

## Research Article

# Knowledge, Attitudes and Practices of Mothers on Seasonal Malaria Chemoprevention in a Senegalese Health District

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## Abstract

**Introduction:** Senegal introduced Seasonal Malaria Chemo Prevention in its Malaria Prevention Policy in 2014. This study assessed knowledge, attitudes and practices of mothers or guardians of children on SMC.

**Material and Methods:** In a cross-sectional descriptive study we used standardized questionnaires to interview Senegalese mothers and guardians of children aged 3 to 120 months who participated in the SMC between September and November 2015.

**Results:** We included a total of 396 mothers or guardians of the children with an average age of  $30.9 \pm 10.5$  years. The women were mostly married (94.9%), uneducated (70.5%) and without a fixed income (99%). The majority (95.2%) knew the benefits of SMC and 78.5% knew the dosage of Sulfadoxine-Pyrimethamine and Amodiaquin to administer to their child. Side effects were common following administration of SMC with vomiting being the most reported side effect (73.9%). Most mothers or guardians (89.6%) had sought help from their local health facilities as a result of side effects and more than two third (69.4%) had not completed the monthly dose of Amodiaquine. Adequate therapeutic coverage was statistically related to income ( $\text{Chi}^2=6.30$ ;  $p=0.04$ ), knowledge of the benefits of SMC ( $\text{OR} = 3.16$ ;  $\text{IC} [1.24-8.01]$ ) and knowledge of the type of side effects from medication ( $\text{Chi}^2 = 6.71$ ;  $p = 0.03$ ).

**Conclusion:** Improvement of the knowledge, attitudes and practices of mothers in SMC is required for optimal therapeutic coverage of malaria chemo prevention in children.

**Keywords:** Seasonal malaria chemoprevention; Malaria; Amodia quine; Sulfadoxine-pyrimethamine; KAP survey; Senegal

## Abbreviations

AQ: Amodia Quine; CFA: French colonies in Africa; DOT: Directly Observed Treatment; HCW: Health Community Worker; LLIN: Long Lasting Insecticide Net; MRTC: Malaria Research and Training Center; SMC: Seasonal Malaria Chemoprevention; SP: Sulfadoxine-Pyrimethamine

## Introduction

Seasonal malaria chemoprevention is a method of malaria prevention where therapeutic doses of Sulfadoxine-Pyrimethamine (SP) plus Amodia Quine (AQ) are given to children aged 3 months to 5 years monthly during periods of high malaria transmission [1]. Recommended by World Health Organization (WHO) since 2012, Senegal introduced SMC in its Malaria Prevention Policy in 2014 and further extended it to children aged less than 10 years in the four regions with the highest rate of morbidity [2,3]. The curative doses of SP plus AQ were administered over three days at one month intervals between August and November 2015 in these regions in Senegal. Community health workers administrated the first dose of SP under Directly Observed Treatment (DOT) and the subsequent two doses

of AQ administered by mothers or guardians on the following two days. This study assessed the knowledge, attitudes and practices of the mothers and guardians of children who received the SMC in Senegal in 2015. The study aimed to evaluate the knowledge of these mothers or guardians on SMC, their attitude towards the occurrence of side effects after administration of SP and AQ and their practices in terms of adherence and achieving therapeutic coverage. Children who have not received all three doses of medication during one treatment cycle are less protected against malaria.

## Material and Methods

The study was conducted from 16<sup>th</sup> to 20<sup>th</sup> December 2015 in the Health district of Bounkiling. It is located in the Southern Senegal, some 345 Km from the capital city Dakar. In 2015 population was estimated at 161,305 inhabitants and children aged 3 to 120 months were estimated at 46665. During this year, 3898 cases of malaria with a proportionate morbidity of 7.14 per 1000 in 2015 had been registered. In 2014, the health district had organized its first SMC among children aged from 3 to 120 months with therapeutic coverage achieved in 97% of children. A second SMC successfully followed in 2015, and this descriptive cross sectional study with analytic purpose

**Table 1:** Distribution of mothers or guardians of children aged from 3 to 120 months in the Health District of Bounkiling /Senegal in 2015 according to the socio-professional characteristics (n=396).

