Factors associated to the use of insecticide treated nets and intermittent preventive treatment for malaria control during pregnancy in Cameroon

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Abstract

Background: Malaria in pregnancy has been shown to cause both maternal and infant morbidity and mortality especially in sub Saharan Africa. The World Health Organization therefore recommends the use of insecticide treated nets (ITNs), intermittent preventive treatment (IPT) and effective management of clinical malaria. The main aim of this study was to assess the coverage of ITN and IPT among pregnant women and the factors associated with their use in the Buea Health District of Cameroon.

Methods: A cross sectional study was carried out from April to July 2014, in the Buea Health District which included 292 pregnant women attending antenatal care at clinics in the area. A structured questionnaire was use to obtain demographic data of participants and information on IPT and ITN use.

Results: The Overall coverage rate of IPT was 88.7 % and 43.8 % for ITN while the overall non usage rate for IPT and ITN was 11.3 % and 17.5 % respectively. Occupation, educational level, trimester and number of ANC were statistically significant to ITN use by bivariate analyses while being a student/ unemployed (OR = 0.25, 95 % CI = 0.07–0.95) was negatively associated to ITN use by multivariate analysis. For IPTp-SP, occupation of participants, educational level, trimester of pregnancy and number of ANC were statistically significantly by bivariate analyses while attending ANC just once (OR = 0.006, 95 % CI = 0.00–0.04) was negatively associated to IPTp-SP use by multivariate analyses.

Conclusion: This study identified that the use of IPT was fairly good, while ITN use was still low despite their free distribution. Therefore, frequent antenatal care visits and involvement of participants in a potential income generating venture (Business or earning a salary) will increase IPT and ITN usage.

Keywords: Usage, ITN, IPT and pregnancy

Background

Malaria infection during pregnancy is a serious public health problem which can result in maternal and new born morbidity and mortality, especially in sub Saharan Africa where about 30 millions pregnant women are at risk of the disease yearly [1]. In Cameroon, just like in other endemic areas, malaria has been shown to be a cause of maternal anaemia, intra-uterine growth retardation, low birth weight, stillbirths and abortions [2, 3].

Pregnant women are more likely than non pregnant women to become infected with Plasmodium falciparum malaria and, once infected, there is a tendency toward increased severity of disease [4, 5]. The infection rate is higher among primigravidae than multidravid women [6].

The World Health Organization (WHO)’s recommendation for the control and prevention of malaria during pregnancy in areas of high to moderate malaria transmission in Africa is a package of intermittent preventive treatment (IPTp) with Sulfadoxine-Pyrimethamine (SP) and insecticide treated nets (ITNs) with effective management of clinical malaria and anaemia, which is...
commonly delivered through collaboration between malaria and reproductive-health programmes [5].

Studies show that the use of IPTp-SP for malaria in pregnancy in areas of high or seasonal transmission will result in lower placental infection rates, increase in both maternal haemoglobin levels and infant birth weight [7]. In addition, other studies in the mesoendemic area of the Thai-Burmese border and the Gambia [8, 9] found reductions in maternal anaemia and low birth weight with the use of ITNs.

So far, very little work has been done on the factors associated to the use of IPTp-SP and ITN during pregnancy in Cameroon. This study therefore seeks to assess the coverage rate and factors associated to the use of ITN and IPTp-SP for the control of malaria during pregnancy.

Methods

Study area

The study was carried out in the Buea Health District (BHD) that comprises of both rural and urban communities. It has seven health areas with a total of 21 recognised health facilities of which Six were purposively selected: Mount Mary Hospital, Buea Road HC, Regional Hospital Buea, Solidarity Health Foundation, Molyko HC, Mile 16 IHC, to have a spatial distribution of the health facilities.

