Received June 2018
Accepted July 2018

Factors influencing utilization of intermittent preventive treatment of malaria during pregnancy among mothers of under-one children in rural Lilongwe, Malawi

Taonga Mafuleka
Ministry of Health, P.O. Box 30377, Lilongwe 3, Malawi;
College of Public Health Sciences, Chulalongkorn University, Bangkok, Thailand

Montakarn Chuemchit
College of Public Health Sciences, Chulalongkorn University, Bangkok, Thailand

Abstract

Purpose - Routine administration of Sulphadoxine Pyrimethamine (SP) for intermittent preventive treatment (IPTp) of malaria during pregnancy leads to improvement of maternal health and pregnancy outcomes. This study explored determinants for IPTp-SP utilization among pregnant women in rural Lilongwe, Malawi.

Design/methodology/approach - A multi-stage sampling method was used to recruit 355 mothers of under-one children. Face-to-face interview was conducted. Bivariate and multivariate statistical models were executed in analyzing data.

Findings - Overall, 84.0% of the mothers attended at least 3 antenatal care (ANC) visits, effectively positioning themselves to the likelihood of receiving optimal IPTp-SP (3+ doses). Only 24.8% of the mothers received the recommended doses; 52.7% and 22.5% took partial and nil doses. Factors associated with IPTp-SP utilization included knowledge, attitudes, timing of ANC visit, frequency of ANC visits, health education, and perceived benefits of IPTp-SP. Client satisfaction with ANC services (AOR 1.94; 95% CI 1.07-3.51), and receipt of SP under health worker' observation (AOR 6.96; 95% CI 2.04-23.71) increased the likelihood of optimal utilization.

Originality/value - Despite high ANC attendance rate, optimal IPTp-SP utilization area is low. Apart from the identified client-level factors, this low coverage can be attributed to health workers' non-adherence to IPTp-SP guidelines leading to missing opportunities. Program efforts should aim at addressing the identified knowledge gaps and reinforcing community trust in the intervention. Operational research is recommended to explore bottlenecks limiting effective coverage of the intervention.

Keywords Antenatal care, Intermittent Preventive Treatment, Malaria, Pregnancy, Sulphadoxine Pyrimethamine, Malawi

Paper type Research paper

Introduction

For centuries, malaria has caused the tragic loss of countless lives, robbing families of their livelihoods, and placing humanity in a vicious cycle of ill health and poverty [1]. Globally, the disease remains a major public health challenge, with 90% of all malaria cases and deaths concentrated in sub-Saharan Africa. Pregnant women and under-five children are the most vulnerable groups to infection [2].

Malaria in pregnancy (MiP) leads to adverse consequences for the mother, her fetus and newborn [3]. There is evidence linking MiP to low birth weight (LBW), maternal anemia, spontaneous abortion, still birth and infant mortality and maternal death [4-7]. Among the causes of neonatal mortality, LBW is acknowledged as the principal risk factor [7]. In malaria-endemic countries in Africa, an estimated 11% of all neonatal mortality is related to LBW induced by MiP [3, 4, 7]. Similarly, severe malaria contributes to approximately 10% of maternal deaths, implying that approximately 25,000 maternal deaths could be averted every year through effective control of MiP [8].

Recognizing these adverse health outcomes, the World Health Organization (WHO) recommends a three pronged approach for the control of MiP: long lasting insecticide bed-nets, intermittent preventive treatment (IPTp), and prompt diagnosis and case management. IPTp refers to the routine provision of a treatment dose of an antimalarial drug to pregnant women during scheduled antenatal care (ANC) visits. The drug of choice for IPTp is *Sulphadoxine Pyrimethamine (SP)* administered during pregnancy, irrespective of parity. Findings from recent trials show that efficacious levels for SP are still high and the drug's safety profile is acceptable during pregnancy [9]. Across African regions with stable transmission of malaria caused by *Plasmodium falciparum,* and where parasite resistance to SP is low, IPTp-SP has improved birth outcomes [10]. Moreover, because it is administered as a single dose treatment, using directly observed treatment (DOT) strategy, the drug is well suited for IPTp programming. This simplifies monitoring of IPTp-SP utilization and provides accurate coverage data [10].

Faced with both high malaria burden and neonatal mortality rates, Malawi adopted WHO's revised IPTp-SP policy in 2013 [11, 12]. The current guidelines require that every pregnant woman receive at least three (optimal) doses of SP during routine ANC visits. The first dose is administered from 16 weeks of gestation, and subsequent doses given at least one month apart until the woman delivers, without any major safety concerns [10]. The 2017 Malawi Malaria Indicator Survey (MMIS) estimated a 41.1% coverage for optimal IPTp-SP, an increase from 30.2% and 13.1% registered in 2015/16 and 2014 (baseline), respectively [13-15]. Although this demonstrates a steady increase, IPTp-SP utilization rate remains below the 80% target set by the Roll Back Malaria (RBM) initiative in 2010 [16]. The situation is worrying considering that ANC coverage is high and receipt of first dose of IPTp-SP in the 2017 MMIS was 92%. This represents a dropout rate of 51 percentage points between IPTp-SP 1+ and IPTp-SP 3+.

