in 1991 from part of Gongola State with four administrative divisions namely: Adamawa, Ganye, Mubi, and Numan. It is one of the thirty-six (36) States which constitute the Federal Republic of Nigeria.

The name "Adamawa" came from the founder of the kingdom, Modibbo Adama, a regional leader of the Fulani Jihad organized by Usman Dan Fodio of Sokoto in 1804. Modibbo Adama came from the region of Gurin (now just a small village) and in 1806 received a green flag for leading the jihad in his native country. In the following years, Adama conquered many lands and tribes. In 1838 he moved his capital to Ribadu, and in 1839 to Joboliwo. In 1841 he founded Yola, where he died in 1848. After the European colonization (first by Germany and then by Britain) the rulers remained as emirs, and the line of succession has continued to the present day.

Adamawa is one of the largest states of Nigeria and occupies about 36,917 square kilometres. It is bordered by the states of Borno to the northwest, Gombe to the west and Taraba to the southwest. Its eastern border forms the national eastern border with Cameroon.

Adamawa was created out of Gongola State on 27th August 1991 as one of the nine new states created by the Federal Military Government. Prior to its creation in 1991, it was part of the North-Eastern State from 1967 to February 1976 and Gongola State 1976-1991.

Mubi South LGA is situated in Adamawa state, North-east geopolitical zone of Nigeria. The LGA is part of the Mubi Emirate and is made up of several towns and villages. The area hosts members of diverse ethnic affiliations with the most populous in the LGA being the Gude Nzanyi and Fali. The Gude Nzanyi, Fali, and Hausa languages are amongst some of the spoken languages in Mubi South LGA while the religions of Islam and Christianity are practiced in the area.

Mubi is the capital of Mubi North Local Government Area of Adamawa State in Nigeria. It lies on latitude 10°32′ N to 10°11′ N and longitude 13°12′E to 13°35'E, with a total landmass of 506.4Km and a population size of 759,045 people. Mubi is a town in Adamawa North Senatorial Districts in Adamawa state, Nigeria. The major tribes are Fulanis from Digil. Names like Nuhu Auwalu Wakili are very common in the state. The Nuhu Wakili's family is the ruling family in the town.

On the other hand, Michika local government area is situated in Adamawa state. The LGA is bordered by the Mubi, Hong, and Madagali LGAs and by parts of Borno state and the Republic of Cameroon. Towns and villages that makeup Michika LGA include Bokka, Likune, Mutse, Dilichime, Bazza, Zah, Garta, and Futu. The estimated population of Michika LGA is put at 304,772 inhabitants with the vast majority of the area's populace made up of members of the Kamwe ethnic affiliation. The Kamwe language is widely spoken in Michika LGA while the religion of Christianity is widely practiced in the area. Popular traditional festivals in Michika LGA include the Yawale and Wasinata festivals while the notable landmarks in the LGA include the Michika College of Health and Technology and the Government Secondary School Michika (Figure 1) [13,14].

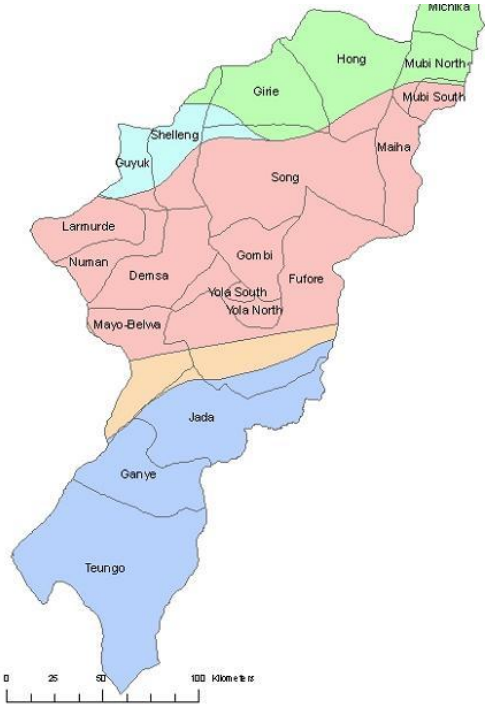


**Figure 1:** Showing map of Adamawa State.

### Study overview

The evaluation's focus was to access health facility data on malaria morbidity amongst the target age group for the period of the intervention and compare with similar periods in the last two years prior to the assessment, in some health facilities.

