



ASSESSMENT OF KNOWLEDGE AND PRACTICE OF SEASONAL MALARIA CHEMOPREVENTION STRATEGY AMONG HEALTHCARE WORKERS IN SELECTED PRIMARY HEALTHCARE FACILITIES IN GOMBE METROPOLIS

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Abstract:

Malaria remains a major public health challenge in Nigeria, particularly in the Sahel-savannah regions where transmission is highly seasonal. Seasonal Malaria Chemoprevention (SMC) has been adopted as a strategic intervention to reduce malaria incidence among vulnerable populations. This study assessed the knowledge and practices of primary healthcare workers regarding SMC and examined the associated factors in Gombe Metropolis. A cross-sectional study involving 120 healthcare workers from selected primary healthcare facilities was conducted using a structured questionnaire. Data were analyzed using frequency counts, percentages and Chi-square tests. The findings showed that 93.33% of respondents had heard about SMC, indicating adequate knowledge, while 58.3% reported prescribing SMC, reflecting satisfactory practice. Chi-square analysis revealed significant associations between selected socio-demographic characteristics and both knowledge and practice levels ($P < 0.001$). The study concludes that although healthcare workers demonstrated good knowledge and satisfactory SMC practices, sustained capacity building, continuous training and adequate availability of SMC materials are essential to strengthen malaria prevention efforts in Gombe Metropolis.

Keywords: Seasonal Malaria Chemoprevention, Primary Healthcare, Healthcare Workers, Incidence, Vulnerability, intervention, Knowledge and Practice.

Background of the study

Malaria is a mosquito borne disease caused by five protozoa: plasmodium falciparum, plasmodium vivax, plasmodium malariae, plasmodium ovale and plasmodium knowlesi are more recently accounted for more than 90% of the world's malaria mortality and therefore remains an important threat to public health on a global scale (1). The world health organization (WHO), world malaria report 2019 estimates 228 million cases of malaria worldwide, causing 405,000 deaths in the 2018. With many under the age of five, Malaria is endemic in more than 90 countries, affecting approximately 40% of the world's population (2). There is a significant number of cases of imported malaria and local transmission following importation occurring in non-malarial countries, including north America and Europe (3). Malaria is associated with travelers to the endemic areas, and increasing numbers of imported malaria necessitated an understanding of frequently nonspecific symptoms, difficulties related to the malarial diagnosis, and treatment possibility (2).

In March 2012, the World Health Organization (WHO), recommended a new strategy called Seasonal Malaria Chemoprevention (SMC), to prevent the peak of malaria-related morbidity and mortality among children aged from 3 to 59 months. It was recommended particularly for countries of the Sahel sub-region, where malaria is endemic (4). SMC consists of intermittent administration of a complete Sulfadoxine-Pyrimethamine (SP) and Amodiaquine (AQ) treatment during the high-transmission season. The goal is to maintain therapeutic levels of these drugs in the blood during the period when the risk of contracting malaria is the highest (5). In view of the evolution of the malaria epidemic in the countries of sub-Saharan Africa, this strategy was adopted and implemented in several countries, including Nigeria in 2014 (5). In these countries, malaria is highly transmissible during the months of July through October (6). During this period, it is highly recommended to administer the treatments (7). The strategy is to administer three doses of medication per month, of which the first dose is given or supervised by a community health worker (CHW) or volunteer in the community. The last two doses are given to the child caregiver with instructions on following up with the treatment 2 days after the initial supervised dose (4). In the SMC's framework strategy, all community-level agents (community health workers and some volunteers as needed) involved in drug delivery are referred to as Community Distributors (CD) (8). These community health workers have previously participated in many other health programs at the community level, since the launch of primary health care at the Alma Atta conference in 1978 (9). Several studies have demonstrated the importance of health workers in strengthening health system in many African countries (10). Since the introduction of this program in Nigeria in 2014, the knowledge and practice of SMC among primary health care workers in Gombe state has not been assessed.

