Utilization of herbs with abortifacient potentials to prevent Malaria in pregnant women in Southwestern Nigeria: A random survey

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Research

Background: Little is known about the potential harmful effects of the plants used by pregnant women for treatment of malaria. This study determined the level of awareness about the potential harmful effects of 3 antimalarial plants (with potential abortifacient properties) used during pregnancy in Abeokuta, Nigeria.

Methods: Structured questionnaire was used to obtain relevant information form 120 participants (43 pregnant and 77 women of reproductive age) from 3 major markets and 2 traditional birth homes (TBHs) in Abeokuta between 2019 and 2020. Data obtained were analyzed using descriptive statistics. Relationship between herb usage and pregnancy outcome(s) was determined using chi-square with probability value of $p<0.05$.

Results: A high proportion of the participants (71.7%) preferred to use herb for malaria treatment during pregnancy. About 13.3 %, 3.3 % and 4.2 % of the respondents claimed to have experienced abortion, still birth and low birth weight (LBW) respectively. Though, abortion was significantly ($p<0.005$) associated with use of antimalarial herbs among the women, none of them linked it to the use of herb. A good proportion of the respondents (43%) were aware that one of the plants used against malaria has the potential of inducing abortion. However, they still preferred to use it in presumably safe quantity.

Conclusion: The use of herbs with abortifacient properties in management of malaria is common among the respondents. There is need to enlighten the public on possible harmful effect of these plants on both mother and the unborn child to improve their health.

Keywords: Traditional Birth Homes; Herbs; Pregnant women; Malaria; Abortion

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Background

It is no longer new in the field of malariology that malaria in pregnancy can be detrimental to both mother and the unborn child. Placental malaria which is one of the major complications of malaria in pregnancy has been incriminated in poor pregnancy outcomes (low birth weight, still birth, abortion, and miscarriage) (Babalola *et al.*2017). As a result, several policies have been made to reduce the scourge of malaria during pregnancy. This includes the use of Long-Lasting Insecticidal Nets (LLINs), Intermittent Preventive Treatment (IPT) and effective case management primarily channeled through

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antenatal care (ANC). Antenatal care (ANC), together with skilled delivery care has been considered a key element of the package of services aimed at protecting maternal and fetal health even against malaria (WHO, 2010).

It is however pitiful that not all pregnant women and women of reproductive age prefers to use ANC or conventional drugs in treatment of malaria during pregnancy in Nigeria. In fact, use of herbs for malaria treatment is quite common among pregnant women in Nigeria. Similarly, the use of Traditional Birth Homes (TBHs) is extremely popular among pregnant women in Nigeria with patronages ranging from 35% to 75% in different parts of the countries (Oshonwon *et al.*2014; Unyime *et al.* 2016). A reported study showed that patronage of TBHs is being encouraged by mothers and mothers-in-law with a claim that TBHs provides the required and safe traditional care in pregnancy (Idowu *et al.*2008). Few studies that assessed the management of malaria during pregnancy among pregnant women attending TBHs revealed that traditional birth attendants (TBAs) often depend on herbs for management of malaria during pregnancy (Adeniran *et al.*2016; Bello *et al.*2011).

Plants contain varieties of compounds that are meant for different purposes. Antimalarial herbs are taken in raw form (without isolating the active ingredient) by users. These compounds may be beneficial and harmful at the same time. However, to use any substance (either natural or synthesized) by a pregnant woman, there must be a consideration for the risk-benefit ratio. In this case, how much benefit will they get in preventing malaria related damages and what is the possible harmful effect of herbs on the mother and the unborn child? Whereas previous studies from Nigeria reported prevalence of abortion of unknown cause ranging from 4.2% to 20% (Adeniran *et al.*2016). Unfortunately, information is seriously lacking on this great issue of epidemiological importance, i.e. what are the herbs used in managing pregnancy associated malaria (PAM) within the country and possible risk associated with the use of these herbs? One of our recent study documented three of the most frequently used plants (*Morinda lucida*, *Enantia chlorantha and Cymbopogon citatrus*) for prevention and treatment of malaria during pregnancy in Abeokuta Nigeria. We also determined their efficacy against PAM as well as the embryo-toxic/abortifacient properties in murine model (Babalola *et al.*2020a). One interesting but shocking fact from our findings was that some of these plants possessed excellent anti-plasmodial properties and even prevented placental malaria related pathological damages (Babalola *et al.*2020b) but still induced abortion and miscarriage by inhibiting the progestogenic activities of the ovary in murine models. In the study, progesterone, an essential hormone (produced by the ovary) that helps in maintaining pregnancy were significantly reduced in mice treated with the plant extracts and consequently, resulted into high proportion of abortion and miscarriage in the mice (Babalola et al. 2020a).