### Aim and objectives of the study

The goal of the study is Evaluation of the Effect of Seasonal Malaria Chemoprevention on Malaria Morbidity and data management in Adamawa State North-Eastern Nigeria.

Thus the survey objectives are:

- To assess the trends in malaria morbidity during the peak transmission season (July to November) in the last 3 years in 3 LGAs in Adamawa
- To assess the effect of SMC intervention on the trends of Malaria mortality within the peak transmission season (July to November) in the last 3 years in 3 LGAs in Adamawa
- To inform future national and state plans for SMC continuance and scale up by disseminating findings and sharing experiences with key stakeholders

## STUDY METHODS

### Study objectives

A cross-sectional survey was conducted to measure malaria morbidity, mortality based on the health facility records. The study was carried out to evaluate impact of SMC from review of health facility data for three years 2016 -2018 (July-November).

### Study design

The primary study design based on the review of health facility records for 2016, 2017, 2018 for July-November. One health facility was selected from each of the 30 wards across the 3 LGAs. The data collection points was

- Health Facility NHMIS registers for July, August, September, October, November for 2016, 2017 and 2018

The data for 2018 intervention period was compared with a similar period for 2016 and 2017, in the intervention LGAs in the state. The evaluation was timed at the end of the fourth cycle of implementation.

### Sampling and sample size

One health facility was randomly selected in each ward located in the three Local Government Areas surveyed. This gave a total of 30 health facilities: 16 health facilities in Michika LGA, 11 health facilities in Mubi north and 3 health facilities in Mubi south. The health facility records from 2016-2018 looking at July-November of each year were reviewed. A comparison of malaria cases between the three years was carried out to ascertain the effect of SMC in the selected LGAs.

The following assumptions were underlying the calculations of sample size and precision using standard formulas:

- Baseline Malaria parasite prevalence 48.2%
- Minimal difference to be detected 10% points
- Confidence interval (alpha-error) 95%
- Power (beta-error) 80%
- Design effect of 2
- Non-record of 10%
- Average fever cases size 5.4%
- Percentage of children under 5 per attending health facility, within the catchment 20%

A retrospective survey of the data from health facilities in these 3 LGAs was carried out to compare fever and confirmed malaria indicators through an assessment tool that collects data from the NHMIS register for the intervention periods in the years.

Data were collected and reviewed from a total of 30 health facilities for the three years in order to have 95% power to detect a minimal difference of 10% in malaria prevalence between the intervention year and none intervention years [15-17].

### Data collection

Prior to the surveys, the affected health facilities were informed and permission of the state ministry of health and Local government authority was sought. All respondents were informed in detailed purpose of the survey, its implications, and benefits [18].

### Tools

A checklist was used for the evaluation. It contains twenty-six questions starting with the geographic location of the health facility, type of health facility, client volume to malaria indicators and data capturing.

The checklist that was adopted for this survey has been adapted from similar evaluations in Nigeria and some questions and their design use malaria indicator survey (MIS) tools and the DHS+modules (MIS 2010) [19,20].

### Data management and statistical analysis

A paper questionnaire-based data collection tool was used to record information from the health facilities. The data entry (including double-entry) and management were done using Microsoft Access with the appropriate checks and measures put in for data validation and quality control.

Once entered, the data were further cleaned, merged, and then migrated to Microsoft Excel for data analysis. The principle comparison of the key outcome variables was between different years' survey data. The magnitude of any measured differences was assessed and compared [21,22].