Methodology**Study location/setting**

The study was carried out in selected PHCs in Gombe Metropolis in Gombe Local Government Area (LEA), Gombe metropolis has coordinates latitude: 10.2833°N longitude 11.1667°E in Gombe State. There are 26 PHCs within the eleven wards in Gombe metropolis which focus on providing health services to communities at local level, such services mainly concerned with women and children. A total of 12 PHCs were randomly selected, the PHCs selected were: Tudunwada PHC, latitude: 9.97705°N longitude: 10.95515°E, Pantami PHC, latitude: 10.26932°N, longitude: 11.16788°E, Nasarawo PHC, latitude: 10.29202° N, longitude: 11.16607°E, Family support PHC, latitude: 10.279142°N longitude: 11.173062°E, Madaki PHC, latitude: 10.283333°N longitude: 11.166667°E,

Kagarawal PHC, latitude: 10.28969⁰N longitude: 11.16729⁰E, Kumbiya Kumbiya PHC, latitude: 10.30012⁰N longitude: 11.1741⁰E, Doma PHC, Town Mataniry PHC latitude 10.28718⁰N, Longitude: 11.12173⁰E, Yelwa Goje PHC, Longitude: 10.29202⁰N, Latitude: 11.16607⁰E Arawa PHC, latitude: 10.28000⁰N longitude: 11.16333⁰E and Gabukka PHC, latitude: 10.26785⁰N longitude: 11.16214⁰E.

Research design

A cross sectional study design was used to carry out the study. The cross-sectional study is an observational research design where data are collected at a single point in time from a sample or population.

Population of the study

The study included healthcare workers comprising of the following: Community Health Workers (CHEW), Junior Community Health Workers (JCHEW), Environmental Health, Health Education, Medical Laboratory science and technician, Pharmacist and Pharmacy technician, Nutrition and dietetics, Health Information Management and Public Health, working at the primary healthcare level. The study population recruited from the 12 selected PHCs. The selected healthcare facilities were: Pantami PHC, Tudun wada PHC, Nasarawo PHC, Family support PHC, Madaki PHC, Kagarawal PHC, Kumbiya Kumbiya PHC, Doma PHC, Town Mataniry PHC, Yelwa Goje PHC, Arawa PHC and Gabukka PHC.

Sample size determination

All eligible healthcare workers who were in OPD and were permanent staff of the selected primary healthcare facilities and signed the informed consent form were included in the study.

Inclusion criteria

All healthcare workers in the selected facilities who have been involved in the SMC program were eligible.

Exclusion criteria

- All healthcare workers who were temporarily away from the facility.
- Healthcare workers who declined to sign the consent form.
- Securities, messengers and cleaners were excluded.

Sampling and sampling techniques

Simple random sampling technique was used to select 12 PHCs and the population of the study within the PHCs. A list of all PHCs and the total participants from each facility were made and numbers 1, 2, 3... were assigned for each facility and the participant. The numbers were shuffled and 12 PHCs and 120 participants were picked at random.

Instrument for data collection

Data was collected using a structured questionnaire for data collection, a validated and reliable questionnaire was adopted and modified from Adisa and Omitogun (2019). The tool was successfully used in our study to assess the knowledge and practice of seasonal Malaria chemoprevention among healthcare workers in selected PHC facilities within Gombe metropolis.

Data collected include:

- Socio-demographic information
- Health care workers' knowledge of SMC in Gombe Metropolis.
- Healthcare workers' practice of SMC in Gombe Metropolis.

Method of data analysis

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0 software. Descriptive statistics, frequency and percentage were used to summarize socio-demographic data and knowledge and practice of SMC, while inferential statistics (Chi-square test) was used to identify the factors associating demographic data with knowledge and practice of SMC. P-values less than 0.05 were considered statistically significant.

Inform consent form

The inform consent form would include:

- **Consent statement:** this written consent will be obtained from the selected healthcare workers of the selected primary health care facilities in Gombe Metropolis.
- **Confidentiality:** Participants' data will be kept confidential and used solely for research purposes.
- **Voluntary Participation:** Participation will be voluntary, with the right to withdraw at any time without any consequence.