Previous studies have documented several possible client-side barriers that affect coverage and access of IPTp services. For instance, there is evidence linking high ANC coverage (both in terms of initiation and frequency of visits) with corresponding increase in IPTp-SP utilization [17-19]. Nevertheless, disparities have been observed in Malawi and elsewhere revealing that high ANC coverage does not always translate into adequate utilization of IPTp. For example, a 2015/16 national survey showed an ANC coverage of 83% for pregnant women attending at ≥ 3 visits [20]. Surprisingly, estimates for optimal IPTp-SP utilization, a service integrated within the ANC platform, still remains very low in the country. This disparity suggests service delivery and utilization gaps that can be attributed to health workers' non-compliance to IPTp guidelines, facility level barriers like drug (SP) stock outs, and client level factors [21, 22].

Besides ANC attendance, various determinants of IPTp utilization have been documented. These include sociodemographic characteristics (e.g. maternal age and education attained); knowledge on MiP and IPTp-SP; attitudes towards IPTp-SP, receipt of SP under DOT; distance to nearest ANC facility and waiting times; client satisfaction; perceptions on susceptibility and severity to MiP and potential benefits derived from IPTp-SP utilization. Contrasting findings have been reported regarding the influence of sociodemographic factors on IPTp uptake. Evidence suggests that women ≥ 35 years delay or entirely neglect ANC because they feel accustomed to pregnancy and childbirth from previous experiences [23]. However, a study conducted in Tanzania reported that women aged < 20 years were more likely to attend adequate ANC visits, increasing their odds of receiving optimal IPTp-SP. The study also determined that counseling on dangers of MiP was the most pervasive predictor for optimization of the intervention [24].

Researchers have also established associations between knowledge regarding the protective benefits of IPTp-SP with receipt of adequate doses. It has been demonstrated that in order to utilize a health intervention, clients must be aware of the potential benefits in minimizing a particular risk; MiP in this case [25]. However, in their systematic review, Pell and others observed that women were ignorant about the efficacy and safety of IPTp-SP. Despite this uncertainty, pregnant women still utilized the intervention because they trusted the health providers administering the drugs [18]. In contrast, because the intervention targets pregnant women, suspicions emerged among communities in Kenya that IPTp was a birth control strategy by the government [26]. Additionally, women in Tanzania were reportedly connecting SP with "difficult deliveries as a result of large babies" based on rumors rather than personal experience [27, 28].

Overall, research findings on the determinants of IPTp-SP from across Africa have been inconsistent. Such variations suggest the contextual nature of enablers and barriers to uptake of the intervention and therefore, cannot be generalized. Besides, documentation of research findings specific to the Malawi context is limited especially considering that the IPTp-SP policy was recently updated [11]. This is an important research gap, thus, this study seeks to determine factors influencing the utilization of IPTp among pregnant women with a case study of rural Lilongwe, Malawi. The evidence from the study will form the basis for designing client-centred programme adjustments in order to increase access and utilization of the intervention.

Methods and materials

Study design

A cross sectional study was conducted in June 2018 using face-to-face interviews. The research was aimed at establishing factors influencing utilization of IPTp-SP during pregnancy in the study area.

Study area

The study was conducted in rural parts of Lilongwe district, Malawi's capital, located within the central region. Administratively, the district is demarcated into two; the city and rural sections, and this study will focus on the latter. According to 2018 projections from the 2008 census, Lilongwe's population stands at around 2.6 million, with 60.8% resident in rural areas [29]. Up to 24% of the population are women of child-bearing age while 5% represents under-one children. According to estimates in 2017, the disease ranks among the top five leading causes of morbidity and mortality in children under five years and pregnant women in the district [12, 30]. In 2016, there were an 494,200 confirmed cases of malaria resulting in 327 deaths among under-five children [29]. Like most districts in the country, Lilongwe is mostly agrarian with most (90%) of its rural residents engaging in subsistence farming for their livelihoods [29]. Therefore, malaria infection to family members poses a serious socioeconomic risk through lost productivity hours, absenteeism from school and costs for treatment [31]. This situation negatively affects educational attainment among children, contributes to food insufficiency at household level, and entrenches poverty by pushing the already impoverished households further down the poverty ladder [32].

Study population

All consenting mothers of children under the age of one, who attended at least one ANC visit during their most recent pregnancy that resulted in a live birth were eligible to participate in the study. Women were eligible for enrollment in our study if they fulfilled the following inclusion criteria: (a). aged 18 – 49 years; (b). mother to an under-one child, (c). attendance of at least one ANC visit during pregnancy

resulting in birth of same child; and (d). resident within catchment area of participant health facility under review. Women were excluded from participation if they had reported mental disorders or hearing problems or were unable to communicate using the local *Chewa* language.

Sample size

A minimum sample size totaling 323 was estimated using the Cochran's formula with 95% confidence level as follows [33]:

$$n = [Z^2\, p\, (1-p)] / d^2 \qquad \text{where;}$$

n = minimum required sample size; Z = standard normal deviation, for 95% confidence interval (thus $Z = 1.96$); p = proportion of pregnant women who reported receipt of IPTp 3+ estimated at 30% [15]; and d = the margin of error on p (estimated at 5%, thus $d = 0.05$).

After adjusting for a 10% attrition and non-response rate, a sample size of 355 was derived.

Sampling procedure

A multi-stage sampling technique was used involving simple random selection of supervision areas and health facilities. Respondents were systematically selected from six participating health facilities that offered ANC services using a non-replacement balloting technique. Based on the population of under-one children, proportionate to size allocation was used to determine the quota sample distribution for each facility.

