

# Level of Implementation of Seasonal Malaria Chemoprevention in Children Aged between 3 to 59 Months in Koza, Far North Region of Cameroon

Djike Puepi Fokam Yolande<sup>1\*</sup>, Kamo Selangai Helene<sup>2</sup>, Noukeu Njinkui Diomede<sup>3</sup>, Missota Tchahe Mariane Gabrielle<sup>4</sup>, Wandji Yanelle<sup>1</sup>, Ganni Wele Wilfried<sup>4</sup>, Tedongfo Nicolas<sup>5</sup>, Verla Vincent Sisyi<sup>1</sup>

<sup>1</sup>Department of Internal Medicine and Pediatric, Faculty of Health Sciences, University of Buea, Buea, Cameroon

<sup>2</sup>Department of Pediatric, Faculty of Medicine and Biomedical Sciences, University of Garoua, Garoua, Cameroon

<sup>3</sup>Faculty of Medicine and Pharmaceutical Sciences, University of Dschang, Dschang, Cameroon

<sup>4</sup>Faculty of Health Sciences, University of Buea, Buea, Cameroon

<sup>5</sup>Department of Public Health, Faculty of Health Sciences, University of Buea, Buea, Cameroon

Email: \*yolandep2000@yahoo.fr

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## Abstract

**Background:** Seasonal Malaria Chemoprevention (SMC) is a strategy put in place by World Health Organisation (WHO) to fight against malaria in zones of high seasonal malaria transmission since the year 2012. This strategy has been implemented in the Far North and North regions of Cameroon since the year 2016. Despite the implementation of this program the number of cases and deaths from seasonal malaria among the under 5 seems to be rising in Koza health area. **Objective:** To determine the level of implementation of the SMC Program and its impact on the mortality of children aged 03 to 59 months during the season of high transmission. **Methods:** This was a community-based cross-sectional and 7-years retrospective study. Data was surveyed for 3 months in 3 health areas of Koza health area. Data were collected and typed in Kobo collect, cleaned in MS Excel and analyzed in SPSS version 25 to come out with descriptive statistics. **Results:** Among the 172 households, female children were mostly represented 99 (57%) The age group mostly represented was 2 years. The population knowledge on SMC's overall score was above average. The overall coverage rate (4 cycles) was 84% from interviewed parents and 67.5% from SMC cards. More than 23% of children experienced at least one side effect with the most common being vomiting (72%). The population's overall impression of the program was good at 85%. The trends SMC coverage showed a sinusoidal fluctuation from 2015 to 2021,

2016 to 2019 and 2020 to 2021. **Conclusion:** The coverage rate of SMC was high thus the program is well implemented.

### Keywords

Level of Implementation, Children, Parents/Tutors, Seasonal Malaria Chemoprevention, Koza

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## 1. Introduction

Malaria is a potentially fatal infectious disease caused by a parasite that infect the female anopheles mosquito that feeds on humans [1] [2]. Malaria is caused by five different species of the protozoan plasmodium, *P. falciparum* accounting for 95% of severe cases of malaria, *P. malariae*, *P. Ovale*, *P. vivax* and *P. knowlesi*. Malaria still remains a major public health issue.

In Africa, 215 million cases of malaria were reported in 2019, distributed in 29 countries and accounting for 95% of the global burden for malaria [3] [4]. The most affected population age group in the sub-Saharan Africa were the under 5 years [5] [6]. Since 2012 WHO recommended the use of sulfadoxine-pyrimethamine and amodiaquine for SMC therapy in sub-Saharan Africa, while amodiaquine ensures rapid parasite clearance, sulfadoxine-pyrimethamine due to its half-lasting effect ensures a prolonged antimalarial effect on residual parasites [7] [8] [9]. Cameroon falls among the top ten sub-Saharan African countries with the highest burden of malaria. Malaria accounted for 25.9% of causes of consultation with 31.5% being children under the age of 5 years accounting for 14.3% of the country's [10].