## RESULTS

Table 2 shows a number of patients under five (5) seen in the OPD across the Local Government Areas from 2016 to 2018. In 2016, it is estimated that male patients in Mubi North LGA were 2117 (41.4%) counts while female patients constitute 2997 (58.6%). Michika LGA had 1792 (41.4%), male patients, while female patients constitute 2538 (58.6%). Also, in Mubi South LGA male patients constitutes 2380 (43.1%) while female patients constitute 3137 (56.9%) seen in the OPD. Therefore in 2017, Mubi North LGA has 2023 (40.7%) patients while female patients constitute 2943 (59.3%), in Michika LGA has 4083 (42.1%), male patients, while female patients constitute 5619 (57.9%), also, in Mubi South LGA male patients constitutes 2952 (40.8%) while female patients constitute 4284 (56.2%) seen in the OPD. Finally in 2018, Mubi North LGA has 1632 (44.2%) male patients while female patients constitute 2063 (55.8%) , Michika LGA has 3054 (39.5%), male patients, while female patients constitute 4670 (60.5%), also, in Mubi South LGA, male patients constitutes 3326 (48.1%) while female patients constitute 3588 (51.9%) seen in the OPD. It is therefore indicated that female patient has more counts when compared with male seen in the OPD in 3 years under survey (Figure 2).

**Table 2:** Number of patients seen in the OPD of children less than 5 years of age across the Local Government Areas from 2016 to 2018 (Source: Field Survey 2018).

| Year | Local government area | Gender | | | | Total |
|---|---|---|---|---|---|---|
| | | Male | % | Female | % | |
| 2016 | Mubi North | 2117 | 41.4 | 2997 | 58.6 | 5114 |
| | Michika | 1792 | 41.4 | 2538 | 58.6 | 4330 |
| | Mubi South | 2380 | 43.1 | 3137 | 56.9 | 5517 |
| | **Total** | **6289** | | **8672** | | **14961** |
| 2017 | Mubi North | 2023 | 40.7 | 2943 | 59.3 | 4966 |
| | Michika | 4083 | 42.1 | 5619 | 57.9 | 9702 |
| | Mubi South | 2952 | 40.8 | 4284 | 59.2 | 7236 |
| | **TOTAL** | **9058** | | **12846** | | **21904** |
| 2018 | Mubi North | 1632 | 44.2 | 2063 | 55.8 | 3695 |
| | Michika | 3054 | 39.5 | 4670 | 60.5 | 7724 |
| | Mubi South | 3326 | 48.1 | 3588 | 51.9 | 6914 |
| | **TOTAL** | **8012** | | **10321** | | **18333** |

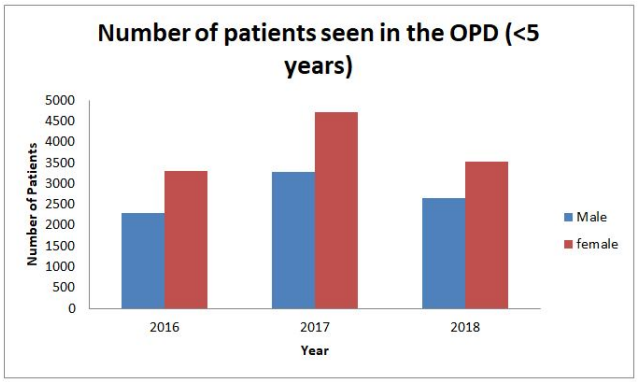


**Figure 2:** Bar chart showing the distribution of Patients (Male and Female) from 2016 to 2018 observed with OPD. Source: Field Survey 2018.