Research instrument

The structure of the questionnaire was based on a conceptual framework adapted from the Andersen's model for health service utilization. The tool was constructed using material mostly adapted from national household surveys like malaria indicator survey (MIS), demographic and health survey (DHS) and service provision assessment (SPA). To attain validity, the tool was informed by a review of existing literature including policies and guidelines on MiP and IPTp-SP. In addition, five academics and programme experts were consulted using the item-objective congruence (IOC) indices yielding a score of 0.88. Initially, the questionnaire was developed in English, but it was administered in local *Chewa* language. Thus, two independent bilingual malaria experts conducted forward and backward translation of the tool. To achieve reliability, the final draft was pretested using the test-retest technique and appropriate changes were made to increase the internal validity. From this pilot testing, the questionnaire had the following reliability scores: 0.84 for KR 20 (knowledge part); and 0.82 and 0.78 for Cronbach's alpha (attitudes and perceptions).

Dependent variable

Researcher explored the factors that influence utilization of IPTp for malaria during pregnancy in rural Lilongwe, Malawi. Utilization of IPTp was categorized into; (a). *optimal;* if a woman received at least 3 SP doses and (b). *suboptimal;* if she received less than 3 SP doses [24, 34]. To reduce biases, researcher used documented information from the respondents' ANC cards as evidence for IPTp-SP receipt.

Independent variable

The independent variables included: maternal age (three age bracket categories: 18-24, 25-34, and 35-49); marital status (with spouse and without spouse); education (no formal education, primary school, and secondary/higher); occupation (unemployed and employed); monthly income (lower and higher); gravidity

(primigravid, secundigravid, and multigravid); knowledge on MiP (low, moderate, and high); attitudes towards IPTp (negative, neutral, and positive); gestation at first ANC visit (first, second and third trimesters); number of ANC visits attended (inadequate and adequate); compliance with DOT (yes or no); exposure to health education (inadequate and adequate); distance to ANC facility (walking time as <1 hour or ≥ 1 hour); transport cost to ANC facility (< 500 or ≥ 500 Malawi Kwacha); waiting time (<1 hour or ≥ 1 hour); perceived susceptibility; and severity to MiP, and perceptions on benefits of IPTp-SP (each categorized as low, moderate, and high).

Data collection procedures

A validated questionnaire was used to collect information through face-to-face interviews. Four trained research assistants recruited and interviewed the mothers during their routine under-five clinic visits. Completed questionnaires were scrutinized to check for correctness, completeness and consistency of data.

Statistical analyses

Data analysis was done using SPSS (version 22.0 licensed by University). In bivariate analyses, Chi-square test ($p = 0.05$) was employed to test for associations between each independent variable with the IPTp utilization. Since the dependent variable was dichotomous, binary logistic regression was conducted during multivariate analysis to examine the influence of each variable on IPTp-SP utilization when controlling for other variables. The regression model comprised of all variables with p-value of < 0.2 in the bivariate analysis. Variables with a p-value of < 0.05 were considered statistically significant to predict utilization of IPTp-SP during pregnancy.

Ethical considerations

Ethical clearance was obtained from two human subjects review boards; Research Ethics Committee; Chulalongkorn University (Thailand) - COA 091.1/61, and National Health Sciences Research Committee; Ministry of Health (Malawi) – approval number 1992.

Results

Respondents' characteristics

A total of 355 respondents provided complete information for analysis. The majority (90.4%) were married; 50.4% had incomplete primary school attendance; 63.4% were subsistence farmers; and 39.4% had a parity of one (Table 1). Overall, 46.5% of the mothers had high level of knowledge on MiP and IPTp-SP while 39.7% and 13.8% had moderate and low knowledge levels, respectively. Attitudes towards the intervention were assessed with results showing 19.7% of the mothers had positive attitudes, however, 62.5% showed indecisiveness.

Utilization of intermittent preventive therapy during pregnancy

Utilization of IPTp-SP during pregnancy was estimated based on documented evidence from respondents' ANC cards. Overall, 77.5% of mothers received at least one IPTp-SP dose, however, the rest missed out entirely from utilizing the intervention. The proportion of respondents who received optimal doses was estimated at 24.8%, while 52.7% took partial doses.

Bivariate analysis

Table 2 shows the distribution of respondents according to predisposing factors and uptake of IPTp-SP. All sociodemographic characteristics had no association with utilization of IPTp-SP. Comparing IPTp-SP 3+ utilization between age categories, the highest coverage (30.4%) was reported among women aged 25-34 years. With regard to level of education, mothers without any formal education were less likely

Table 1. Respondents' profile

Variable/Category	n = 355	%
Age (years)		
18 - 24	207	58.3
25 - 34	115	32.4
35 - 49	33	9.3
Mean = 25; SD = 6		
Marital status		
Single	28	7.9
Married	321	90.4
Separated	5	1.4
Widowed	1	0.3
Education level		
None	26	7.3
Incomplete primary	179	50.4
Complete primary	63	17.8
Secondary and higher	87	24.5
Occupation		
Farmer	225	63.4
Employed	11	3.1
Businesswoman	31	8.7
Housewife	88	24.8
Monthly income*		
Lower (< 10,000 MWK)	146	41.1
Higher (≥ 10,000 MWK)	209	58.9
Gravidity		
Primigravid	136	38.3
Secundigravid	80	22.5
Multigravid	139	39.2
Parity		
1 child	140	39.4
2 or 3 children	88	24.8
≥ 4 children	127	35.8