Study design and population

The study was a cross sectional hospital-based survey that contacted 410 pregnant women. However, 292 pregnant women met the inclusion criteria. That is being in their second or third trimester of pregnancy. There was no case of refusal. The survey was carried out from April to July 2014. The Cochran formula \( Z^2 \times p (1-p)/d^2 \) Where \( z = 1.96 \) for 95 % CI; \( p \) = ITN and IPT usage rate of 25 % and 90 % respectively; \( d \) = precision) was used to estimate the minimum sample size assuming that, the proportion of pregnant women using ITN and IPT was 25 % and 90 % based on [10] and [11] respectively, with a 95 % confidence interval and a 5 % precision.

Data collection

A closed ended structured questionnaire was designed and administered in English. However, for all illiterate women, questions were translated and the participants were interviewed in “Pidgin” (Creole). The questionnaire sought to obtain demographic data and data on IPTp-SP and ITN use. Before the study started the questionnaire was pre-tested out of the study site and upon analysis, the results were promising and questions in which participants had difficulties understanding were rephrased before the final study. Hospital records of participants were used to confirm IPTp-SP use and the dosage. The Roll Back Malaria(RBM) partnership indicator for ITN use which is

| Table 1 Socio demographic characteristics of pregnant women attending ANC in the Buea Health District |
|-----------------------------------------------|
| Characteristics                          | Total enrolled | IPT users (%) | IPT Non users (%) | ITN users (%) | ITN Non users (%) |
|-----------------------------------------------|
| Total                                         | 292            | 259 (88.7)    | 33 (11.3)         | 128 (43.8)    | 51 (17.5)         |
| Gravidity                                     |                |               |                   |               |                   |
| Primigravid                                   | 97             | 94 (36.3)     | 3 (9.1)           | 27 (21.1)     | 18 (35.3)         |
| Secondigravid                                 | 92             | 76 (20.3)     | 16 (48.5)         | 44 (34.4)     | 14 (27.5)         |
| Multigravid                                   | 103            | 89 (34.4)     | 14 (42.4)         | 57 (44.5)     | 19 (37.3)         |
| Age                                           |                |               |                   |               |                   |
| <20                                           | 22             | 19 (7.3)      | 3 (9.1)           | 6 (4.7)       | 3 (5.9)           |
| 21–25                                         | 98             | 92 (35.5)     | 6 (18.2)          | 29 (22.7)     | 19 (37.3)         |
| >25                                           | 172            | 148 (57.1)    | 24 (72.4)         | 93 (72.6)     | 29 (56.9)         |
| Occupation                                    |                |               |                   |               |                   |
| Students/unemployed                           | 92             | 88 (34)       | 4 (12.1)          | 19 (14.8)     | 26 (51.0)         |
| Business                                      | 90             | 79 (30.5)     | 11 (33.3)         | 43 (33.6)     | 12 (23.5)         |
| Civil servants                                | 58             | 50 (19.3)     | 8 (24.2)          | 34 (26.6)     | 7 (13.7)          |
| House wife/ farmers                           | 52             | 42 (16.2)     | 10 (30.3)         | 32 (25)       | 6 (11.8)          |
| Number of ANC Attendance                      |                |               |                   |               |                   |
| First                                         | 27             | 21 (7.9)      | 6 (21.4)          | 22 (18.8)     | 1 (2.0)           |
| Second                                        | 88             | 81 (31.3)     | 7 (21.2)          | 36 (28.1)     | 12 (23.5)         |
| Third or more                                 | 177            | 173 (66.8)    | 4 (1.2)           | 68 (53.1)     | 38 (74.5)         |
| Education                                     |                |               |                   |               |                   |
| Primary                                       | 68             | 56 (21.6)     | 12 (36.4)         | 36 (28.1)     | 10 (19.6)         |
| Secondary/high                                | 126            | 108 (41.7)    | 18 (54.5)         | 62 (48.4)     | 19 (37.3)         |
| Tertiary                                      | 98             | 95 (36.7)     | 3 (9.1)           | 30 (23.4)     | 22 (43.1)         |
| Trimester                                     |                |               |                   |               |                   |
| Second                                        | 150            | 120 (46.3)    | 30 (90.9)         | 73 (57)       | 19 (37.3)         |
| Third                                         | 142            | 139 (53.7)    | 3 (9.1)           | 55 (43)       | 32 (62.7)         |
based on the proportion of pregnant women who slept under an ITN the previous night [12] was equally used to determine ITN use. The term ITN in this study was referred to nets that had been treated with insecticide and needed ongoing treatment. Or long lasting insecticide nets which are currently the most frequently distributed types of net in Africa [12]. The term free distribution net in this study refers to the door to door distribution as well as free nets received from the hospital. A sample size of 288 or 139 had been estimated to provide the desired outcome at 5 % precision, 95 % confidence level and an estimated usage rate for ITN of 25 % [10] and 90 % [11] for IPT.