Table 3 shows a number of under-five (5) patients presenting with fever across the Local Government Areas from 2016 to 2018. In 2016, it is estimated that male patients in Mubi North LGA has 1107 (41.9%) counts while female patients constitute 1533 (58.1%) , Michika LGA has 1045 (40.8%), male patients, while female patients constitute 1516 (59.2%), also, in Mubi South LGA male patients constitutes 768 (37.3%) while female patients constitute 1291 (62.7%) seen with fever. Therefore in 2017, Mubi North LGA has 1065 (40.6%) patients while female patients constitute 1556 (59.4%), Michika LGA recorded 2438 (41.8%), male patients, while female patients constitute 3392 (58.2%), also, in Mubi South LGA male patients constitutes 1110 (42.1%) while female patients constitute 1529 (57.9%) seen with fever. Finally in 2018, Mubi North LGA recorded 1001 (46.0%), male patients, while female patients constitute 1175 (54%), Michika LGA has 1748 (42.1%) male patients while female patients constitute 2402 (57.9%), also, in Mubi South LGA, male patients constitute 768 (42.6%) while female patients constitute 1035 (57.4%) seen with fever. It is therefore indicated that female patient constitutes recorded greater counts for patients presenting with fever when compared with male patients for the 3 years under survey (Figure 3).

**Table 3:** Number of patients seen with Fever of age less than 5 years across the Local Government Areas from 2016 to 2018 (Source: Field Survey 2018).

| Year | Local government area | Gender | | | | Total |
|---|---|---|---|---|---|---|
| | | Male | % | Female | % | |
| 2016 | Mubi north | 1107 | 41.9 | 1533 | 58.1 | 2640 |
| | Michika | 1045 | 40.8 | 1516 | 59.2 | 2561 |
| | Mubi south | 768 | 37.3 | 1291 | 62.7 | 2059 |
| | **Total** | **2920** | | **4340** | | **7260** |
| 2017 | Mubi north | 1065 | 40.6 | 1556 | 59.4 | 2621 |
| | Michika | 2438 | 41.8 | 3392 | 58.2 | 5830 |
| | Mubi south | 1110 | 42.1 | 1529 | 57.9 | 2639 |
| | **Total** | **4613** | | **6477** | | **11090** |
| 2018 | Mubi north | 1001 | 46.0 | 1175 | 54.0 | 2176 |
| | Michika | 1748 | 42.1 | 2402 | 57.9 | 4150 |
| | Mubi south | 768 | 42.6 | 1035 | 57.4 | 1803 |
| | **Total** | **3517** | | **10321** | | **8129** |

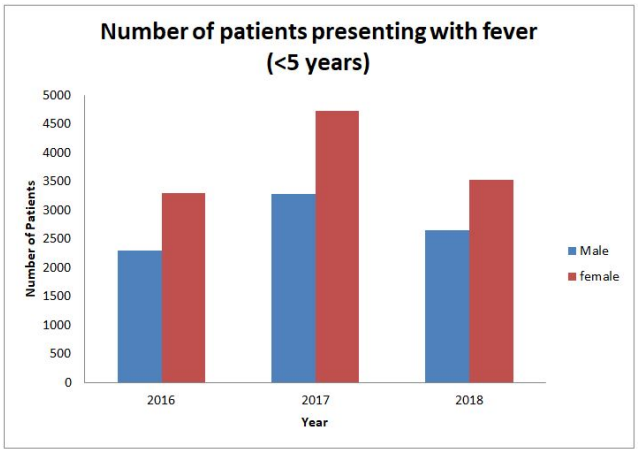


**Figure 3:** Bar chart showing the distribution of Patients (male and Female) from 2016 to 2018 observed with fever.

Table 4 shows number of under-five (5) confirmed malaria cases across the Local Government Areas from 2016 to 2018. In 2016, it is estimated that male patients in Mubi North LGA recorded 769 (44.0%) counts while female patients constitute 977 (56.0%), Michika LGA recorded 858 (41.9%) male patients while female patients constitute 1188 (58.1%), also, in Mubi South LGA male patients constitutes 664 (37.1%) while female patients constitute 1128 (62.9%) confirmed cases of malaria. Therefore in 2017, Mubi North LGA recorded 557 (38.6%) patients while female patients constitute 885 (61.4%) , Michika LGA recorded 1930 (43.0%) male patients while female patients constitute 2555 (57.0%), also, in Mubi South LGA, male patients constitutes 793 (38.2%) while female patients constitute 1281 (61.8%) cases of confirmed malaria. Finally in 2018, Mubi North LGA has 511 (45.1%) patients while female patients constitute 622 (54.9%), Michika LGA recorded 1552 (42.3%) male patients while female patients constitute 2117 (57.7%), also, in Mubi South LGA male patients constitutes 589 (43.0%) while female patients constitute 782 (57.0%) seen with malaria. It is observed that female patients recorded higher counts for confirmed cases of malaria when compared with male patients in the three (3) LGAs surveyed (Figure 4).