These findings were quite worrisome, and as a result birthed this current study. We carried out a post evaluation on the use of the three herbs among pregnant women and women of reproductive age in Abeokuta with a view to determine the awareness about the harmful effects of the plants during pregnancy, magnitude of poor pregnancy outcomes caused by use of herbs against malaria during pregnancy and factors responsible for high preference with respect to using herbs and traditional antenatal care during pregnancy in the study area.

Materials and Methods

Design

This study was based on qualitative, exploratory research design. We used in-depth interview with questionnaire as primary data collection technique.

Study Area

The research was carried out in Abeokuta, which is the capital of Ogun state. Abeokuta is located within longitude 7° 15^{1} North and Latitude 3° 21^{1} East. Three major markets and two traditional birth homes were used for this study. The markets used were Kuto (7^{o}13$^{'}$941''N, 3^{0}35'035''E), Itoku (7^{o}15'703''N, 3^{o}32''661''E) and Lafenwa markets (7^{0}15''795''N, 3^{o}32'669''E). While the two traditional birth homes used were located at Ago-Ika (7^{0}16''378''N, 3^{o}33'334''E) and Ijemo (7^{0}16''520''N, 3^{o}34'556''E) respectively.

Inclusion criteria and Sample Size

Only pregnant women and women within reproductive ages were included in this study. The pregnant women considered for this study were the ones receiving antenatal care from Traditional Birth Attendants (TBAs). All the pregnant women met at the TBHs were included in this study (but interviewed separately). A convenient random sampling was carried out within the market. Therefore, a total of 120 participants (43 pregnant and 77 women of reproductive ages) were enrolled for this study.

Pilot Study for validity and reliability test

Before the commencement of this research pilot studies were conducted at locations that are different from the study area. Validity was determined with internal consistency method. In this test, Cronbach's alpha, whose values between 0.70 and 0.90 were acceptable (CDC, 2008). Reliability of the questionnaire was carried out with intra-class

correlation coefficient (ICC) for stability analysis. This involved comparing of score obtained after application of the questionnaire in the test-retest as recommended in literature (Sapnas and Zeller, 2002). The value of at least 0.65 for ICC was adopted following the recommendation of Fayers and Machin, (2007) for substantial agreement. The Chronbach's alpha value of 0.87 and ICC of 0.85 obtained from this study rendered the questionnaire valid and reliable. Errors observed in the way questions were itemized were also corrected (visual validity) prior to the commencement of the study.

Questionnaire administration

A structured open-ended questionnaire was self-administered to the respondents (interview method). This is to ensure easy analysis and interpretations of data. The questionnaire was divided into 4 different sections; Personal characteristics of respondents, history of pregnancy, Treatment of malaria in pregnancy using herbs and Awareness and use of *Morinda lucida*, *Enantia chlorantha, Cymbopogon citatrus* and other antimalarial plants during pregnancy. Interactions were also made with the participants on cost of patronizing TBHs, Hospitals and Herb sellers.

Trustworthiness

In this study, we utilized prolonged engagement with participants to strengthen the credibility of the accounts. The interviews were also recorded with a recorder to be able to capture all information provided by the interviewee (Lowe *et al.*2016).

Data Analysis

Data were entered into Excel and thereafter transferred to SPSS version 20.0 for further analysis. Descriptive statistics (simple percentages, tables and figures) were employed. Also, relationship between use of herbs and poor pregnancy outcomes were also tested using Chi-square test with probability value of $p<0.05$ considered as being significant.

Results

Demographic characteristics of pregnant and women of chid bearing age interviewed on the use of *Morinda lucida*, *Enantia chlorantha* and *Cymbopogon citatrus.*

The age of the respondents ranges from 25 – 44 years, with average age of 32.5 ± 2.5 years (Table 1). Most of the respondents (64.2 %) were traders, with Most of the respondents having formal education (36.7 % and 15% had primary and tertiary education respectively). Lastly, about 35.8 % of the respondents were pregnant at the time of the interview (Table 1).