Note: *Median = 10,000 MWK

Table 2. Distribution of IPTp-SP utilization by predisposing factors

Variables	n	IPTp-SP Utilization - n (%)		$\chi 2$	*p*- value[a]
		Suboptimal (n = 267)	Optimal (n = 88)		
Age *(years)*					
18 – 24	207	162 (78.3)	45 (21.7)		
25 – 34	115	80 (69.6)	35 (30.4)	5.12	0.223
35 – 49	33	25 (75.8)	8 (24.2)		
Marital status					
Without spouse	34	28 (82.4)	6 (17.6)	3.23	0.310
With spouse	321	239 (74.45	82 (25.3)		
Education level					
None	26	22 (84.6)	4 (15.4)		
Primary	242	180 (74.4)	62 (25.6)	1.34	0.513
Secondary/Tertiary	87	65 (74.7)	22 (25.3)		
Occupation					
Unemployed	313	240 (76.7)	73 (23.3)	3.05	0.081
Employed	43	27 (62.8)	16 (37.2)		

(continued)

Table 2. (continued)

Variables	n	IPTp-SP Utilization - n (%)		χ2	*p*- value[a]
		Suboptimal (n = 267)	Optimal (n = 88)		
Monthly income *(Malawi Kwacha)*					
Lower	146	116 (79.5)	30 (20.5)	2.39	0.122
Higher	209	151 (72.2)	58 (27.8)		
Gravidity					
Primigravid	136	101 (74.3)	35 (25.7)		
Secundigravid	80	65 (81.3)	15 (18.8)	2.12	0.347
Multigravid	139	101 (72.7)	38 (27.3)		
Parity					
< 4 children	228	174 (76.3)	54 (61.4)	0.42	0.518
≥ 4 children	127	93 (73.2)	34 (38.6)		
Knowledge					
Low	48	41 (85.4)	7 (14.6)		
Moderate	141	114 (80.9)	27 (19.1)	10.42	**0.005**
High	166	138 (83.1)	60 (16.9)		
Attitudes					
Negative	63	55 (87.3)	8 (12.7)		
Neutral	222	171 (77.0)	51 (23.0)	15.73	**<0.001**
Positive	70	41 (58.6)	29 (41.4)		

Note: [a] *p* value of Pearson's Chi squared test

to achieve optimal IPTp-SP utilization (15.4%) compared with those with primary (25.6%) and secondary/tertiary education (25.3%). Mothers with birth orders of three and below were more likely to receive the recommended IPTp-SP doses (61.4%) than their counterparts who had given birth at least four times (38.6%).

Women's knowledge on MiP ($p = 0.005$) and attitudes towards IPTp-SP ($p < 0.001$) influenced the extent to which the intervention was utilized. Overall, possession of high level of knowledge did not translate into the expected optimal utilization as only 16.9% of mothers in this category with received IPTp-SP 3+. However, when compared to the group with low knowledge, coverage of optimal IPTp-SP doses was slightly higher among respondents with high knowledge; 16.9% versus 14.6% ($p = 0.005$). The proportion of mothers reporting receipt of optimal doses was higher among those with positive attitudes (41.4%) compared to those possessing negative attitudes (12.7%).

Among the enabling factors, the following showed no statistical association with IPTp-SP utilization: distance; transport costs; and wait times in in relation to accessibility of ANC facility (Table 3). On the other hand, an association was observed for ANC attendance in terms of both timing of first visit ($p < 0.001$) and frequency of visits attended ($p = 0.005$). Utilization of optimal IPTp-SP was highest among respondents who initiated ANC during the first trimester (41.4%) and was lowest among those reporting late in third trimester (14.8%). Similarly, women who received adequate ANC visits were more likely to take optimal doses (32.4%) compared to those who sought fewer visits (19.3%). Contrary to popular belief that adequate ANC attendance is precursor for IPTp-SP optimization, this study observed that among women who attended at least four ANC visits, 67.6% were unable to utilize the intervention effectively. Adherence to DOT guidelines was significantly associated with IPTp-SP ($p < 0.001$). Receipt of optimal IPTp-SP was likely to be higher among women taking at least one dose of SP under DOT (30.5%) than those who did not adhere to this requirement (2.7%). Although mothers cited constraints in accessing ANC services, 54.4% of them reported satisfaction with

Table 3. Distribution of IPTp-SP utilization by enabling factors

Variables	n	IPTp-SP utilization - n (%)		χ2	*p*- value[a]
		Suboptimal (n = 267)	Optimal (n = 88)		
Gestation at first ANC visit (trimester)					
1st	87	51 (58.6)	36 (41.4)		
2nd	241	193 (80.1)	48 (19.9)	17.35	<0.001
3rd	27	23 (85.2)	4 (14.8)		
Number of ANC visits					
< 4 (inadequate)	207	167 (80.7)	40 (19.3)	7.95	0.005
≥ 4 (adequate)	148	100 (67.6)	48 (32.4)		
At least 1 dose under DOT					
Yes	279	194 (69.5)	85 (30.5)	22.53	<0.001
No	75	73 (97.3)	2 (2.7)		
Health education					
Inadequate	128	111 (86.7)	17 (13.3)	14.22	<0.001
Adequate	227	156 (68.7)	71 (31.3)		
Distance to ANC facility					
< 1 hour	203	153 (75.4)	50 (24.6)	0.01	0.936
≥ 1 hour	152	114 (75.0)	38 (25.0)		
Transport costs					
< 500 MWK	161	119 (73.9)	42 (26.1)	0.27	0.606
≥ 500 MWK	194	148 (76.3)	46 (23.7)		
Waiting time					
< 1 hour	198	143 (72.2)	55 (27.8)	2.15	0.143
≥ 1 hour	157	124 (79.0)	33 (21.0)		
Client satisfaction					
Low	162	135 (83.3)	27 (16.7)	10.54	0.001
High	193	132 (68.4)	61 (31.6)		