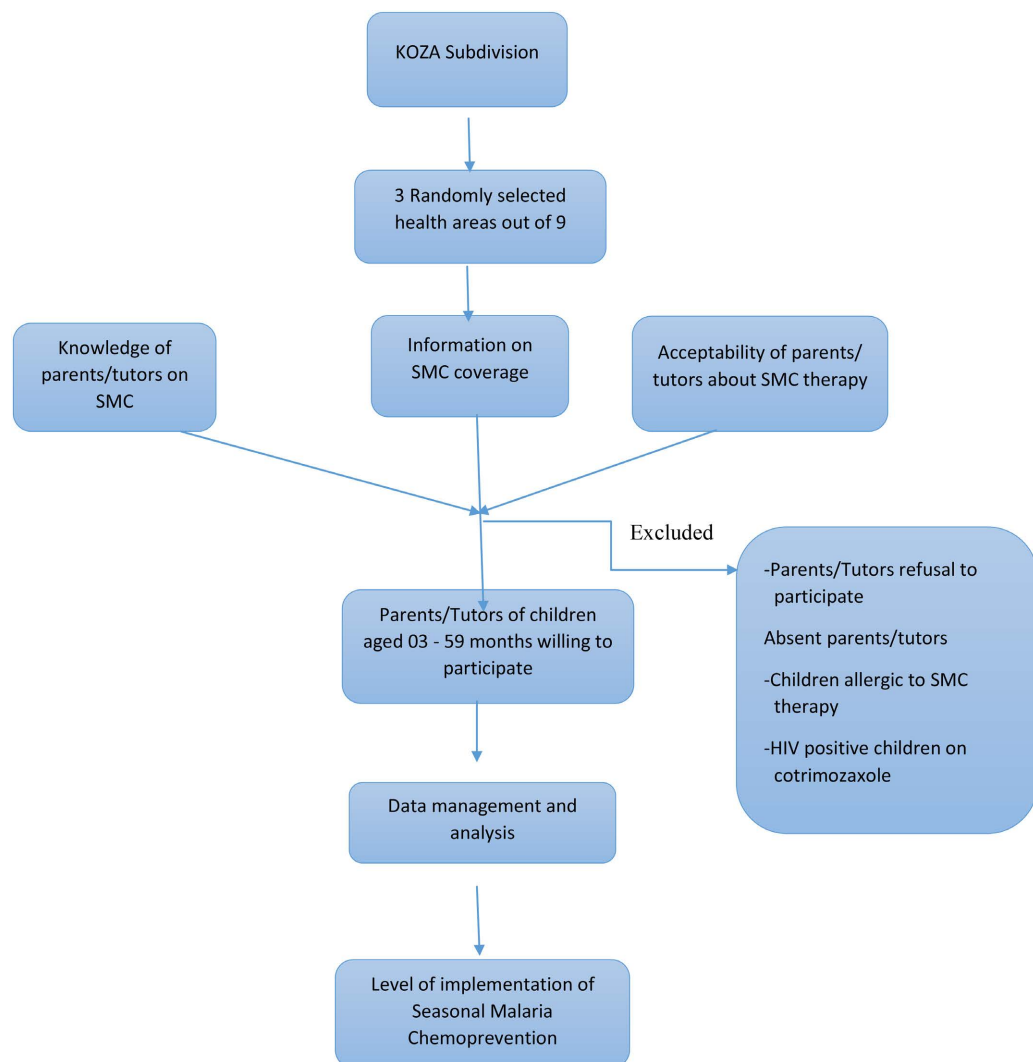
In this light, the Cameroon government implemented in 2016 the WHO recommendation for prevention of seasonal malaria by initiating the program of SMC in children aged from 3 months to 59 months in these Regions [11]. However, the rate of admission in the Koza subdivision, Far North Cameroon remains high therefore justifying our study.

## 2. Methods

This was both a community based descriptive cross-sectional study in 3 randomly selected health areas in Koza subdivision through balloting, and a hospital based 7 years' retrospective study at the Koza district hospital focused on children aged 3 months to 59 months. The survey went from February 2022 to April 2022.

Koza subdivision is located in the Far North region of Cameroon. It has of 87,043 inhabitants with a population density of 227.6 person/km<sup>2</sup> in 2005 [12] [13]. It shares international borders with Nigeria [12]. There is a rainy and dry season. They can be broken down into periods of dry and relatively cool from January to April, heavy rainfall from April to June, sporadically wet from June to November. Temperature reaches their maximum point from January to May.