Table 1. Demographic characteristics of women of childbearing age interviewed on the use of *Morinda lucida, Enantia chlorantha and Cymbopogon citatrus*

Variables	Frequency N = 120	Percentage
Age (Years)	Mean = 32.5 ± 2.5	
25-29	25	20.8
30-34	66	55.0
35-39	21	17.5
40-44	8	6.7
Occupation		
Artisan	33	27.5
Trader	77	64.2
Civil servant	3	2.5
Teacher	2	1.7
Others	5	4.2
Educational status		
Pry	44	36.7
Sec	39	32.5
Tertiary	18	15.0
None	19	15.8
Pregnancy status		
Pregnant*	43	35.8
Non-pregnant	77	64.2

*Most 41 of 43 (95.3%) of the pregnant women were interviewed at traditional birth home (TBH)

Pregnancy history and use of herbs against malaria among pregnant women interviewed

Most of the respondents (48.8 %) were multi-gravid with Most of the pregnant women (65.1 %) being in their second trimester. A high proportion of the pregnant women (62.8 %) claimed to have suffered from at least one episode of malaria in their current pregnancy (Table 2). All the pregnant women claimed to use herbs in treatment of malaria which about 41.2% claimed to use *C. citratus*, followed by *E. chlorantha* (23.4%), *Morinda lucida* (21.9%), *Vernonia amygdalina* (8.1%), among other plants. Other plants mentioned by the respondents to be useful in preventing malaria in pregnancy includes, *Vernonia amygdalina* (8.1%), *Carica papaya* (2.3%), *C. medica* (1.2%) etc. (Figure 1). Most of them (37.2 %) sourced their herbs from herb sellers, followed by self (29.1 %), parents/elders (24.4 %) (Figure 2)

Most of the respondents (67.6 %) claimed not to solely depend on TBHs for antenatal care, a low percentage (31.6%) of the pregnant women claimed to use intermittent preventive treatment (IPT) during pregnancy. The traditional birth attendance (TBAs) claimed to exclusively manage malaria among their patients with herbs. However, they did not disclose the names of plant(s) used in treatment of malaria in pregnancy.

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Table 2. Pregnancy history of pregnant women interviewed

Variables	Frequency N=43	Percentage
Gravidity		
Primi	13	30.2
Secundi	9	20.9
Multi	21	48.8
Gestational age		
1st trimester	1	2.3
2nd trimester	28	65.1
3rd trimester	14	32.6
Malaria episode during pregnancy		
Yes	27	62.8
No	16	37.2