Results

The study involved 120 participants. The demographic breakdown of the healthcare workers was as follows:

Socio-demographic characteristics

Descriptive statistics were used to summarize the demographic data of healthcare workers within the selected area of the study, Frequencies and percentages were calculated for categorical variables. The mean age and SD of respondents was 33 ± 9 , with slightly more than one-third (34.2 %) between 28 and 37 years, while those between 18 and 27 years, 38 and 47 years and older than 48 years were 28.3%, 25.8% and 11.7% respectively. Female respondents (58.3%) were more than male (41.7%) and majority practice Islam. Fulfulde (31.7%) and Hausa (30.8%) languages were the most spoken among the respondents. The vast majority of the respondents have higher certificate (84.2%) while (15.8%) were those with secondary certificates.

Table 1: Socio-demography of healthcare workers in selected primary healthcare facilities in Gombe metropolis

Characteristics	Frequency (n)	Percentage (%)
Age in years		
18 – 27	34	28.3
28 – 37	41	34.2
38 – 47	31	25.8
48 – 57	14	11.7
Mean $\pm$ SD	33 $\pm$ 9	
Gender?		
Male	50	41.7
Female	70	58.3
Religion		
Islam	94	78.3
Christianity	25	20.8
Traditional	1	0.8

Ethnic group?		
Fulfulde	38	31.7
Hausa	37	30.8
Tangale	15	12.5
Waja	5	4.2
Tera	6	5.0
Kanuri	6	5.0
Yoruba	3	2.5
Igbo	4	3.3
Other	6	5.0
Highest educational qualification		
Secondary certificate	19	15.8
Tertiary education	101	84.2
Marital status		
Single	64	53.3
Married	55	45.8
Widowed	1	0.8
Total	120	100

Working duration in years

The chart showing the working period in years of the respondents, the respondent with years of service between 10 and 19 years has longest duration in service with 54 frequencies, followed by respondents between 0 and 9 years with 50 frequencies, followed by between 20 and 29 with 15 frequencies and ≥ 30 with a frequency.

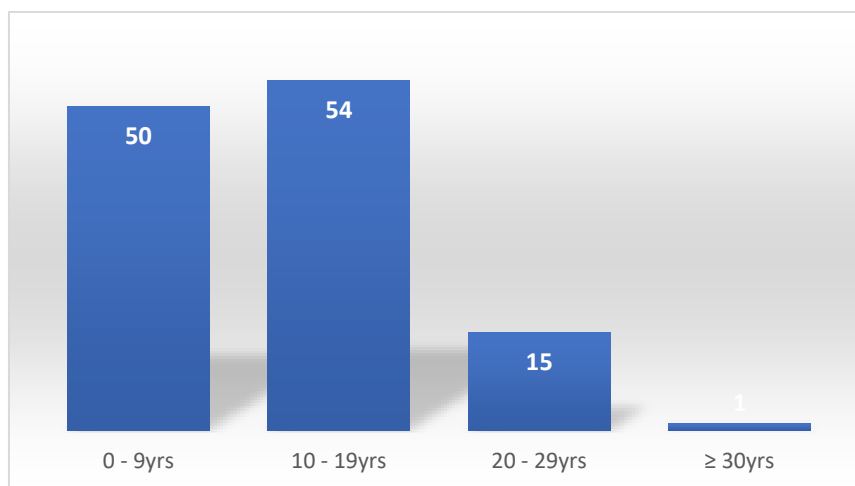


Figure 1: Working duration of the respondents

Cadre of the respondents

Pie chart displaying the respondents' cadre, with CHEW being the study's largest cadre. Followed by Medical laboratory technician, JCEW, Nutrition and dietetics then other cadres.