Ethical considerations
The study was approved by the Institutional Review Board of the Faculty of Health Sciences of the University of Buea. And an administrative authorisation was obtained from the Regional Delegation of Public Health, South West region and the District Medical Officer of Buea. Consent was sought from the different health facilities selected for the study. Informed consent was obtained from the women prior to their interview at the clinic.

Data analysis
A template of the questionnaire was prepared using Epi Info version 3.4.3 statistical software and the data entered and subsequently exported to the Statistical Package for the Social Sciences SPSS version 20 (SPSS, Inc., Chicago, IL, USA) and analyzed. A descriptive statistical analysis was carried out on the use of ITN and IPT. Differences in proportions were analyzed using Chi square ($\chi^2$) tests. Multivariate analysis was done for all significant values obtained from bivariate analysis to get the best-fit model using unconditional multiple logistic regression. A $P$-value < 0.05 was considered a statistically significant association.

Results
The majority of pregnant women in this survey were greater than 25 years, and the ages ranged from 18 to 48 years with a mean age of 26.73 ± 4.681. More than half of the women (60.6 %) were attending ANC for the third time or more; more than two thirds were enrolled or had attained secondary/high school or tertiary level of education, while 22.9 % had the primary level of education (Table 1). The overall use of ITN was 43.8 % and of IPTp-SP was 88.7 % while the overall non usage rate for

| Factors          | ITN use (%) | ITN Non users (%) | Significance | Multivariate analysis |
|------------------|-------------|-------------------|--------------|-----------------------|
| Gravidity        |             |                   |              |                       |
| Primigravid      | 27(21.1)    | 18(35.3)          | $\chi^2 = 3.92$ | NA                    |
| Secundigravid    | 44(34.4)    | 14(27.5)          | $P = 0.141$   | NA                    |
| Multigravid      | 57(44.5)    | 19(37.3)          |              |                       |
| Age              |             |                   |              |                       |
| < 20             | 6(4.7)      | 3(5.9)            | $\chi^2 = 3.92$ | NA                    |
| 21–25            | 29(22.7)    | 19(37.3)          | $P = 0.141$   | NA                    |
| > 25             | 93(72.6)    | 29(56.9)          |              | NA                    |
| Occupation       |             |                   |              |                       |
| Students/unemployed | 19(14.8)   | 26(51.0)         | $\chi^2 = 25.779$ | 0.25(0.07–0.95) | 0.042 |
| Business         | 43(33.6)    | 12(23.5)          | $P = 0.001$   | 0.65(0.18–2.35) | 0.511 |
| Civil servants   | 34(26.6)    | 7(13.7)           |              | 1.39(0.33–5.75) | 0.654 |
| House wife/farmers | 32(25)      | 6(11.8)           |              | REF                   |
| Educational level|             |                   |              |                       |
| Primary          | 56(21.6)    | 10(19.6)          | $\chi^2 = 6.909$ | 2.40(0.57–10.18) | 0.234 |
| Secondary/high   | 108(41.7)   | 19(37.3)          | $P = 0.032$   | 2.11(0.77–5.77) | 0.147 |
| Tertiary         | 95(36.7)    | 22(43.1)          |              | REF                   |
| Trimester        |             |                   |              |                       |
| Second           | 73(57)      | 19(37.3)          | $\chi^2 = 5.710$ | 1.64(0.63–4.27) | 0.312 |
| Third            | 55(43)      | 32(62.7)          | $P = 0.017$   | REF                   |
| Source of ITN    |             |                   |              |                       |
| Hospital         | 50(39.1)    | 18(41.9)          | $\chi^2 = 11.912$ | 7.45(0.67–83.22) | 0.103 |
| Free distribution | 77(60.2)    | 20(46.5)          | $P = 0.003$   | 8.06(0.75–87.04) | 0.09  |
| Bought           | 1(0.8)      | 5(11.6)           |              | REF                   |
| Number of ANC visits |          |                   |              |                       |
| One              | 24(18.8)    | 1(2.0)            | $\chi^2 = 10.464$ | 4.23(0.46–39.19) | 0.204 |
| Twice            | 36(28.1)    | 12(23.5)          | $P = 0.005$   | 1.46(0.53–4.01) | 0.461 |
| Thrice or more   | 68(53.1)    | 38(74.5)          |              | REF                   |