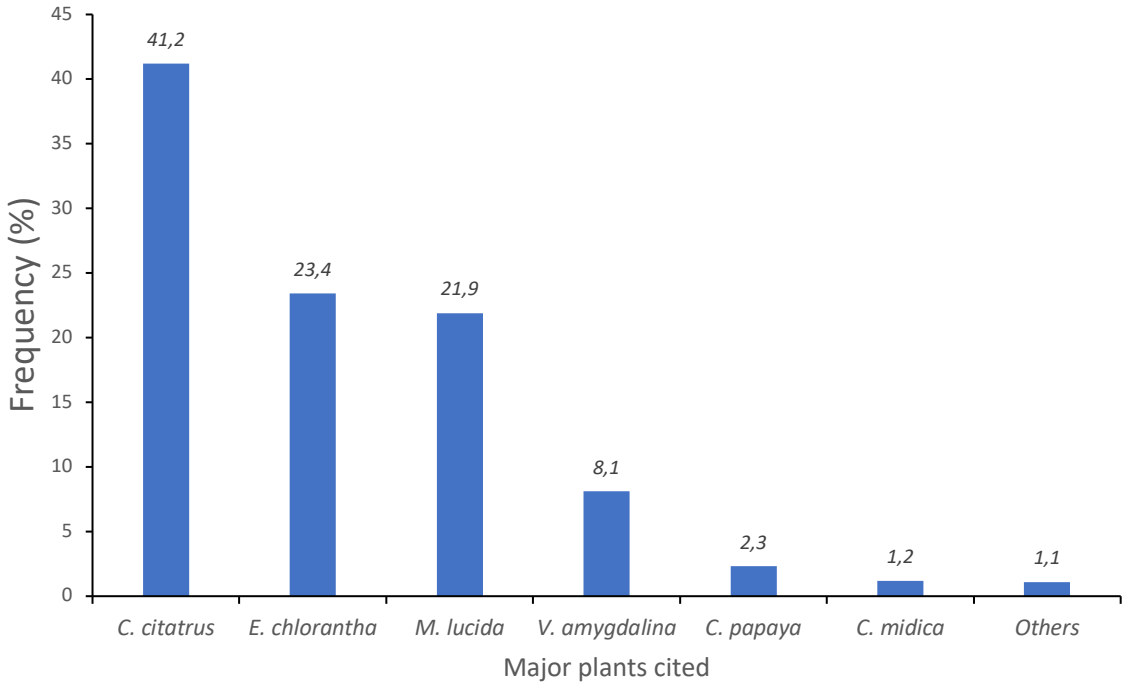

Figure 1. Herbs used in malaria treatment among the pregnant women

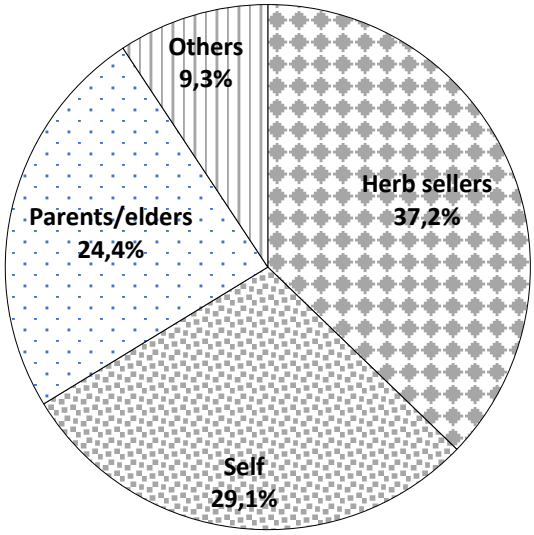

Figure 2. Sources of herbs used in treatment of malaria during pregnancy

Occurrence of poor pregnancy outcomes and use of herbs among the respondents

About 13.3 %, 3.3 % and 4.2 % of the respondents claimed to have experienced abortion, still birth and low birth weight (LBW) respectively, while none of them had record of deformed baby (Figure 3). Furthermore, a significantly higher proportion ($p < 0.05$) of the pregnant women that claimed to have record of abortion use herbs (*Enantia chlorantha* and *Morinda lucida*) in treatment of malaria during pregnancy. However, occurrence of still birth and LBW were slightly higher ($p > 0.05$) among the herb (*Enantia chlorantha* and *Morinda lucida)* users (Figure 4). It is also noteworthy that none of the respondents attributed those records to wrong use of herbs in malaria treatment during pregnancy.