The annual rainfall is 400 - 900 mm/year with an average temperature of 26°C [14]. During the raining season, the waterways elevate and cause floods. These floods serve as important breeding grounds for anopheles' mosquitoes there by favoring high transmission seasons of malaria. The target population comprised of parents or tutors of children aged 3 - 59 months who resided in Koza for more than 12 months at least, files of children aged 3 - 59 months who were admitted and or died from severe malaria from the year 2015 to 2021 during the high transmission period (July-October). This was carried out in Adventist hospital of Koza II which serves as district hospital in Koza Subdivision. There is paucity of data on the level of implementation, of the SMC Program in children aged 03 to 59 months, following the initiation of this program in Koza subdivision, Far North Cameroon. The result of our study will provide statistical information on this topic in our setting. In addition, the results will help the health system, the government, and international organizations to review or ameliorate the strategies of SMC Program (Figure 1).



**Figure 1.** Conceptual frame work.

We used a multistage sampling technic whereby we randomly selected 3 health areas out of the 9 health areas found in Koza Subdivision. Next, Purposive sampling was done to select households from every health area and Snowboard sampling was used to select the rest of the households having children with the targeted age group. Records of children aged 3 to 59 months who were admitted or died from severe malaria during the period of high transmission (July-October) were obtained from Koza Adventist Hospital. Data from the community was collected using a structured questionnaire with opened and multiple-choice questions to interview participating parents or tutors. The questionnaires were translated into French for a better understanding of the population and pre-tested in Garoua a week before proper collection in the Koza subdivision. This was to ensure that the questions were within context and well understood by inhabitants of Garoua who are relatively more literate than the population in Koza. Once in Koza, two persons originating from Koza and who had a mastery of the different communities were trained on the questionnaire and helped in translating the questions from French to Mafa which was the local language thus making sure that the questionnaire was well understood by all levels of the population. The household's selection was such that, when we reached a particular village in the selected health area, we took a haphazard direction. They determined the number of houses in that line and purposely selected a house in which resided children of the targeted age group. Then the investigator continued in the rest of the households with the target age group using the snowboard method until the required number is reached per health area. Together with the main investigator, we were responsible for leading the whole process of data collection and entered them directly in the KOBO collect toolbox. One week before the data collection, each health area was visited to confirm the appointment and prepare the setting for the following week. Data from medical records were extracted using a data extraction form.

### **2.1. Ethical Considerations**

Approval from the Dean of the Faculty of Health Sciences, University of Buea was obtained, the ethical approval was sought from the Institutional Review Board of the Faculty of Health Sciences, University of Buea (IRB FHS-UB) followed by administrative authorizations from the; Regional Delegation of Public Health for the Far North Region.

### **2.2. Statistical Analysis**

The questionnaires were directly filled, stored and analyzed in KOBO collect toolbox and could only be accessed by the research team. An excel sheet was extracted from the KOBO collect toolbox and analyzed using Statistical Package for Social Sciences (SPSS) version 25.

## **3. Results**

General characteristics.

### 3.1. Socio-Demographic Characteristics of Parents or Tutors

In our study 172 households with children within the age range of 03 - 59 months were visited and parents or tutors interviewed. Among the parents or tutors interviewed, males were 143 (83%) and females were 29 (16%). Their ages ranged from 20 years to 80 years with mean age  $36.63 \pm 10.1$  SD; the age group 31 - 40 years most mostly represented 64 (37%). For the marital status, 167 (97%) were married. Most of them were biological parents 166 (96.5%) to the children. More than 97% of the parents or tutors attended formal schools and only 2% of them.

### 3.2. Socio-Demographic Characteristics of Children

Of the 172 households, female children were mostly represented 99 (57%). Households with 2 children represented 57% of houses. The mostly represented rank the children occupied in their family were first born children representing 24% of the children. The age group mostly represented was 2 years.

### 3.3. Awareness and Sources of Information about SMC Campaign

More than 90% of the population had at least heard about the SMC program once and were aware of the previous campaign that took part in their communities. The main source of information about the SMC campaign was through health personnel (95%). This was followed by religious institutions like mosques/churches and neighborhoods representing 51% and 36% respectively. The other sources of information were town criers, banners, televisions, and radios (Figure 2).