NA means not applicable and REF means reference group use for comparison
IPT and ITN was 11.3 % and 17.5 % respectively. The use of both ITN and IPTp-SP was highest among multigravid women (42.3 %); women in their third trimester (53.6 %), women aged 26 years and above (72.2 %) and women who had three or more ANC attendance (67 %). The non usage of ITN and IPT was highest among women in their second trimester and first ANC attendance. A detailed comparison is found in table.

Factors associated to ITN use
Bivariate analyses for factors associated with ITN use showed that the following factors were statistically significant at $P < 0.05$: occupation, trimester of pregnancy, source of net, number of ANC visits (Table 2).

Again, using multivariate analyses to obtain the final best-fit model, only one factor (occupation of participants) was found to be independently associated with ITN use, with being a student/unemployed person negatively associated to IPT use.

Factors associated to IPTp-SP use
Bivariate analyses for factors associated with IPTp-SP use showed that the following factors were statistically significant at $P < 0.05$: gravidity, occupation, educational level, trimester of pregnancy, number of ANC visits. Again, using multivariate analyses to obtain the final best-fit model, only one factor that is ANC attendance, was found to be independently associated with IPTp-SP use, with those visiting the clinics just once being negatively associated to IPTp-SP use (Table 3).

**Discussion**
This study assessed factors affecting the uptake of IPTp-SP and use of ITN among pregnant women in the BHD. The overall usage rate obtained for ITN was 43.8 %, which is half of that reported in Sudan [13], but similar to that reported in Tanzania [14]. However, it was less than the target for the Abuja Declaration which was set at a target of 60 % ITN coverage. The usage rate of IPTp-SP was 88.7 % which is above the 80 % set by Roll Back Malaria Partnership for 2010, but less than the ambitious 100 % coverage set for 2015 by the same organization. The highest proportion of both ITN and IPTp-SP users were in the >25 year-old group, women who were currently enrolled or had obtained the secondary or high school level of education that is multigravid women and those that had attended ANC three or more times. This might be because multigravid women already know the dangers of malaria in pregnancy. Also those with more ANC attendance had high chances of receiving more lectures on the importance of ITN and IPTp-SP and hence increasing their usage rate. Primigravid women were more likely to use IPTp-SP than ITN which is similar to findings made in a meta analysis [15].

The lone independent factor associated to IPTp-SP use was number of ANC attended, which is similar to