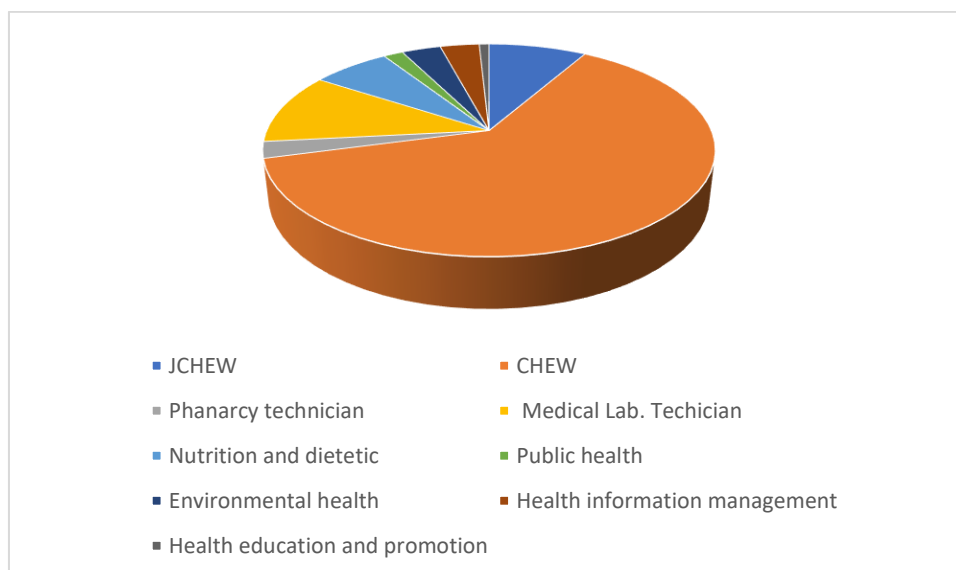


Figure 2: Cadre of the respondents

Knowledge of seasonal malaria chemoprevention

Descriptive statistics were used to summarize the knowledge of Seasonal Malaria Chemo-prevention among healthcare workers within the selected area of the study. Frequencies and percentages were calculated for the variables. The bulk of respondents, 112(93.3%) were familiar with SMC, whereas 8(6.7%) were not. The question that followed, which was connected to the one proceeded it, confirmed respondents' knowledge of meaning of SMC, with 114(95%) admitted that, they knew meaning of it and 6(5%) were not. Coworkers accounted for 70(58.0%) of the respondents' sources of information on SMC, followed by radio 30(25%), school 9(7.5%), television 4(3.3), newspapers 2(1.7%) and internet 5(4.2%). When it comes to drug combinations, the majority of responders, 105(87.5%) accepted the drug combination used during SMC was amodiaquine and sulphadoxine pyrimethamine, while the remaining 12.5% opted for other possibilities. Of the responses, the majority, 110(91.7%) admitted oral as a route of administration of drug during SMC, while the remaining 10(8.3%) admitted injection as a route of administering SMC. The majority of respondents, 116(96.7%) accepted that tablets as the drug used to treat SMC, while 4(3.3%) opted for suspension. SMC is used for what? majority 115(95.8%), admitted treatment and prevention of Malaria, 3(2.4%) opted treatment of malaria, 1(0.8%) admitted is for treatment of typhoid and other, 1(0.8%) accepted treatment of pneumonia. The majority of respondents, 105(87.5%) stated that children under five years old were group recommendation for SMC, followed by those that admitted adults 5(4.2%), pregnant women 1(0.8%), and those that accepted everyone 9(7.5%). The majority of responders 99(82.5%) accepted that, there are adverse effects during administering SMC, however 21(17.5%) of respondents did not accept that. and majority of the study population 98(81.7%) admitted Fever, weakness, and headache as averse of SMC. 5(4.2%) accepted nose, mouth and teeth pain. 8(6.7%) opted Leg, elbow and head pain and 9(7.5%) selected Stomach, back and weakness as the adverse during administering of SMC.