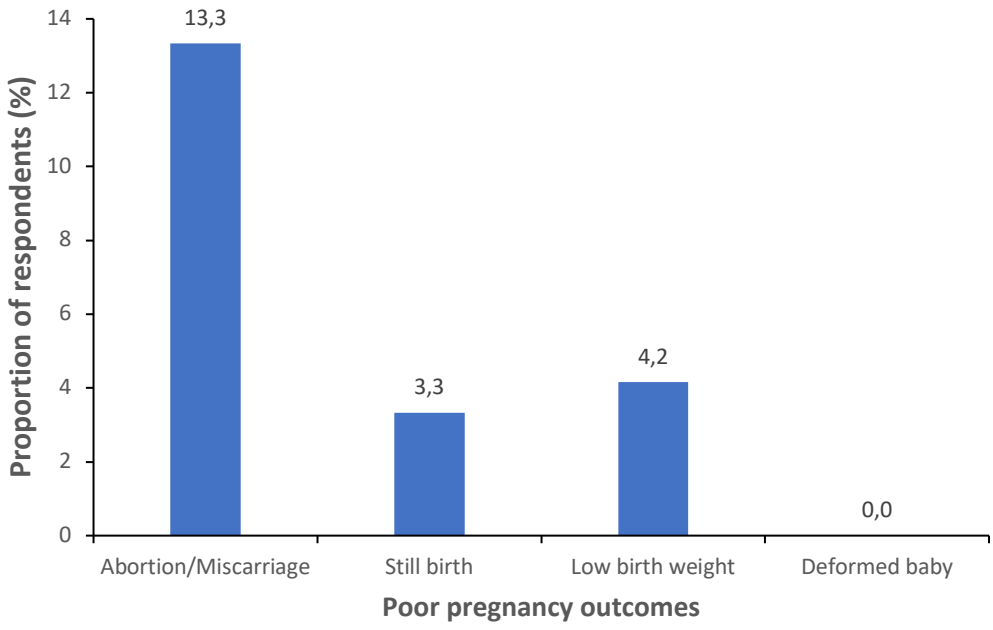

Figure 3. History of poor pregnancy outcomes among the respondents

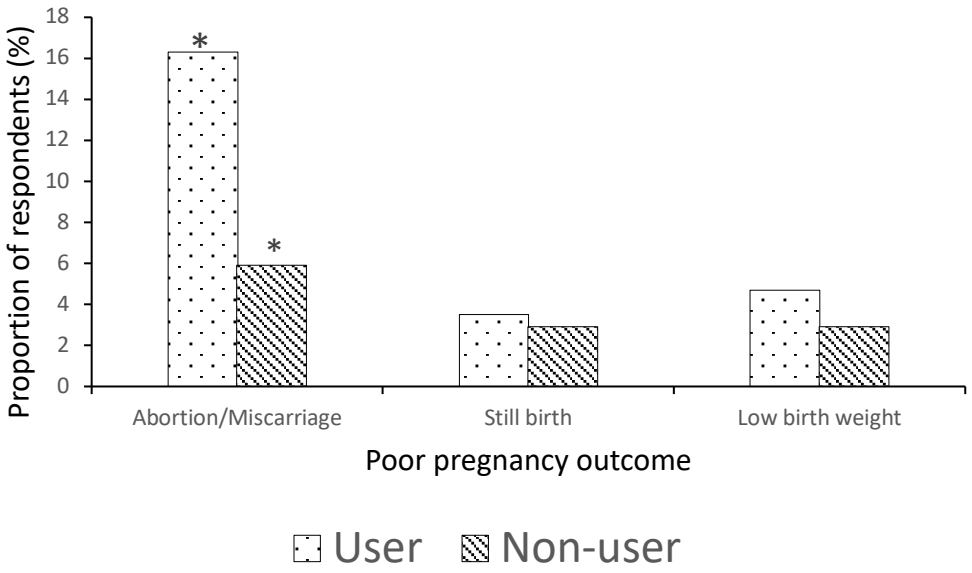

Figure 4. Occurrence of poor pregnancy outcome with respect to herb usage among the pregnant women
Note: Bars with asterisk (*) connotes significant difference between users and non-users of herbs

Factors influencing preference for herbs in treatment of malaria in pregnancy among the respondents

Most of the respondents (71.7 %) preferred taking herbs for malaria treatment during pregnancy. Major reasons given by the respondents were; the fact that herbs are safer than conventional drugs during pregnancy (44.2 %), followed by the believe that they are very effective in treatment of malaria (33.7 %) while about 12.8 % of the respondents believed it makes their baby grow stronger (Table 3).

Table 3. Use of herbs in treatment of malaria in pregnancy among the respondents

Variables	Frequency	Percentage
Preference for herbs against malaria during pregnancy		
Yes	86	71.7
No	34	28.3
Total	**120**	**100.0**
Reasons for taking herbs		
It is safer than conventional drugs	38	44.2
It is very effective	29	33.7
It makes baby becomes stronger	11	12.8
Others	8	9.3
Total	**86**	**100.0**
Reasons for not taking herbs		
Religious believe	19	55.9
It can induce abortion	11	32.4
Others	4	11.8
Total	**34**	**100.0**
All antimalarial herbs are safe for use during pregnancy		
Yes	55	64.0
No	9	10.5
Do not know	22	25.6
Total	**86**	**100.0**

Reasons for not taking herbs by some of the respondents was dominated by religious believes. This was followed by 32.4 % of the respondents who claimed herbs could induce abortion especially if used during early pregnancy stage (Table 3).

Furthermore, most of the herb users (64 %), claimed that all antimalarial herbs are safe for use during pregnancy followed by 25.6 % that claimed the do not know, while only 10.5 % of the respondents claimed that not all antimalarial herbs can be used during pregnancy (Table 3).

Awareness and use of *E. chlorantha*, *M. lucida* and *C. citratus* among the respondents

All the respondents were aware of both *E. chlorantha* and *C. citratus,* as antimalarial herbs while 94 % of the respondents were aware of *M. lucida* as antimalarial herbs. Furthermore, most of the respondents use the three herbs during pregnancy, with *C. citratus* having the highest frequency of usage, followed by *E. chloranta*.