### 3.4. Population Knowledge on SMC

In order to evaluate the overall knowledge on SMC therapy, 15 questions comprising of multiple-choice questions and short answer questions were asked. Of the 15 questions asked, two questions recorded 100% correct answer and 9 questions recorded above 90% correct answers, two question between 66% to 86% good answers and only two questions recorded 33% correct answers. The questions with poor answer rate were those on the number of tablets of SP and AQ

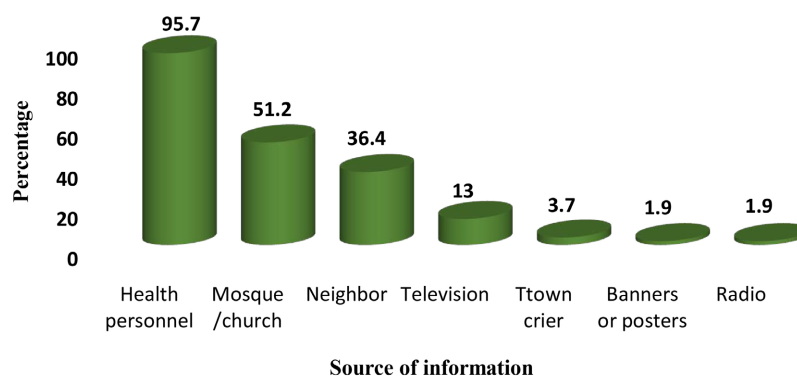


Figure 2. Source of information on SMC therapy.

given to children less than 11 months and above 12 months could barely be recalled by the parents or tutors giving a percentage of 33% for those who answered correctly.

The population knowledge on malaria preventive chemotherapy was graded on a 15 point using a composite score. Those with the right answer were attributed one (1) point and those with the wrong answer were attributed zero (0) point. The cut-off point of 7.5 was used which is the average of 15. Those who scored  $\leq 7.5$  points were considered having inadequate knowledge and those who scored  $> 7.5$  points were considered having adequate knowledge. The overall score was above average and ranged from 10 - 15 with 41.9 having a score of 13 on 15 (**Figure 3**).

### 3.5. Side Effects of SMC Therapy

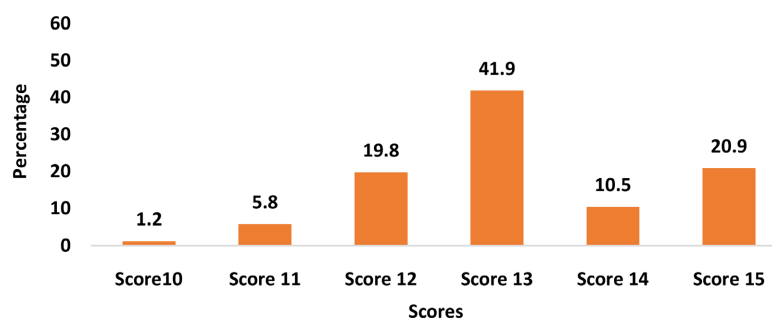
More than 70% of children experienced at least one side effect with the most common being vomiting which was reported in 72% of children to whom SMC therapy was administered followed by drowsiness and fever that was reported in 69% and 24% of children respectively (**Figure 4**).

### 3.6. Implementation According to Coverage Rate of SMC Therapy during the Last Campaign

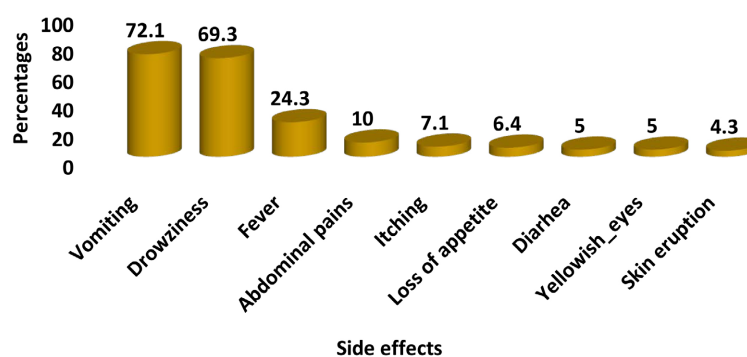
Of the 172 parents interviewed about the frequency of administration of SMC therapy during the last campaign, 134 had an SMC cards on which were reported the exact number of cycles received by every child and 38 were not provided with SMC card for their children. Of the 134 children with cards, 134 reported to have received at least the 1<sup>st</sup> cycle, 122 reported to have received both the 1<sup>st</sup> and 2<sup>nd</sup> cycle, 116 reported to have received the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> cycle, and only 98 reported to have received the 4 complete cycles (**Table 1**). The second and third doses recorded on SMC cards for each cycle were reported to have been administered by parents or tutors at home (**Table 2**).