Table 2: Knowledge of seasonal malaria chemoprevention

Questions/ Variables	Frequency (n)	Percent (%)
Have you ever heard of SMC?		
Yes	112	93.3
No	8	6.7
If yes, do you know the full meaning of SMC?		
Special Malaria Chemist	4	3.3
Seasonal Malaria Chemist	2	1.7
Seasonal Malaria Chemo-prevention	114	95.0
What is your source of information on the knowledge of SMC?		
Radio	30	25.0
Television	4	3.3
Newspaper	2	1.7
School	9	7.5
Coworkers	70	58.3
Internet	5	4.2
Do you know the drug combination in SMC?		
Chloroquine and Fansider	11	9.2
Athemeter and lumefantrine	3	2.5
Proguanil and mefloquine	1	0.8
Amodiaquine and sulphadoxine pyrimethamine	105	87.5
What is the route of administering SMC?		
Oral	110	91.7
Injection	10	8.3
what kind of drug used for treatment in SMC?		
Tablet	116	96.7
Suspension	4	3.3
What SMC use for?		
Prevention and treatment of malaria	115	95.8
Treatment of malaria	3	2.4
Treatment of typhoid	1	0.8
Treatment of pneumonia	1	0.8
Which group recommended for SMC?		
Children less than five years	105	87.5
Adult	5	4.2
Pregnant woman	1	0.8
Everybody	9	7.5
Is there any side effect during SMC?		
Yes	99	82.5
No	21	17.5
If yes, what are the side effects during the administering of SMC?		
Fever, weakness, and headache	98	81.7
Nose, mouth and teeth pain	5	4.2
Leg, elbow and head pain	8	6.7
Stomach, back and weakness	9	7.5

Practice of Seasonal Malaria Chemoprevention (SMC)

Descriptive statistics were used to summarize the practice of Seasonal Malaria Chemo-prevention among healthcare workers within the selected area of the study, Frequencies and percentages were calculated for the variables. Most of the respondents 70(53.8%) admitted that they had prescribed drugs during SMC while 50(41.7%) accepted they never prescribed. 102(85%) of the respondents admitted that they passed information on SMC to caregivers while 18(15%) admitted the opposite. 86(71.7%) of the respondents, accepted that they administered drugs during SMC while 34(28.3%) of them admitted they never administered. Most of the respondents 99(82.5%), admitted that, they do something on side effect caused by drugs administered during SMC while 21(17.5%) of them admitted that, they never do anything on side effect. Majority of the respondents 84(70%), accepted that Three Doses to be administered during SMC, followed by 11(9.2%), admitted that Four time and others 16(13.3%) and 9(7.5%) accepted that two and one times respectively. Most of the respondents 92(76.6%), admitted that the first dose will be administered to a child by trained Health worker, followed by 15(12.5%), admitted that Caregiver will do so, 8(6.7%) admitted that Mother will do and 5(4.2%) admitted that Father will administer. The other doses will be administered by, majority 99(82.5%) of the respondents, accepted that Caregiver will do, 13(10.8%), accepted Doctor, others 3(2.5%) and 5(4.2%) admitted that Medicine vendor and Neighbor respectively. Most of the respondents 96(80%) accepted Rainy Season as the season of SMC to be administered while the other respondent opted the followed: 17(14.2%), accepted dry season, 4(3.3%) accepted Tropical and 3(2.5%) accepted Harmattan season.

Table 3: Practice of Seasonal Malaria Chemoprevention (SMC)

Questions/ variables	Frequency (n)	Percentage (%)
Have you ever prescribed during SMC?		
Yes	70	58.3
No	50	41.7
Do you provide information on SMC to caregiver?		
Yes	102	85
No	18	15
Did you ever administer drug during SMC to anyone in your place of work?		
Yes	86	71.7
No	34	28.3
Did you do anything when a patient develops side effects after administering SMC?		
Yes	99	82.5
No	21	17.5
How many doses during SMC a child supposed to have?		
One	9	7.5
Four	11	9.2
Two	16	13.3
Three	84	70

First dose will be given to a child by?		
Father	5	4.1
Mother	8	6.7
Trained health worker	92	76.7
Caregiver	15	12.5
The other doses will be given by?		
Caregiver	99	82.5
Doctor	13	10.8
Medicine vendor	3	2.5
Neighbor	5	4.2
Which season of a year when SMC is to be given?		
Harmattan	3	2.5
Dry	17	14.2
Rainy	96	80
Tropical	4	3.3

Factors associated with the knowledge of SMC of the respondents

Table 4: Chi-square Test was used to identify the factors associated with the knowledge of SMC of the respondents. All p - values < 0.05 were considered significant therefore, from the Table below, most p - values of the factors relating demography with the knowledge SMC were significant, only educational qualification with p - value $0.204 > 0.05$ was not significant.