Note: [a] *p* value of Pearson's Chi squared test

Table 4. Distribution of IPTp-SP utilization by needs factors

Variables	n	IPTp-SP utilization - n (%)		χ2	*p*-value[a]
		Suboptimal (n = 267)	Optimal (n = 88)		
Perceived susceptibility					
Low	77	65 (84.4)	12 (15.6)		
Moderate	193	142 (73.6)	51 (26.4)	4.75	0.093
High	85	60 (70.6)	25 (29.4)		
Perceived severity					
Low	50	40 (80.0)	10 (20.0)		
Moderate	169	132 (78.1)	37(21.9)	3.47	0.176
High	136	95 (69.9)	41 (30.1)		
Perceived benefits					
Low	69	60 (22.5)	9 (13.0)		
Moderate	164	131 (49.1)	33 (20.1)	17.94	<0.001
High	122	76 (28.5)	46 (37.7)		

Note: [a] *p* value of Pearson's Chi squared test

service delivery (results not tabled). Clients with high levels of satisfaction were more likely to use optimal IPTp-SP (31.6%) compared to those who had reservations with the received services (16.7%).

Table 4 shows that among the needs factors, perceptions regarding the protective value of IPTp-SP was associated with optimized service utilization ($p < 0.001$).

Women who acknowledged the benefits of IPTp-SP were more likely (37.7%) to receive the recommended doses than those who were ignorant of the same (13.0%).

Multivariate analysis

Table 5 shows results from a multiple logistic regression model comprising of: variables with p-value < 0.2 from bivariate analysis; significant variables from previous studies; and known confounders. Having received at least one IPTp-SP dose under DOT ($p < 0.002$); and the extent to which woman were satisfied with delivery of services at ANC ($p < 0.029$) were statistically significant ($p < 0.002$) and could predict uptake of IPTp-SP. The former predicted that receipt of optimal doses was 7 times more likely among women who complied with the DOT requirement (AOR 6.96; 95% CI 2.04-23.71). In the case of client satisfaction, women who were contented with service delivery were 1.94 times more likely to receive optimal IPTp-SP doses (AOR 1.94; 95% CI 1.07-3.51).

Table 5. Factors associated with uptake of optimal doses of IPTp-SP

Variables	AOR	95% CI	p- value
Occupation status			
Employed	1.333	0.594-2.993	0.486
Monthly income			
Higher	0.998	0.549-1.814	0.994
Knowledge level			
Low	Ref.		0.320
Fair	1.142	0.409-3.189	0.799
High	1.818	0.650-5.087	0.255
Attitudes towards IPTp-SP			
Negative	Ref.		0.143
Neutral	1.141	0.460-2.833	0.776
Positive	2.271	0.758-6.804	0.143
Timing of first ANC visit			
3rd trimester	Ref.		0.065
2nd trimester	1.669	0.440-6.333	0.451
1st trimester	0.792	0.231-2.718	0.710
Number of ANC visits attended			
Adequate (>4)	1.549	0.859-2.793	0.145
At least 1 dose taken under DOT			
Yes	6.956	2.041-23.705	0.002*
Counselling			
Adequate	0.602	0.250-1.449	0.258
Client satisfaction			
High	1.941	1.072-3.514	0.029
Wait times at ANC facility			
> 1 hour	1.113	0.629-1.971	0.712
Perceived susceptibility			
Low	Ref.		0.091
Moderate	1.249	0.539-2.893	0.605
High	0.526	0.174-1.584	0.253
Perceived severity			
Low	Ref.		0.995
Moderate	0.954	0.395-2.306	0.917
High	0.961	0.358-2.577	0.936
Perceived benefits			
Low	Ref.		0.048
Moderate	1.128	0.448-2.843	0.798
High	2.657	0.947-7.454	0.063

Note: * Significance at p -value < 0.05 Reference category is Optimal IPTp-SP

Discussion

Researcher studied the various factors that could influence uptake of IPTp-SP in rural Lilongwe, Malawi. The indicator used to measure utilization of IPTp-SP in this current study is the proportion of mothers with an under-one that had documented evidence in their ANC cards. Results show that over three-quarters of women (77.5%) received at least one SP dose. One in every four women (24.8%) had taken the recommended IPTp-SP doses. Compared to estimates from the 2014 national survey which reported a 13% coverage for IPTp-SP 3+, this result shows an improvement in utilization rates [14]. While this increase is an indication of the country's commitment to reduce malaria burden, coverage of the intervention remains below the RBM's target of 80 % [16]. It is important to state that this 2014 study coincided with the country's revision of IPTp-SP guidelines from the initial minimum 2 doses to at least 3 doses currently recommended by the WHO. In essence, the coverage from the 2014 MMIS only serves as the baseline for IPTp-SP 3+ [14]. In contrast, IPTp-SP coverage from this current study is lower than findings from two recent national surveys conducted in the country. According to the 2015/16 MDHS and 2017 MMIS, coverage of optimal IPTp-SP was estimated at 30.2% and 41.1%, respectively [13, 15]. The difference in coverage with findings can be attributed to use of different methodological approaches. For instance, the current study was hospital-based, had limited geographic scope, and recruited mothers of under-ones. Conversely, the surveys were national, sampled respondents from households, and enrolled mothers of under-two children.