| Factors                        | IPT use (%) | IPT Non users (%) | Significant | Multivariate analysis | OR (95 % CI)    | p-value |
|-------------------------------|-------------|-------------------|-------------|-----------------------|----------------|---------|
| Gravidity                     |             |                   |             |                       |                |         |
| Primigravid                   | 94(36.3)    | 3(9.1)            | $\chi^2 = 10.463$ | 5.04(0.69-37.10)     | 0.112          |         |
| Secundigravid                 | 76(29.3)    | 16(48.5)          | $P = 0.005$ | 0.41(0.11-1.56)       | 0.190          |         |
| Multigravid                   | 89(34.4)    | 14(42.4)          |             |                       |                |         |
| Age                           |             |                   |             |                       |                |         |
| <20                           | 19(7.3)     | 3(9.1)            | $\chi^2 = 3.949$ | NA                   |                |         |
| 21-25                         | 92(35.5)    | 6(18.2)           | $P = 0.139$ | NA                   |                |         |
| >25                           | 148(57.1)   | 24(72.4)          |             |                       |                |         |
| Occupation                    |             |                   |             |                       |                |         |
| Students/unemployed           | 88(34)      | 4(12.1)           | $\chi^2 = 8.135$ | 1.64(0.28-9.67)     | 0.586          |         |
| Business                      | 79(30.5)    | 11(33.3)          | $P = 0.043$ | 4.31(0.85-21.86)      | 0.079          |         |
| Civil servants                | 50(19.3)    | 8(24.2)           |             |                       | 0.51(0.07-3.92) | 0.520  |
| House wife/farmers            | 42(16.2)    | 10(30.3)          |             |                       |                |         |
| Educational level             |             |                   |             |                       |                |         |
| Primary                       | 49(19.4)    | 12(36.4)          | $\chi^2 = 11.749$ | 0.23(0.02-2.14)     | 0.195          |         |
| Secondary/high                | 108(42.9)   | 18(54.5)          | $P = 0.003$ | 0.26(0.05-1.46)       | 0.126          |         |
| Tertiary                      | 95(37.7)    | 3(9.1)            |             |                       |                |         |
| Trimester of pregnancy        |             |                   |             |                       |                |         |
| Second                        | 120(46.3)   | 30(90.9)          | $\chi^2 = 23.283$ | 0.25(0.06-1.13)     | 0.071          |         |
| Third                         | 139(53.7)   | 3(9.1)            | $P = 0.000$ |                       | REF            |         |
| Number of ANC visits          |             |                   |             |                       |                |         |
| One                           | 5(1.9)      | 22(66.7)          | $X^2 = 148.08$ | 0.006(0.00-0.04)     | 0.001          |         |
| Twice                         | 81(31.3)    | 7(21.2)           | $P = 0.000$ | 0.39(0.10-1.56)       | 0.181          |         |
| Thrice or more                | 173(66.8)   | 4(12.1)           |             |                       |                |         |

Where NA means not applicable and REF means reference group use for comparison.
findings in Sudan [13]. This shows that the more
the women go for ANC, the more knowledge they
acquire and the more likely they are to accept and
receive IPTp-SP. This therefore explains why those
who attended ANC just once were negatively associated
to IPTp-SP use. This finding is different from that reported
in a study in Tanzania [16] where number of ANC
attended had no effect on IPTp use.
Furthermore, occupation was the only independently
associated factor to ITN use with being a student/unemployed
negatively associated to ITN use.
Information or recall bias may have occurred during
the study because the data on ITN use was based on interview.
No causal inferences may be drawn from these findings
because of the weak nature of cross-sectional studies.

Conclusion
This study identified that the use of IPT was fairly good
while ITN use is still low despite their free distribution.
However, the use of IPTp and ITN are independently
affected by factors such as number of ANC attended and
occupation of participant respectively. Effective public
health education on the use of ITNs should be reinforced
in addition to giving them out for free, to enhance accessi-
bility to and use of IPT and ITN. It might be productive
for public health authorities and actors to undertake mass
awareness campaigns to educate mothers on the import-
ance of regular ANC visits and IPT use targeting espe-
cially people with low levels of education, pregnant
teenagers, students and the unemployed.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions
NL: Conception and design of study, data collection, analysis, interpretation
and manuscript preparation and pretested the questionnaire. EF: overseeing
of study design, data collection, analysis, manuscript preparation. SW and
JA-K: preparation and critical reading of the manuscript for important and
intellectual content. All authors read and approved the contents of the manuscrip-
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