Table 4: Factors associated with the knowledge of Seasonal Malaria Chemoprevention

Have you ever heard SMC?	Responses			
Age in years?	Yes	No	Total	P – value
18-27	34	0	34	$< 0.001^*$
28-37	41	0	41	
38-47	31	0	31	
greater or equal to 48	6	8	14	
Gender?				
Male	50	0	50	$< 0.03^*$
Female	62	8	70	
Highest educational qualification				
Secondary certificate	19	0	19	0.204
Tertiary education	93	8	101	
Marital status				
Single	64	0	64	$< 0.001^*$
Married	48	7	55	
Widowed	0	1	1	
Cadre of healthcare workers				

JCHEW	10	0	10	< 0.001*
CHEW	75	0	75	
Pharmacy technician	3	0	3	
Medical Lab. Technician	13	0	13	
Nutrition and dietetic	8	0	8	
Public health	2	0	2	
Environmental health	1	3	4	
Health information management	0	4	4	
Health education and promotion	0	1	1	
Working period in years				
0 – 9	50	0	50	< 0.001*
10 - 19	54	0	54	
20 – 29	8	7	15	
Greater than or equal to 30	0	1	1	

Factors associated with the practice of SMC

Chi-square Test was Used and identified the factors associated with the practice of SMC. all the p - values with $p < 0.05$ is significant therefore, from the below table all p - values of the factors relating demography with the practice of SMC were significant.

Table 5: Factors associated with the practice of Seasonal Malaria Chemoprevention

Do you provide information on SMC to caregiver?	Responses		Total	P-value
Age in years?	Yes	No		
18-27	34	0	34	< 0.001*
28-37	41	0	41	
38-47	27	4	31	
greater or equal to 48	0	14	14	
Gender?				
Male	50	0	50	< 0.001*
Female	52	18	70	
Religion?				
Islam	94	0	94	< 0.001*
Christianity	8	17	25	
Traditional	0	1	1	
Ethnic group?				
Fulfulde	38	0	38	< 0.001*
Hausa	37	0	37	
Tangale	15	0	15	
Waja	5	0	5	
Tera	6	0	6	

Kanuri	1	5	6	
Yoruba	0	3	3	
Igbo	0	4	4	
Other	0	6	6	
Highest educational qualification?				
Secondary certificate	19	0	19	< 0.046*
Tertiary education	83	18	101	
Marital status?				
Single	64	0	64	< 0.001*
Married	38	17	55	
Widowed	0	1	1	
Cadre of healthcare workers?				
JCHEW	10	0	10	< 0.001*
CHEW	75	0	75	
Pharmacy technician	3	0	3	
Medical Lab. Technician	13	0	13	
Nutrition and dietetic	1	7	8	
Public health	0	2	2	
Environmental health	0	4	4	
Health information management	0	4	4	
Health education and promotion	0	1	1	
0 – 9	50	0	50	< 0.001*
10 - 19.	52	2	54	
20 – 29	0	15	15	
Greater than or equal to 30	0	1	1	

Discussion

The result of this study revealed that there is adequate knowledge of SMC among healthcare workers in Gombe metropolis. The respondents in this study were mostly of female gender. This could be linked to the nature of services in PHCs which is mainly concerned with women and children. This could lead to more female's population than males. Most of the respondents from the study were CHEWs. This is because primary healthcare facilities in Nigeria are primarily managed by CHEWs who were trained for community health service delivery. The predominance of female CHEWs in our study might reflect broader gender dynamics in the healthcare workforce, potentially influencing knowledge and practice of SMC. The study earlier reported good knowledge of SMC among the respondents and suggested this, is as a result of efforts made by Government and NGOs to equip HCWs with SMC experience during the implementation of SMC program in the State. These efforts could be through media and physical interaction such as seminar, workshop organized to create awareness on the implementing of SMC program. For the most part of the respondents' knowledge and experience, this might be the impact of trainings, seminars and workshops organized by government and NGOs to equip healthcare workers and other activities such as campaign in public and private media on SMC program in order to increasing the awareness of SMC among