Age was not associated with uptake of optimal utilization ($p = 0.223$), a result consistent with findings from previous studies that determined that maternal age does not influence uptake of IPTp-SP [22, 34]. Findings from this study were also consistent with a publication by Kibusi et al which reported that IPTp-SP3+ was highest among the 25 – 34 age group [35]. Researchers have argued that among young mothers who fall pregnant outside wedlock, the fear of social reprimands may lead them to conceal their pregnancy and stay away from utilizing ANC services, missing out on IPTp-SP [23, 36].

Women with early timing of the first ANC visit ($p < 0.001$) and adequate number of ANC visits ($p < 0.001$) were more likely to receive the recommended IPTp-SP doses. This finding is consistent with findings from studies conducted Malawi, Tanzania and Nigeria [22, 37, 38]. This result supports the WHO observation that uptake of IPTp-SP can significantly improve if the service is delivered as part of an integrated ANC program [39]. However, in this study, coverage of ANC was high and was therefore, not a barrier. Overall, 84.0% of the respondents made at least 3 ANC visits; the average gestation at initiation of ANC was 4.4 months; and the mean frequency for ANC visits was 3.3. This shows that the majority of the women attended ANC with satisfactory timing and frequency; and should therefore have received the recommended 3 doses of SP. The fact that only 24.8% of these eligible women received optimal IPTp-SP doses reveals existence of missed opportunities and health system bottlenecks limiting optimization of the intervention and achievement of related maternal health goals [21, 37].

Women who were not observed when swallowing the drug (DOT) were less likely to take the recommended doses ($p = 0.001$). A study from Tanzania made a similar observation which showed decreasing utilization of optimal IPTp-SP among women who were permitted to take the SP at home [40]. Barriers affecting administration of SP under DOT have been documented and include unavailability of supplies like clean drinking water and cups [18, 21, 40].

Despite the reported barriers with service accessibility, most were satisfied with services offered in ANC facilities which is consistent with findings documented in

previous studies [41, 42]. Clients were more likely to optimize IPTp-SP if they expressed satisfaction with the quality of ANC services ($p = 0.001$). Therefore, health facility managers should ensure that delivery of ANC services is of high quality and responsive to needs of pregnant women. Monitoring for potential bottlenecks such as availability of medicines and long waiting times should be done and corrective action effected to improve client satisfaction.

Clients who expressed satisfaction with services offered at ANC facilities were more likely to receive the recommended number of IPTp-SP doses ($p = 0.001$). This demonstrates the trust these women have towards health providers in administering beneficial and safe drugs [21]. Surprisingly, there was no association between distance to ANC clinics and uptake of the IPTp-SP. This contradicts with evidence by other researchers documenting that long walking distances to ANC facilities lead to discontinuity of receiving subsequent IPTp-SP doses among pregnant women who took the initial dose [18]. This can be explained by potential selection bias as this was a facility-based study that recruited caregivers accessing services from under-five clinics. Mothers residing in hard-to-reach areas, who access corresponding child health services from scheduled outreach clinics, may have been omitted from participating in this study [12, 43].

In line with literature from previous studies, this study has determined that women with inadequate IPTp-SP uptake possess low awareness on the preventive benefits of SP. In Zambia, researchers observed that although pregnant women reported mild side effects after taking SP, they still utilized the intervention because of their familiarity with protective functions of drug. In their meta-analysis on factors affecting uptake of IPTp-SP in sub-Saharan Africa, Hill J. et al established that among populations with ignorance on benefits of IPTp-SP, fears, myths and misconceptions are common regarding the safety of the drug during pregnancy [21]. Such issues create a sense of mistrust with devastating implications such as some women rejecting the intervention for fear of the perceived adverse effects and complications, such as abortion, allegedly caused by SP [18].

This study shows that while associations exist, most of the client level factors were not statistically significant to predict IPTp-SP uptake. Just like other previous studies, these results suggest that suboptimal IPTp-SP utilization may be due to inadequate policy implementation, health system factors and health facility barriers, and poor health worker performance [22].

A key strength for this study is that researcher used documented evidence to validate uptake of IPTp-SP recall and social desirability biases for the outcome variable. Since this study was conducted in one of the 29 districts in Malawi, the results cannot be generalizable. Nevertheless, it provides insightful evidence that can inform policy formation and implementation. In order to understand the context specific bottlenecks to IPTp-SP optimization, and to improve generalizability of results, a community-based study with a larger sample size is proposed. A major limitation was the cross sectional nature of the study, in which causal inferences cannot be established. To minimize missed opportunities, the District Health Office should ensure: consistent availability of IPTp-SP services through deployment of health workers in under-served areas, maintain the supply chain to avoid SP stock outs, and conduct routine supportive supervision to health facilities. In order to assess the delivery of IPTp-SP, NMCP should conduct operational research to investigate health system factors limiting the optimization of the intervention.

Acknowledgement

The following individuals provided insightful comments for which researcher are appreciative: Dr. Tepanata Pumpaibool (Chulalongkorn University, Thailand); Dr.

Michael Kayange (NMCP, Malawi), Dr. Chikondi Mwendera (Liverpool School of Tropical Medicine, UK); Dr. Mwayiwawo Madanitsa (University of Malawi), and Dr. Maryse Kok (Royal Tropical Institute, Holland). The authors also thank all mothers who agreed to be interviewed, the research assistants, and staff of Lilongwe DHO. Author are also grateful for the generous financial support from the people of Thailand, through the Thailand International Postgraduate Programme (TIPP) scholarship. This thesis is supported by Graduate School Thesis Grant, Graduate School, Chulalongkorn University.