**Table 4:** Number of patients seen with Malaria of age less than 5 years across the local government areas from 2016 to 2018 (Source: Field survey 2018).

| Year | Local government area | Gender | | | | Total |
|---|---|---|---|---|---|---|
| | | Male | % | Female | % | |
| 2016 | Mubi north | 769 | 44.0 | 977 | 56.0 | 1746 |
| | Michika | 858 | 41.9 | 1188 | 58.1 | 2046 |
| | Mubi south | 664 | 37.1 | 1128 | 62.9 | 1792 |
| | **Total** | **2291** | | **3293** | | **5584** |
| 2017 | Mubi north | 557 | 38.6 | 885 | 61.4 | 1442 |
| | Michika | 1930 | 43.0 | 2555 | 57.0 | 4485 |
| | Mubi south | 793 | 38.2 | 1281 | 61.8 | 2074 |
| | **Total** | **3280** | | **4721** | | **8001** |
| 2018 | Mubi north | 511 | 45.1 | 622 | 54.9 | 1133 |
| | Michika | 1552 | 42.3 | 2117 | 57.7 | 3669 |
| | Mubi south | 589 | 43.0 | 782 | 57.0 | 1371 |
| | **Total** | **2652** | | **3521** | | **6173** |

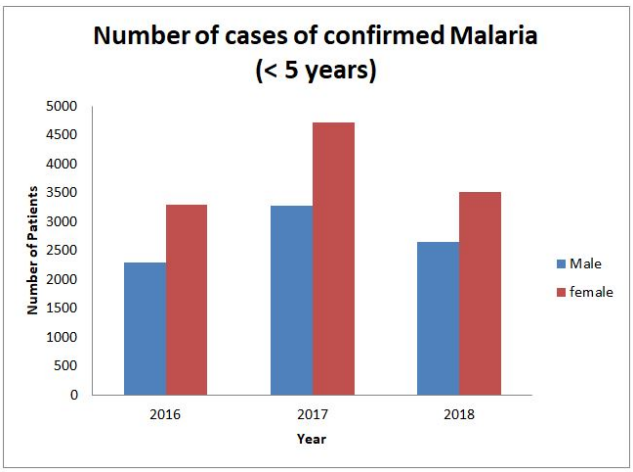


**Figure 4:** Bar chart showing the distribution of patients (male and Female) from 2016 to 2018 confirmed with Malaria.

Table 5 shows number of cases of confirmed malaria given ACT (<5 years) across the Local Government Areas from 2016 to 2018. In 2016, it is estimated that male patients in Mubi North LGA recorded 584 (45.7%) patients while female patients constitute 695 (54.3%) , Michika LGA has 823 (41.8%) male patients while female patients constitute 1145 (58.2%), also, in Mubi South LGA, male patients constitutes 350 (43.1%) while female patients constitute 463 (56.9%) number of cases of confirmed malaria given ACT. Therefore in 2017, Mubi North LGA has 469 (43.4%) patients while female patients constitute 611 (56.6%), Michika LGA has 1779 (43.1%) male patients while female patients constitute 2350 (56.9%), also, in Mubi South LGA male patients constitutes 783 (42.6%) while female patients constitute 1053 (57.4%) number of cases of confirmed malaria given ACT. Finally in 2018, Mubi North LGA has 428 (43.5%) patients while female patients constitute 555 (56.5%), Michika LGA has 1564 (43.1%) male patients while female patients constitute 2063 (56.9%), also, in Mubi South LGA, male patients constitutes 639 (43.9%) while female patients constitute 816 (56.1%) number of cases of confirmed malaria given ACT. It is observed that female patient constitutes higher proportion of patients with confirmed malaria given ACT in the three 3 LGAs when compared with the male patients (Figure 5).