Socio-professional characteristics	Number (n = 396)	Percentage (%)	Confidence interval -95%
Age group			
15 - 24 years	123	31.1	26.1 - 35.9
25 years and more	273	68.9	64.1 - 73.4
Marital status			
Single	14	3.5	2.0 - 6.0
Married	376	95	92.2 - 96.8
Divorced	2	0.5	0.1-2.0
Widows	4	1	0.3-2.7
Regime of marriage			
Monogamous	281	74.7	70.0 - 79.0
Polygamous	95	25.3	21.0 - 30.0
Level of education			
None	279	70.5	65.7 - 74.9
Primary	101	25.5	21.3 - 30.2
Secondary	16	4	2,4 - 6,6
Salary			
Yes	2	0.5	0.1-2.0
No	394	99.5	98.0 - 99.9
Income-generating activities			
Trade	38	10	7.0 - 13.0
Agriculture	289	73	68.3 - 77.2
Livestock	6	1	0.6-3.4
None	61	15.4	12.1 - 19.4
Clerk	1	0.3	0.0-1.6
Teacher	1	0.3	0.0-1.6
Place of residence			
Rural	350	88.4	84.8 - 91.4
Urban	46	11.6	8.7 - 15.3

was conducted to assess the knowledge, attitude and practices of mothers and guardians of children who received the SP and a dose of AQ by DOT, and registered for the administration of the last two doses of AQ. We excluded mothers and guardians whose children were not present in the health district of Bounkiling during all three rounds of SMC.

We calculated our sample size using Schwartz's formula:  $N = [(Z(\Sigma 2.p.q) / i^2) * 2]$ , where N is the sample size;  $E_a$  (corresponding reduce gap) = 1.96;  $\alpha$  (granted risk) = 5%; p (Approximate frequency of the use of SMC) = 0.50; q (Supplement (1 - p)) = 0.50 and I (desired accuracy) = 5%.

Applying this, formula gave a sample size of 384, which we rounded up to 400 or 40 clusters of 10 statistical units. We used randomized cluster sampling with proportional probability to the size of the municipalities or villages. A standardized questionnaire, pre-tested with 10 mothers, was used to collect data on socio-

**Table 2:** Distribution of the mothers or guardians of children aged from 3 to 120 months in the Health District of Bounkiling /Senegal in 2015 according to global knowledge on SMC (N=396).

Global knowledge on SMC	Yes (%)	No (%)
1 <sup>st</sup> round	316 (79.8)	80 (20.2)
2 <sup>nd</sup> round	327 (82.6)	69 (17.4)
3 <sup>rd</sup> round	329 (83.1)	67 (16.9)
Benefits of the SMC	377 (95.2)	19 (4.8)
Side effects of the drugs of the SMC	364 (91.9)	32 (8.1)
Amodiaquine dose to administer	311 (78.5)	85 (21.5)

demographic characteristics and SMC knowledge, attitudes and practices. All questionnaires were anonymized with the identity of participants protected. We defined operational variables as:

Attitudes were considered

1. Adequate: If the mother has visited a health structure in the event of side effects to the drugs
2. Inadequate: If the mother used self-medication or traditional practitioners

Therapeutic coverage was considered

1. Adequate: If the mother had administrated at least one dose of treatment during each round of SMC campaign;
2. Inadequate: If the mother had not administered any doses of amodiaquine during the three rounds of SMC campaign;

Data was entered and analyzed using Epi info version 3.5.3. With significance threshold set at  $p < 0,05$ . Participation in the survey was voluntary and without constraints

## Results

A total of 396 mothers or guardians were enrolled in this study. After initial assessment, four were excluded: one for refusal to participate in the investigation and three for not being present during all three rounds of SMC. Mothers or guardians of the children aged from 3 to 120 months living in rural areas accounted for 88.4% of participants. Their average age was 30.9 years  $\pm$  10.5 years with extremes being 15 and 79 years. These mothers or guardians were mostly married (94.9%) and uneducated (70.5%), with only having 25.5% elementary and 4.0% secondary level education. Agriculture (73%), trade (9.6%) and livestock (1.5%) were the primary source of income for the mothers, with 15.4% not involved in any income generating activities. Average monthly income was low, with 90.7% having a estimated monthly income less than 20 000 CFA (French colonies in Africa). (Table 1) summarizes the main socio-demographic characteristics of mothers or guardians in our study.