Regarding their safety for use during pregnancy, all the respondents claimed that *C. citratus* is completely safe for use. On the other hand, a high proportion of the respondents claimed that *E. chlorantha* might not be safe for use during pregnancy when compared with that of *M. lucida.* (Figure 5).

About 84.9 % of the respondents claimed that the selected anti-malarial herbs are effective. However, about 43 % of the respondents claimed to have heard about the abortifacient properties of the selected plants in which Most incriminated *E. chlorantha.* (Table 4). Most of the respondents (61.6 %) claimed that taking the herbs during first trimester, may induce abortion, while about 24.4 % believed that taking too much may cause abortion (Table 4).

Most of the respondents (54.7 %) got informed about the abortifacient properties of the selected herbs from herb sellers. This was followed by 29.1 % that got information from parents and elders, while 4.7 % and 11.6 % of the respondents got informed through personal experience and other means respectively Table 4).

Apart from assessment of the perception of the respondents on the abortifacient properties of the selected herbs, our in-depth interview with some of the respondents revealed that other harmful effects of may exist. The respondents stated that use of alcoholic and aqueous extracts of *E. chlorantha* may be associated with womb rupture, fetal malformations, and even death of fetus.

Cost implications of receiving treatment from TBH and public hospital

The cost implications for enjoying the services of TBHs and Hospital for antenatal care are presented in Table 5. It is quite interesting that the cost of using TBHs (ranging from 22.86 USD to 58.57 USD) in the study area was more expensive compared to that of public hospitals (ranging from 24.29 USD to 29.28 USD). During the interview with some of the pregnant women, we learnt that even though there were public hospitals close to them, they still preferred to travel a long distance to seek care from TBHs. Comparing the cost of drugs against malaria in pregnancy (IPT-Sp) with that of herbs, the results showed that the latter cost more than the former (Table 5).

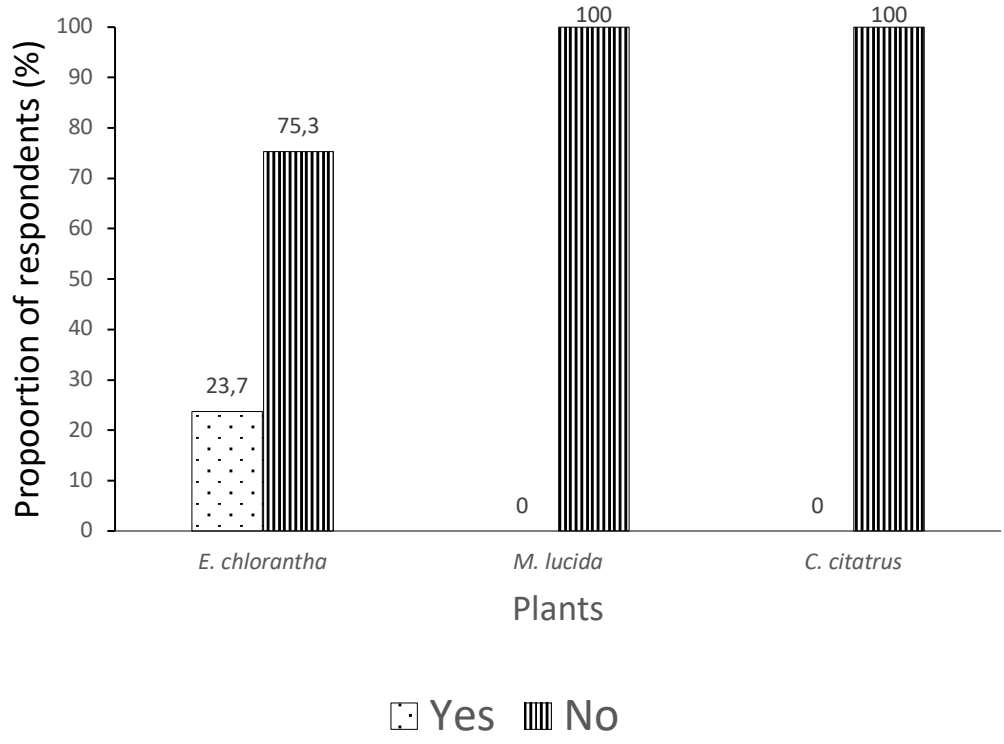

Figure 5. Awareness about unsafe use of the selected herbs during pregnancy

Table 4. Perception of the respondents about effectiveness and abortifacient properties of the selected herbs