healthcare workers, working in the PHCs and general public of the State. Training workshop and seminars have been shown to improve any program implementation processes. Similarly, reporting practice of SMC of the respondents, just like Knowledge of SMC was observed to be good among the PHCs workers. Although, this has not been translated into SMC practice in a field work, some of the respondents could have good knowledge of the program but never participated in the implementation of SMC.

Generally, the study revealed that the primary healthcare workers in Gombe metropolis demonstrated adequate knowledge of seasonal malaria chemoprevention (SMC) and satisfactory delivery practices of SMC which contrasted with some published studies from some states in northern Nigeria where health-worker knowledge and practice were reported as sub-optimal. For example, studies in Kano State and programmatic coverage surveys across Sokoto, Katsina, Zamfara and Jigawa state, documented gaps in HCW knowledge, variable campaign coverage, and implementation barriers such as weak community engagement and inconsistent adherence to program guidelines. Differences between Gombe and other northern states may reflect variation in the timing and intensity of SMC training, supervision and community mobilization (for example, use of lead-mother volunteers), as well as differences in health-system support and monitoring. Nonetheless, regional evidence also highlights persistent technical gaps (such as pharmacovigilance/ADR reporting and guideline adherence) that merit attention in Gombe to sustain and improve SMC delivery.

Conclusion

In conclusion, there was adequate knowledge of SMC and satisfactory practices related to SMC delivery. The results also identified the factors associated with the knowledge and practices of SMC among the staff. From our assumptions, these were as a result of the efforts made by government and NGOs to see that the program was fully implemented in the state and adhered to.

Recommendations

The following are recommendation made based on this study:

- Enhance SMC Programs by include other community leaders in each PHC facility to increase trust and confidence among the public.
- Public Health Education: Implement targeted education campaigns to raise awareness about the importance of SMC implementation, particularly in areas with low maternal education levels.
- Strengthen Healthcare Infrastructure: Improve the healthcare infrastructure in regions with high Malaria incidence to ensure effective implementation of SMC to help tackle the outbreak of the disease.
- Provide adequate training to stakeholders for the full implementation of the program.

Scope/limitations of the study

This study had several limitations that should be considered when interpreting the findings:

- **Self-reported responses:** Much of the information on knowledge and practice was obtained through self-administered questionnaires. This may introduce response bias, as some healthcare workers may overreport good practices or knowledge to appear competent.
- **Limited to PHC facilities in Gombe metropolis:** The study was conducted only within the urban PHC facilities of Gombe metropolis. Therefore, the findings may not fully represent healthcare workers in rural areas or other LGAs in Gombe State.
- **Cross-sectional study design:** Because the research was cross-sectional, it captures information at only one point in time. It cannot establish cause–effect relationships between factors and knowledge or practice of SMC.

- **Small sample size (if applicable):** With a sample of 120 respondents, the results may have limited generalizability to all healthcare workers in the state or region.
- **Possible incomplete records:** Some facilities may have incomplete or inconsistent SMC documentation, limiting the ability to verify accuracy of practice.
- **Time constraints:** Data collection was conducted during a specific period, which may not reflect variations in SMC implementation across different campaign cycles.
- **Non-observation of practice:** Direct observation of SMC administration was limited, which may affect the accuracy of assessing real-life practices compared to what is reported.

Suggestions for further studies

- **Expanded Geographic Scope:** Expand the study to include more LGAs in Gombe state to obtain a more comprehensive understanding of the knowledge and practice of SMC.
- **Qualitative Research:** Explore qualitative research methods to understand the underlying reasons for vaccine hesitancy and gaps in vaccination coverage.
- **Impact of Public Health Interventions:** Evaluate the impact of the interventions of SMC program on the community where the program was implemented.

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