Without looking at the SMC card of last campaign, 100% of parents or tutors reported that some health personnel came to administer the 1<sup>st</sup> cycle to their children in the month of July, 93% reported that some health personnel came to administer the 2<sup>nd</sup> cycle in month of August, 83% reported that some health personnel came to administer the 3<sup>rd</sup> cycle in the September, and only 62% reported that some health personnel came to administer the 4<sup>th</sup> cycle in the month October (**Table 3**).

Parents or tutors who were taught by some health personnel how to administer the SMC therapy represented 84% that is 145 out of 172 were explained how to administer the therapy. Parents or tutors who were informed by health personnel about the probable side effects their children may encounter represented 73% and parents or tutors who were told what to do in case of any side effect represented 72%. Every household that is 100% of our sampled population were given the therapy at home by at least one health personnel.



**Figure 3.** Distribution of scores to the knowledge and implementation questions.



**Figure 4.** Side effects experienced after treatment.

**Table 1.** Implementation of malaria chemotherapy from SMC card.

Variable	Category	Cycle 1		Cycle 2		Cycle 3		Cycle 4	
		Freq	%	Freq	%	Freq	%	Freq	%
Intake of SP + AQ	No	38	22.1	50	29.1	56	32.6	74	43
	Yes	134	77.9	122	70.9	116	67.4	98	57
	Total	172	100	172	100	172	100	172	100
Intake of AQ	No	38	22.1	50	29.1	56	32.6	0	0
	Yes	134	77.9	122	70.9	116	67.4	74	43
	Total	172	100	172	100	172	100	98	57
Administered by	None	38	22.1	50	29.1	56	32.6	172	100
	Parent	134	77.9	122	70.9	116	67.4	74	43
	Total	172	100	172	100	172	100	98	57

Freq = Frequency.

**Table 2.** Coverage rate according to SMC card.

Cycle	Coverage rate (%)
Cycle 1	77.9
Cycle 2	70.9
Cycle 3	67.4
Cycle 4	56.9

**Table 3.** Coverage rate according to parent's knowledge.

Month No.	Month	Frequency	Coverage rate (%)
Month 1	JULY	172	100
Month 2	AUGUST	160	93.0
Month 3	SEPTEMBER	144	83.7
Month 4	OCTOBER	107	62.2

### 3.7. Population Appraisal of the SMC Program

The population overall impression about the program was good 85% reported that no aspect of the SMC program needed to be changed where as 14% reported that it needed some improvement. Their main recommendations that accounted for 58% were to change the therapy tablets to syrups to ease swallowing this was followed by providing SMC cards to every child for proper follow up and providing complete SMC cycles to every child during the campaigns.

### 3.8. Trend in Mortality Due to Malaria in Children Less than Five Years in the Study Site

A graph of the malaria death rate per 1000 children during the raining season in Koza from the year 2015-2021 was plotted. The trend showed a fluctuation from 2015 to 2021 with an increase from 2016 to 2019 followed by a drop in 2020 and 2021. The highest mortality (88.9 per 1000 was observed in 2019 (**Figure 5**).

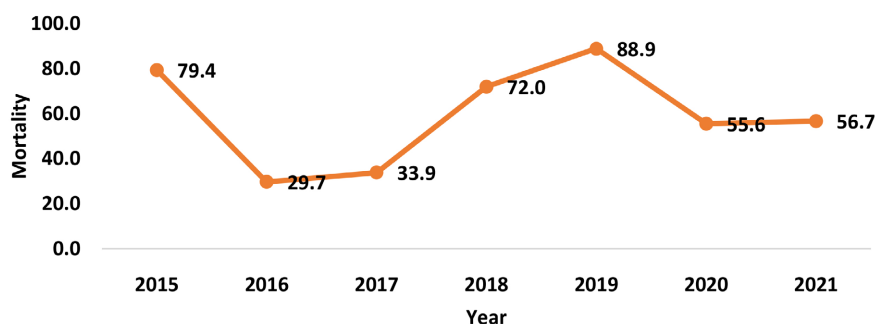
## 4. Discussion

For us to achieve our objectives, we conducted a mixed study of both a community based descriptive cross-sectional study for a period of 3 months (February-April) and a hospital based retrospective study to analyze medical records of children who died from severe malaria during the study period.