### Knowledge of mothers or guardians of the children

Overall, mothers and guardians of children had good knowledge of SMC (Table 2). The use of Long Lasting Insecticide Nets (LLINs) and SMC were mentioned as means of malaria prevention in 78% of cases; SMC only in 21.5% and LLINs alone in 0.5%. The proportion of mothers informed about SMC had increased during the three months of SMC, from 79.8% in the first month, 82.6% in the second and 83.1% in the third. Mothers and guardians had multiple sources

**Table 3:** Distribution of the children aged from 3 to 120 months in the Health District of Bounkiling /Senegal in 2015 according to the administration of doses of AQ to children from 3 to 120 months by mothers or guardians on the second and third day during the 3 rounds of SMC (n = 396).

The dose of AQ	Absolute frequency (n = 396)	Relative frequency (%)	confidence interval -95%
First round of SMC			
Yes	108	27.3	23.0 - 32.0
No	288	72.7	68.0 - 77.0
Second round of SMC			
Yes	103	26	21.8 - 30.7
No	293	74	69.3 - 78.2
Third round of SMC			
Yes	103	26	21.8 - 30.7
No	293	74	69.3 - 78.2

**Table 4:** Therapeutic coverage in the Health District of Bounkiling /Senegal in 2015 according to sociodemographic characteristics, knowledge and attitudes of mothers and guardians of the children (n=396).

Variables	Therapeutic coverage		P	
	Adequate	Inadequate		
Age group	15-24	35 (28.5%)	88 (71.5%)	0.72
	> or = 25 years	73 (26.7%)	200 (73.3%)	
Marital status	single	3 (21.4%)	11 (78.6%)	0.27
	Married	105 (27.9%)	271 (72.1%)	
	Divorced and widow	0 (0%)	6 (100%)	
Education level	None	85 (30.5%)	194 (69.5%)	0.08
	primary	20 (19.8%)	81 (80.2%)	
	secondary	3 (18.8%)	13 (81.3%)	
Place of residence	urban	15 (32.6%)	31 (67.4%)	0.38
	rural	93 (26.6%)	257 (73.4%)	
Knowledge of SMC advantage	Yes	98 (26.0%)	279 (74%)	0.01
	No	10 (52.6%)	9 (47.4%)	
Knowledge of side effects	Yes	98 (26.9%)	266 (73.1%)	0.59
	No	10 (31.3%)	22 (68.8%)	
Attitudes in case of side effects	correct	80 (29%)	196 (71%)	0.02
	bad	4 (11.4%)	31 (88.6%)	

of information about SMC, with Community health workers (40.5%), radio (30.4%) and public announcers (22.0%) being the most frequently found sources. Other sources include television (3.0%), village Chief (2.1%), interpersonal communication (1.2%), telephone (0.6%), and the mosque (0.3%). More than 95.2% of mothers reported knowledge of the benefits of the SMC, with 91.2% citing malaria prevention as a major benefit of SMC. A relatively similar proportion 91.9% stated to know the common side effects after administration of SMC drugs and cited vomiting (73.9%), somnolence (18.7%), diarrhea (4.1%), abdominal pain (3.3%). Up to 78.5% knew the doses of AQ to administer according to the weight of their child.

#### Attitudes of mothers or guardians in the occurrence of side effects after administration of drugs of the SMC

In case of side effects after administration of SMC, 89.6% of mothers or guardians had recourse to health facilities, 5.8% went to traditional practitioners and 4.5% tried self-medication.