Variables	Frequency	Percentage
Effectiveness of the selected herbs		
Effective	73	84.9
Not that effective	13	15.1
Total	**86**	100.0
Awareness about the abortifacient properties of the selected herbs		
Yes	37	43.0
No	49	57.0
Total	**86**	100.0
Ways by which they cause abortion		
Taking it in the first trimester	53	61.6
Taking too much of herbs ("Overdose")	21	24.4
When alcohol is used as solvent	12	14.0
Total	**86**	100.0
Source of information		
Herb sellers	47	54.7
Parents/elders	25	29.1
Self-experience	4	4.7
Others	10	11.6
Total	**86**	100.0

Table 5. Cost of patronizing TBH, Government Hospitals and Herb Sellers among pregnant women in Abeokuta, Ogun State Nigeria

ITEMS	Amount (USD)		
	TBH	**HOSPITAL**	**HERB SELLERS**
Registration	20.00 – 42.86	24.29 – 28.57	-
Appointment Card	1.43 – 5.71	0.00 – 0.57	-
Malaria Preventive Drugs	-	0.00 - 0.14	-
Herbal Concoction/ Service charges	1.43 – 10.00	-	1.43 - 10.00
Total Amount (USD)	**22.86 – 58.57**	**24.29 – 29.28**	**1.43 - 10.00**

Discussion

The use of herbs for malaria treatment is quite common among pregnant women in Nigeria. Similarly, the use of TBHs is extremely popular among pregnant women in Nigeria. Patronage of TBHs is being encouraged by mothers and mothers-in-law with a claim that TBH provides the required traditional care in pregnancy (Idowu *et al.*2008). Traditional management of malaria during pregnancy involves the use of herbs (combination of plants). Plants contain varieties of compounds that are meant for different purposes. Antimalarial herbs are taken in raw form (without isolating the active ingredient) by users. These compounds may be beneficial and harmful at the same time. However, to use any substance (either natural or synthesized) by a pregnant woman, there must be a consideration for the risk-benefit ratio.

Information about the benefits associated with herb usage are widely circulated (Adeniran *et al.*2016; Afolabi and Abejide, 2020) but evidence is lacking about possible risk associated with the use of herbs during pregnancy. This study determined the awareness about the harmful effects of the plants during pregnancy, magnitude of poor pregnancy outcomes caused by use of herbs against malaria during pregnancy and factors responsible for high preference with respect to using herbs and traditional antenatal care during pregnancy in Abeokuta Southwestern Nigeria.

Most of the pregnant women interviewed at the TBHs were not carrying their first child. This is an implication that they are likely to be attending TBHs willingly without much of external influence. Most of these pregnant women had malaria episodes during pregnancy, and it is certain that they are going to take herbs in managing their symptoms (Bello *et al.*2011). Just as it occurred in our previous study, *Cymbopogon citratus* (Leaf), *Morinda lucida* (Leaf) and *Enanthia chlorantha* (Bark) were the most frequently mentioned plant known to be useful in treatment of malaria by the respondents. Other plants mentioned to be useful in managing malaria during pregnancy were also in consistent with another study from Nigeria (Idowu *et al.,* 2010) Both *in vivo* and *in vitro* antiplasmodial activities of these

plants have been reported (Ebiloma *et al.*2011; Idowu *et al.*2010; Idowu *et al.*2014). However, no study has ever documented any information about their harmful effect during pregnancy. In fact, a recent study on traditional and medicinal uses of *Morinda lucida* from Nigeria claimed that *M. lucida* posed no risk to pregnant women without any study or experiment to prove this (Adeleye *et al.*2018).

About 13.3 %, 3.3% and 4.2% claimed to have experienced abortion, still birth and low birth weight respectively in their previous pregnancies. Previous studies from Nigeria reported prevalence of abortion ranging from 4.2 % - 20 % (Adeniran *et al.*2016). Furthermore, abortion was significantly associated with use of herbs in this study. However, none of the pregnant women could link it to the use of herbs. Though abortion can be caused by many other factors (Adeniran *et al.*2016), it is equally important to emphasize that usage of herbs during pregnancy can induce abortion as revealed in this study. Hence use of herbs during pregnancy should be given careful considerations.