**Table 5:** Number of cases of confirmed Malaria given ACT (<5 years) with age less than 5 Years across the local government areas from 2016 to 2018 (Source: Field survey 2018).

| Year | Local government area | Gender | | | | Total |
|---|---|---|---|---|---|---|
| | | Male | % | Female | % | |
| 2016 | Mubi north | 584 | 45.7 | 695 | 54.3 | 1279 |
| | Michika | 823 | 41.8 | 1145 | 58.2 | 1968 |
| | Mubi south | 350 | 43.1 | 463 | 56.9 | 813 |
| | **Total** | **1757** | | **2303** | | **4060** |
| 2017 | Mubi north | 469 | 43.4 | 611 | 56.6 | 1080 |
| | Michika | 1779 | 43.1 | 2350 | 56.9 | 4129 |
| | Mubi south | 783 | 42.6 | 1053 | 57.4 | 1836 |
| | **Total** | **3031** | | **4014** | | **7045** |
| 2018 | Mubi north | 428 | 43.5 | 555 | 56.5 | 983 |
| | Michika | 1564 | 43.1 | 2063 | 56.9 | 3627 |
| | Mubi south | 639 | 43.9 | 816 | 56.1 | 1455 |
| | **Total** | **2631** | | **3434** | | **6065** |

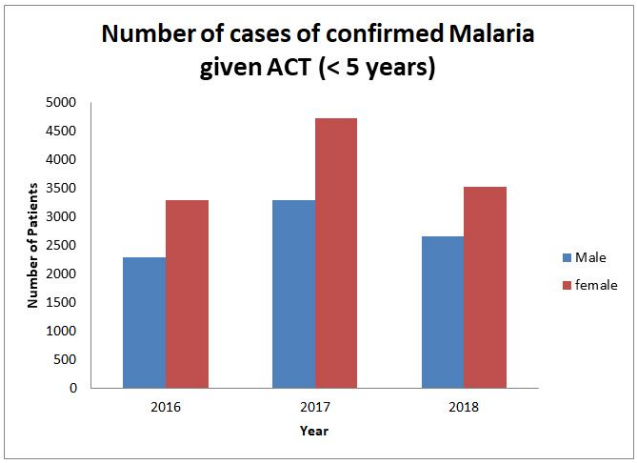


**Figure 5:** Bar chart showing the distribution of Patients (male and Female) from 2016 to 2018 observed with Malaria and given ACT.

Table 6 shows number of patients of age less than 5 years across with cases across the three (3) Local Governments of Mubi-North, Mubi-South and Michika from 2016 to 2018. In 2016, it is estimated that patients in OPD are 14961 (27.1%), in 2017, patients in the OPD are 21904 (39.7%) while in 2018 patients in OPD decreases to 18333 (33.2%). In addition, it is estimated that patients seen with fever are 7260 (27.4%) in 2016, while in 2017, patients with fever are 11090 (41.9%) while in 2018 patients with fever case decreases to 8129 (30.7%). Therefore, it is estimated that patients confirmed with malaria are 5584 (28.3%) in 2016, while in 2017, patients with malaria cases are 8001 (40.5%) while in 2018 patients with malaria cases decreases to 6173 (31.2%). Finally, it is estimated that patients confirmed with malaria given ACT are 4060 (23.6%) in 2016, while in 2017, patients confirmed with malaria given ACT are 7045 (41.0%) while in 2018 patients confirmed with malaria given ACT decreases to 6065 (35.3%) (Figure 6).