#### Practices of mothers or guardians in term of SMC

The number of mothers or guardians who had administered the last two doses of AQ in the three rounds of SMC increased overtime, from only 3.3% in the first round to 21.5% by the third (Table 3). On average, 99.1% of mothers or guardians who had administered the last two doses of AQ on the second and third days had documented this on their SMC cards. A significant proportion of mothers and guardians, approaching 75%, did not administer the complete dose of AQ. Reasons for not completing the course of treatment were the development of side effects (57.6%), forgetfulness (29.2%), refusal of the child (7.6%), Community Health Worker (CHW) not delivering the AQ tablets (2.4%), no SMC card to document administering the drugs (1.7%), absence for work (1.0%) and loss of AQ tablets (0.3%). Adequate therapeutic coverage was statistically related to the mother's/guardian's knowledge of the benefits of the SMC (OR = 3.16; IC [1.24-8.01]), the referral care structures in case of side effects (OR = 0.31; IC [0.10 - 0.92]), and the occurrence of side effects from

the SMC drugs (OR = 33.62; IC [16.58-68,17]) (Table 4).

## Discussion

Mothers or guardians in our study were relatively young and mostly married. These demographics are similar to those reported by Seck et al. in their conducted in Popenguine, another region of Senegal [4]. In contrary to Seck's cohort where educated women made up 49.6% of the interviewed women, most of the women in our study were uneducated. Such level of education found in our study is not surprising as more than 88% of our participants live in rural areas, with very low literacy levels. Level of education can affect the women's understanding of SMC, as was reported by Kimbi [5].

### Knowledge of mothers or guardians of the children aged from 3 to 120 months about SMC

The use of LLINs and SMC were mentioned as means of prevention against malaria in 78% of cases. More conventional means such as spraying households with insecticides and getting rid of the breeding sites were not cited, suggesting that the women's information on malaria prevention was primarily from the SMC sensitization campaign. Implementing any new strategy requires effective community sensitization and dissemination of accurate, simplified information. We found that, similar to previously reported studies in Senegal [4], community health workers, radio announcements and public announcers are the most efficient means of communicating. Understanding the most effective means of communicating with and sensitizing the masses is important in achieving better coverage. The increase in the proportion of mothers and guardian completing the dose of AQ between the first and the third SMC round could be attributable to continuous information and sensitization campaign during the months of the three SMC rounds. More effective sensitization before the malaria season and prior to starting the first SMC round, including information on the benefits of SMC, can yield higher therapeutic coverage.

Low literacy level did not negatively affect the mother's understanding of the benefits of SMC. A Ghanaian study on a suboptimal strategy of SMC with administration of 5 doses reported similar high rates of understanding of the benefits of the strategy among caregivers [6]. Another study conducted in the Gambia [7] found that concerns of potential side effects were a significant barrier to mass drug administration within communities. Gastrointestinal symptoms (abdominal pain and vomiting) and fever are the most commonly reported side effects of the SMC drugs [3]. Most of the mothers and guardians interviewed in our study knew the common side effects associated with administration of SP and A. whilst more than three-quarters of the women knew the dose of AQ to administer to their child, 24.5% did not.

This result is important because it could impact on the effectiveness of this strategy. In addition, the high report of knowledge about required drug dose may not necessary translate into correct administration, as was observed in a 2013 survey in Ghana where 71% of the mothers were able to tell how to properly administer the medication at home but only 14.6% were able to administer it correctly [8].