References

1. Roll Back Malaria Partnership. The global malaria action plan for a malaria free world. Geneva: Roll Back Malaria Partnership; 2008.
2. World Health Organization [WHO]. World malaria report 2017. Geneva: WHO; 2017.
3. Steketee RW, Nahlen BL, Parise ME, Menendez C. The burden of malaria in pregnancy in malaria-endemic areas. Am J Trop Med Hyg. 2001 Jan-Feb; 64(1-2 Suppl): 28-35. doi: 10.4269/ajtmh.2001.64.28
4. Guyatt HL, Snow RW. Malaria in pregnancy as an indirect cause of infant mortality in sub-Saharan Africa. Trans R Soc Trop Med Hyg. 2001 Nov-Dec; 95(6): 569-76. doi: 10.1016/S0035-9203(01)90082-3
5. Menendez C, Bardaji A, Sigauque B, Sanz S, Aponte JJ, Mabunda S, et al. Malaria prevention with IPTp during pregnancy reduces neonatal mortality. PLoS One. 2010 Feb; 5(2): e9438. doi: 10.1371/journal.pone.0009438
6. McGready R, Lee SJ, Wiladphaingern J, Ashley EA, Rijken MJ, Boel M, et al. Adverse effects of falciparum and vivax malaria and the safety of antimalarial treatment in early pregnancy: a population-based study. Lancet Infect Dis. 2012 May; 12(5): 388-96. doi: 10.1016/S1473-3099(11)70339-5
7. Guyatt HL, Snow RW. Impact of malaria during pregnancy on low birth weight in sub-Saharan Africa. Clin Microbiol Rev. 2004 Oct; 17(4): 760-9. doi: 10.1128/CMR.17.4.760-769.2004
8. Malaria in Pregnancy Consortium [MIP]. Mission statement. [cited 2018 March]. Available from: http://www.mip-consortium.org/about_us/mission.htm
9. World Health Organisation [WHO]. WHO evidence review group: Intermittent Preventive Treatment of malaria in pregnancy (IPTp) with Sulfadoxine-Pyrimethamine (SP). Geneva: WHO; 2012.
10. World Health Organisation [WHO]. WHO policy brief for the implementation of intermittent preventive treatment of malaria in pregnancy using sulfadoxine-pyrimethamine (IPTp-SP). Geneva: WHO; 2013.
11. Mwendera CA, de Jager C, Longwe H, Phiri K, Hongoro C, Mutero CM. Changing the policy for intermittent preventive treatment with sulfadoxine-pyrimethamine during pregnancy in Malawi. Malar J. 2017 Feb; 16(1): 84. doi: 10.1186/s12936-017-1736-9
12. Ministry of Health [MoH]. Malaria strategic plan (2017 - 2022). Lilongwe, Malawi: National Malaria Control Program; 2017.
13. Ministry of Health [MoH], ICF. Malawi malaria indicator survey 2017. Lilongwe, Malawi, and Rockville, Maryland, USA: MoH and ICF; 2018.
14. Ministry of Health [MoH], ICF International. Malawi malaria indicator survey 2014. Lilongwe, Malawi, and Rockville, Maryland, USA: MoH and ICF International; 2015.
15. National Statistical Office [NSO], ICF. Malawi demographic and health survey 2015-16. Zomba, Malawi, and Rockville, Maryland, USA: NSO and ICF; 2017.
16. Roll Back Malaria. The Abuja declaration on roll back malaria in Africa by African Heads of States and Governments. Roll Back Malaria; 2000.
17. Hill J, Kazembe P. Reaching the Abuja target for intermittent preventive treatment of malaria in pregnancy in African women: a review of progress and operational challenges. Trop Med Int Health. 2006 Apr; 11(4): 409-18. doi: 10.1111/j.1365-3156.2006.01585.x