**Table 6:** Number of patients of cases with age less than 5 years across the local government areas from 2016 to 2018 (Source: Field survey 2018).

| Year | OPD | % | Fever | % | Malaria | % | ACT | % |
|---|---|---|---|---|---|---|---|---|
| 2016 | 14961 | 27.1 | 7260 | 27.4 | 5584 | 28.3 | 4060 | 23.6 |
| 2017 | 21904 | 39.7 | 11090 | 41.9 | 8001 | 40.5 | 7045 | 41.0 |
| 2018 | 18333 | 33.2 | 8129 | 30.7 | 6173 | 31.2 | 6065 | 35.3 |
| **Total** | **55198** | | **26479** | | **19758** | | **17170** | |

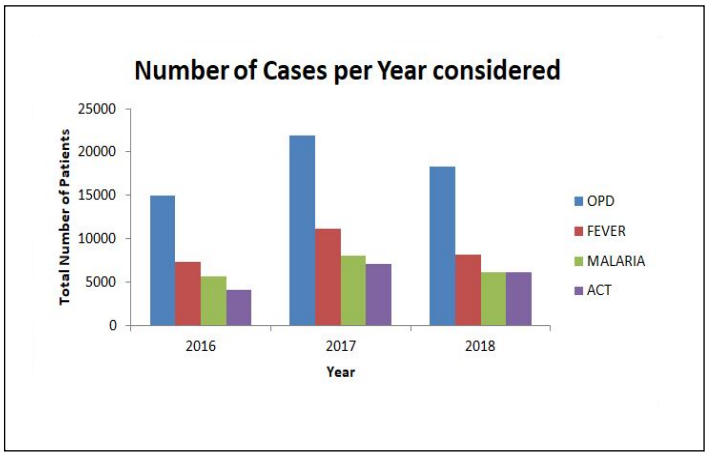


**Figure 6:** Bar chart showing the distribution of Patients from 2016 to 2018 observed per cases.

## DISCUSSION

The study demonstrated a trend in Malaria cases across the study locations. The pattern of malaria trends was similar for the indicators we considered during the 3 years (2016-2018) reviewed. The number of female children less than 5 years seen and managed for malaria from all the indicators analysed were more than those of the males. OPD attendance of children under 5 peaked in 2017 and we saw a decline of 6.5% in 2018. Fever and malaria cases reported at the health facilities also peaked in 2017 and showed a greater declined by about 11% and 9% respectively in 2018. Number of children who had malaria and were treated with ACT also had a similar decline of 6% in 2018 from a peak in 2017.

The declines seen in the reported cases of fever, malaria, and ACTs used for malaria treatment could be due to the implementation of Seasonal Malaria Chemoprevention intervention targeted at the same age group of children (3-59 months) in the 3 LGAs of the state. This further affirms other studies which indicated the effectiveness of SMC amongst children exposed to the prophylaxis when compared with those who did not benefit from the intervention.

### Challenges and recommendation

Some of the challenges encountered in course of the evaluation were:

1. Inadequate information in the health facilities registers needed to extract our desired data. This sometime is due to incomplete filling of the registers

2. Loss or missing registers especially those for 2016

3. Insecurity in some of the wards in the LGAs selected for the survey

4. Some of the health facilities are hard to reach making it difficult for data collectors to have access to the facilities

5. The implementation of SMC should be scaled-up to cover more children during the malaria season

6. There is need for government to prioritise interventions in malaria, in order to reduce the mortality associated with malaria

7. There is need for continuous capacity building on data management for health care providers and the need to use the data generated for decision making

## CONCLUSION

Based on the results above, it is observed that the SMC intervention program has a positive impact on reduction in the number of patients seen in the OPD, patients present with fever, confirmed malaria cases and patients confirmed with fever given ACT in the targeted Local Government Areas. There is need for improved documentation and data management at all levels of health care delivery. Although, there was a sharp increase in confirmed malaria cases in 2017 when compared with 2016, the incidence of malaria reduced significantly in 2018 when compared with 2017 as a result of the intervention programme. We therefore recommend continuous implementation of SMC intervention in the Local Governments Areas surveyed and possible extension to cover the entire 21 local government areas of Adamawa state.

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2. State Ministry of Health, Adamawa State

3. The field workers/dat collectors

4. Executive Secretaries, Mubi North, Mubi South and Michika Local Government Areas

5. RBM focal persons in the 3 LGAs

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