### Attitudes of mothers or guardians of the children aged from 3 to 120 months for malaria prevention, including

### occurrence of side effects after administration of Sulfadoxine Pyrimethamine plus amodiaquine

Following several clinical trials both in Senegal and in other countries in West Africa few side effects have been identified [2,9]. The most frequently reported side effects are mild gastrointestinal symptoms and fever, all of which can often be managed easily in a district health centre. Most of the mothers and guardians in our study had recourse to health facilities for care in the event of adverse reactions after administration of SMC drugs. The SMC sensitization campaign in Bounkiling provided adequate information about the possible occurrences of side effects, their likely modes of presentation, and a simplified plan of what mothers should do in the event of a drug side effect. Free treatment was available for all recipients of SMC who developed side effects, and the community health workers, public announcers and radio broadcasts reiterated this message frequently to encourage mothers to seek help from the health facilities. The resulting high level of awareness of potential side effects and the help available to mothers at their local health facilities had a positive impact on attitudes observed, where 9 in 10 mothers whose children developed side effects sought medical treatment at the health facility. The effective sensitization also explains the increased proportion of mothers completing the dose of AQ from less than 5% in the first round of SMC to more than 20% by the third round. Similarly in Ghana, advice and encouragement from extended family members and community health workers encouraged some caregivers to complete the course of SMC treatments for their children despite the occurrence of side effects [6].

### Mothers' or guardians' practices toward SMC in the health district of Bounkiling in 2015

Whilst 98% of eligible children in the health District of Bounkiling registered for the SMC and received the first dose of SP plus AQ by DOT, less than 30% completed the therapeutic dose of AQ. Unfortunately the community health workers' report to the National Malaria Control program wrongly indicated that 98% of the population achieved therapeutic coverage, as the report was based only on the first dose of SP+AQ administered under DOT. Our study has highlighted a significant discordance between the uptake of the first dose of the first dose of SP and AQ, and the completion of the therapeutic dose. Highlighting the significantly low proportions of mothers completing the therapeutic dose of AQ is important as it provides vital information for a more focused response. Subsequent SMC campaigns should devote more time and resources in addressing the barriers towards completing the dose of AQ, either by administering these by DOT, sending reminders by SMS to all registered mothers, or providing incentives to parents completing the dose of SMC.

The proportion of mothers administering the complete dose of SMC in our study is significantly lower than those reported in several other studies in West Africa. An SMC trial in Niger by Doctors without Borders reported adequate therapeutic coverage of 98.3% based on the assertion of parents [10]. The investigators highlighted however, that the high reports of therapeutic coverage could be influenced by parents' desire to satisfy CHW and researchers thereby providing positive answers irrespective of whether or not they actually administered the complete dose.

In Mali, a household survey to evaluate the implementation of SMC found that therapeutic coverage was achieved in 89.1% according to statement from parents and 84.6% according to documentation of drug administration on SMC cards [11].

This SMC project, conducted by the Doctors without Borders, the National Malaria Counterprogram and the MRTC (Malaria Research and Training Center) used two drug distribution strategies: door-to-door strategy in less populated areas and fixed site strategy in densely populated areas. A third trial in Ghana comparing two strategies of intermittent preventive treatment – a community-based and health worker led strategy showed no statistically significant difference between the two arms in terms of therapeutic coverage [12].

Higher proportions of children of mothers or guardians with no formal education achieved therapeutic coverage (30.5%) compared to children of mothers of guardians who had primary (19.8%) or secondary education (18.8%). This difference in achieving therapeutic coverage could be explained by the fact that, more often, educated parent tend to be more reluctant to change behavior and accept new interventions. Our study shows that the commonest reasons for not administering the complete dose of AQ were forgetfulness and mothers' knowledge and concerns about the occurrence of side effects. Generally, parents who know the side effects of medicinal products tend to be less likely administer the drugs, especially if their children are not unwell. Educating mothers and guardians about the individual and community benefits of SMC, and about means of mitigating some of the side effects of AQ, could impact the uptake of SMC and increase the proportion of mothers administering the complete therapeutic dose. A Ghanaian study found that advising mothers to feed children with sweet foods at the time of administering AQ reduced the incidence of vomiting [6].

## Conclusion

Despite sufficient knowledge of SMC, adequate therapeutic coverage of AQ in children remains low. In order for SMC to be an effective and sustainable malaria prevention strategy, it would be necessary to conduct deeper and more detailed socio-anthropological studies to better understand the barriers to acceptability of SMC.

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