18. Pell C, Straus L, Andrew EV, Menaca A, Pool R. Social and cultural factors affecting uptake of interventions for malaria in pregnancy in Africa: a systematic review of the qualitative research. PLoS One. 2011; 6(7): e22452. doi: 10.1371/journal.pone.0022452
19. Sikambale C, Halwindi H, Baboo KS. Factors influencing utilization of intermittent presumptive treatment of malaria (IPTp) services by pregnant women in Sesheke district of Western province Zambia. Med J Zambia. 2013; 40(1): 24-32.
20. National Statistical Office [NSO]. Malawi MDG endline survey 2014. Zomba, Malawi: NSO; 2015.
21. Hill J, Hoyt J, van Eijk AM, D'Mello-Guyett L, Ter Kuile FO, Steketee R, et al. Factors affecting the delivery, access, and use of interventions to prevent malaria in pregnancy in sub-Saharan Africa: a systematic review and meta-analysis. PLoS Med. 2013; 10(7): e1001488. doi: 10.1371/journal.pmed.1001488
22. Odjidja EN, Duric P. Evaluation of demand and supply predictors of uptake of intermittent preventive treatment for malaria in pregnancy in Malawi. Malariaworld J. 2017; 8(20): 1-7.
23. Simkhada B, Teijlingen ER, Porter M, Simkhada P. Factors affecting the utilization of antenatal care in developing countries: systematic review of the literature. J Adv Nurs. 2008 Feb; 61(3): 244-60. doi: 10.1111/j.1365-2648.2007.04532.x
24. Exavery A, Mbaruku G, Mbuyita S, Makemba A, Kinyonge IP, Kweka H. Factors affecting uptake of optimal doses of sulphadoxine-pyrimethamine for intermittent preventive treatment of malaria in pregnancy in six districts of Tanzania. Malar J. 2014 Jan; 13(1): 22. doi: 10.1186/1475-2875-13-22
25. Champion VL, Skinner CS. The health belief model. In: Glanz K, Rimer BK, Viswanath K, editors. Health behavior and health education: Theory, research, and practice. 4th ed. San Francisco: Jossey-Bass; 2008. p.45-65.
26. Chuma J, Okungu V, Ntwiga J, Molyneux C. Towards achieving Abuja targets: identifying and addressing barriers to access and use of insecticides treated nets among the poorest populations in Kenya. BMC Public Health. 2010 Mar; 10(1): 137. doi: 10.1186/1471-2458-10-137
27. Mushi AK, Schellenberg J, Mrisho M, Manzi F, Mbuya C, Mponda H, et al. Development of behaviour change communication strategy for a vaccination-linked malaria control tool in Southern Tanzania. Malar J. 2008 Sep; 7(1): 191. doi: 10.1186/1475-2875-7-191
28. Mubyazi G, Bloch P, Kamugisha M, Kitua A, Ijumba J. Intermittent preventive treatment of malaria during pregnancy: a qualitative study of knowledge, attitudes and practices of district health managers, antenatal care staff and pregnant women in Korogwe district, North-Eastern Tanzania. Malar J. 2005 Jul; 4: 31. doi: 10.1186/1475-2875-4-31
29. Ministry of Health [MoH]. District implementation plan (Lilongwe) 2017- 2018. Lilongwe, Malawi: MoH; 2017.
30. Ministry of Health [MoH]. Malawi health sector strategic plan II (2017 - 2022). Lilongwe, Malawi: MoH; 2017.
31. The president's malaria initiative: Eleventh annual report to congress, April 2017. Washington, DC: USAID; 2017.
32. Abuja declaration on HIV/AIDS, tuberculosis and other related infectious diseases. [updated 2001 April 27; cited 2018 January]. Available from: http://www.un.org/ga/aids/pdf/abuja_declaration.pdf
33. Cochran WG. Sampling techniques. New York: John Wiley & Sons; 2007.
34. Azizi SC, Chongwe G, Chipukuma H, Jacobs C, Zgambo J, Michelo C. Uptake of intermittent preventive treatment for malaria during pregnancy with Sulphadoxine-Pyrimethamine (IPTp-SP) among postpartum women in Zomba District, Malawi: a cross-sectional study. BMC Pregnancy Childbirth. 2018 Apr; 18(1): 108. doi: 10.1186/s12884-018-1744-y
35. Kibusi SM, Kimunai E, Hines CS. Predictors for uptake of intermittent preventive treatment of malaria in pregnancy (IPTp) in Tanzania. BMC Public Health. 2015 Jun; 15(1): 540. doi: 10.1186/s12889-015-1905-0
36. Mbonye AK, Neema S, Magnussen P. Preventing malaria in pregnancy: a study of perceptions and policy implications in Mukono district, Uganda. Health Policy Plan. 2006 Jan; 21(1): 17-26. doi: 10.1093/heapol/czj002
37. Mpogoro FJ, Matovelo D, Dosani A, Ngallaba S, Mugono M, Mazigo HD. Uptake of intermittent preventive treatment with sulphadoxine-pyrimethamine for malaria during pregnancy and pregnancy outcomes: a cross-sectional study in Geita district, North-Western Tanzania. Malar J. 2014 Nov; 13(1): 455. doi: 10.1186/1475-2875-13-455

38. Okoronkwo I, Okoye H. Factors influencing utilization of intermittent preventive treatment and long lasting insecticide treated bed nets by pregnant women in Anambra State, Nigeria. International Journal of Advanced Scientific Research and Management. 2016; 1(7): 229-37.

39. de Jongh TE, Gurol-Urganci I, Allen E, Zhu NJ, Atun R. Integration of antenatal care services with health programmes in low- and middle-income countries: systematic review. J Glob Health. 2016 Jun; 6(1): 010403. doi: 10.7189/jogh.06.010403

40. Mubyazi GM, Bygbjerg IC, Magnussen P, Olsen O, Byskov J, Hansen KS, et al. Prospects, achievements, challenges and opportunities for scaling-up malaria chemoprevention in pregnancy in Tanzania: the perspective of national level officers. Malar J. 2008 Jul; 7(1): 135. doi: 10.1186/1475-2875-7-135

41. Uzochukwu BS, Onwujekwe OE, Akpala CO. Community satisfaction with the quality of maternal and child health services in southeast Nigeria. East Afr Med J. 2004 Jun; 81(6): 293-9.

42. Ogaji DS, Giles S, Daker-White G, Bower P. Systematic review of patients' views on the quality of primary health care in sub-Saharan Africa. SAGE Open Med. 2015; 3: 2050312115608338. doi: 10.1177/2050312115608338

43. Ministry of Health [MoH], ICF International. Malawi Service Provision Assessment (MSPA) 2013-14. Lilongwe, Malawi, and Rockville, Maryland, USA: MoH and ICF International; 2014.

Corresponding author

Montakarn Cheumchit can be contacted at: Montakarn.Ch@Chula.ac.th