In this study, majority (94%) of the participants were aware of SMC campaign. This finding was similar to that of Salissou *et al.* in Niger [15] who reported that 84% of participants were aware. Health personnel constituted the most important source of information it represented 95% of source of information this was similar to that of Salissou *et al.* in Niger [15] who reported health personnel as the main source of information. This can be explained by the fact that SMC campaigns are preceded by sensitization campaigns carried out by health personnel's in the different communities.

Parents/tutors were well knowledgeable of the SMC program and had at least an idea on the use of SMC therapy with 96% of them reporting that it is used to prevent malaria in children. This was similar to finding of Diawara *et al.* in Mali [16]. This was followed by 49% who reported that it also helps eliminate malaria in the community, and 39% reported that it treated malaria and 10% reported that it prevented other diseases.





**Figure 5.** Dead rate per 1000 of children in the Koza health district.

The overall knowledge on SMC therapy was good with all the participants having adequate knowledge on the program. Of the 15 questions asked to evaluate knowledge, two questions recorded 100% correct answer and 9 questions recorded above 90% correct answers, two question between 66% to 86% good answers and only two questions recorded 33% correct answers. The questions with poor answer rate were those on the number of tablets of SP and AQ given to children less than 11 months and above 12 months could barely be recalled by the parents or tutors giving a percentage of 33% for those who answered correctly. As a whole 99% of participants knew that on the 1<sup>st</sup> day of a cycle, their children are to be given 2 tablets. Whereas for the 2<sup>nd</sup> and 3<sup>rd</sup> day of a cycle, 100% knew that 1 tablet is given per day this can be compared to 78% reported by Diop *et al.* in Senegal [17].

Percentage of children in which caregivers reported side effects after the intake of the therapy were 23%. This is similar to 27% of children reported by parents in the study carried out by Salissou *et al.* in Niger [15]. The most common side effect observed was vomiting experienced by 72% of children. This finding was similar to that of Diop *et al.* in Senegal [16] and Oumar *et al.* in Mali [18] who reported vomiting as the most common side effect experienced by children at 73% and 69%. But this differed from the findings of and Elhaj *et al.* in Senegal [19] who reported diarrhea to be the most common side effect followed by vomiting.

We observed a relatively high coverage rate of SMC among eligible children. For the first cycle, the coverage rate obtained from interviewed participants was 100% and that obtained from SMC cards was 77%. These results were similar to those of Diawara *et al.* in Mali [16] and Salissou *et al.* in Niger [15] who reported 80% and 81% of coverage rates during the first cycle. However, this coverage rates were found dropping during consecutive cycles and were found to be only 62% and 56% from interviewed participants and from SMC cards. This shows how important it is to observe a closed and continuous monitoring of SMC cycles over time to avoid this decrease in coverage per cycles. Diawara *et al.* in Mali [16] reported the similar changes in coverage per cycles. The rate of SMC coverage according to SMC cards were 77%, 70%, 67%, and 56% for the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> cycles respectively this was low compared to the coverage rate calculated by interviewed participants which were 100%, 93%, 83% and 62% for the

1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> cycles respectively. This difference could be as a result of cards not properly filled by health personnel and/or parents and also due to the lack of available cards to every household.

Overall 84% of participants interviewed were taught on how to administer the therapy to their children, 73% were informed on the different side effects and 72% were taught on what to do in case of any side effect. This shows the effectiveness of health personnel when it comes to educate the parents about SMC programs.

Overall, 85% of participants were satisfied with the program. This was similar to Diawara *et al.* in Mali [16] and Salissou *et al.* in Niger [15] who reported 90% and 85% satisfaction respectively. From all the participants interviewed, 14% reported not to be satisfied with the program and majority reported they will like the tablets to be changed to syrups to ease ingestion by children.

A rise in the mortality from 2016-2019 was observed in this study. This rise could be explained by the fact that during that period, the sociopolitical instability may have caused the population not to have an easy access to health facilities. This was found to be improving with time the mortality was found to be decreasing when socio-political issues were better controlled and the program was able to outreach maximum children thus explaining the decrease in trend observed in the years 2020 and 2021.

## 5. Conclusion

SMC is a program well known and accepted by parents/tutors of Koza subdivision. The coverage rate was high thus the program is well implemented. Through social mobilization and communication, the coverage could be further improved and strengthen SMC impact. The most common side effect experienced by children was vomiting. The mortality was found to be decreasing when socio-political issues better controlled and the program was able to outreach maximum children.

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## Conflicts of Interest

The authors declare that they have no competing interest.

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