Still birth and low birth weight (LBW) are known to be a major complication of malaria during pregnancy (Babalola *et al.*2017). The fact that still birth and LBW were slightly higher among those that use herbs in management of malaria during pregnancy indicates two things. It is either the herbs are not providing adequate protection against the parasite or herbs usage directly contributed to occurrence of still birth and LBW in the study population. There is need for further investigation into this subject matter.

Culture and belief have been known as one of the major drivers of health seeking behavior in sub-Saharan Africa (Oshonwon *et al.*2014; Ebuehi and Akintujoye, 2012). The decisions of 28% of the respondents who claimed not to use herbs in treatment of malaria during pregnancy, were mainly informed by religious believes rather than the potential harm that could be caused by using herb during pregnancy. This was further buttressed by the fact that some of the women still preferred to use *E. chlorantha* during pregnancy despite awareness about the potential of *E. chlorantha* to induce abortion. They believe it is still safer to use in pregnancy compared with conventional drug, if it used in very 'small and presumably safe' (tolerable) quantity. This situation is worrisome because there is no standard dosage for taking these herbs; they only rely on prescription by herb sellers or other unprofessional source. In fact, most of these people boast that their children were strong solely because they took all sorts of herbs during pregnancy.

Finally, comparing the cost of receiving antenatal care (ANC) at TBHs and public hospital, the former is more expensive than the latter. This implies that poverty or lack of money was not responsible for these health seeking behaviours. It was more a factor of what they belief in. Studies from other parts of Nigeria (Oshonwon *et al.*2014; Ebuehi and Akintujoye, 2012) and Africa (Adatara *et al.*2019; Rono *et al.*2018; Izugbara *et al.*2008) reported the role of culture in use of TBHs by pregnant women. A study carried out 12 years ago from the same study area (Idowu et al. 2008) reported that cost of receiving antenatal care at TBHs was higher than that of public hospital. This is an implication that this situation continues to linger on even after a decade. During the interview with some of the pregnant women, we learnt that even though there were public hospitals close to them, they still preferred to travel a long distance to seek care from TBHs. This buttresses how long cultural believes have impacted the health seeking behavior of pregnant women in the study area.

There are several potential consequences associated with exclusive use of TBHs for ANC (Oshonwon *et al.*2014). For example, the issue of Rhesus factor. No specific blood group test (to determine the blood Rhesus factor between the mother and the baby) are required for pregnant women receiving ANC at TBHs. Also, malaria related anemia cannot be detected and treated on time. There is a strong need to solicit for extension of malaria control and other health interventions to pregnant women attending TBHs for ANC.

Conclusion

This study concluded that use of herbs in treatment of malaria during pregnancy is rampant among pregnant women in Abeokuta, Southwestern Nigeria. The herbs used for malaria treatment were associated with abortion and other poor pregnancy outcomes among the respondents. However, none of them could link poor pregnancy outcomes with use of herbs. The major driver of this health seeking behavior was cultural belief. The cost of receiving antenatal care at TBHs was higher than that of public hospital. There is need to enlighten the public on possible harmful effect of these plants on both mother and the unborn child to improve their health

Declarations

List of abbreviations: TBH – Traditional Birth Home, **PAM** – Pregnancy Associated Malaria, **IPT**-Intermittent Preventive Treatment, **TP** – Traditional Practitioners, **TBA** – Traditional Birth Attendance, **ANC** – Antenatal clinic, **LLIN** – Long lasting insecticidal nets, **LBW** – Low birth weight, ***M. lucida*** - *Morinda lucida*, ***C. citratus*** - *Cympobogon citratus,* ***E. chlorantha*** - *Enanthia chlorantha*

Ethics approval and consent to participate:

This research is a non-invasive study; hence it does not require any major ethical approval. However, advocacy visits were paid to the leaders of the markets and the owners of the two TBHs. They were all briefed about the research and their verbal consents were obtained. The participants were also briefed about the objectives of the research and only those who gave their consent to participate were recruited into the study. All participants were kept anonymous. Approval for the research was granted by the Department of Pure and Applied Zoology review committee on 27th July, 2018, after making a presentation on the research proposal with reference No. PG12-0388/002/018.

Consent for publication: Not Applicable**.**

Availability of data and materials: All data generated in this research has been included in the manuscript by means of Tables and Figures**.**

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