Antimalarial Drugs in Ghana: A Case Study on Personal Preferences

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Abstract: Malaria is a serious infection affecting millions of people in Africa. Our study investigated the personal preferences and applications of antimalarial medicines in Ghana. Based on over 1000 questionnaires distributed in Ghana from January to May 2019, we noticed that although Western medications to fight this disease are widely available, most patients in Ghana prefer treatment with locally produced herbal remedies. This preference appears to be due to a combination of traditional venues for obtaining medicines “on the street” rather than in licensed pharmacies, trust in local and “green” products, extensive advertisement of such local products, and an inherent distrust of imported and synthetic or unnatural medicines. Going local and natural is a trend also observed in other countries across the globe, and adds to the acceptance or rejection of drugs regardless of their activity or toxicity. In fact, adverse side effects associated with herbal remedies, such as general weakness and swollen, sore mouth, do not seem to deter the respondents of this study in Ghana. We propose a combination of (a) increasing public awareness of the benefits of modern medicine and (b) an improvement and control of the quality of herbal remedies to raise the standard of malaria treatment in countries such as Ghana.

Keywords: adverse drug reactions; antimalarial; Ghana; herbal remedies; malaria; questionnaire; street sale; orthodox; unnatural medicines; patient preference

1. Introduction

Malaria is a serious human infection affecting around 228 million people worldwide each year, primarily in African countries such as Ghana. Caused by the Plasmodium parasite and transmitted by female Anopheles mosquitoes, this disease kills over 400,000 persons each year and impacts heavily...
on the health of millions, and also on the healthcare systems and economies of the affected countries [1,2]. Malaria can be treated with artemisinin-based combination therapies and, indeed, the World Health Organization (WHO) advocates the manufacture, import, stockpiling, distribution, and subsequent application of medicines such as artemether–lumefantrine and dihydroartemisinin–piperaquine in fixed-dose combinations in countries where malaria is endemic [3–5].

At the same time, countries such as Ghana, over the centuries, have developed a tradition in treating malaria with locally produced herbal remedies, using branded names such as Taabea or Time Herbal Mixture (Figure 1a).

Furthermore, there is a wealth of locally produced herbal medicinal remedies, such as the one from the fresh roots of Cryptolepis sanguinolenta (Figure 1c), a liquid dosage form which is produced as follows: Fresh roots of C. sanguinolenta are harvested, washed, cut into smaller sizes and dried under shade. An amount of the dried roots based on the practitioner’s discretion is put into an earthen pot after which clean water is added. The fresh roots are then boiled for about 30 min to extract the active ingredients. The preparation is allowed to cool and filtered using a clean white cloth. The filtrate is taken by calabash or cups of different sizes three times daily as directed by the practitioners [6,7].

Today, quite a few of these herbal potions are sold widely and freely over the TV, radio, and “on the street”, often varying in composition and of questionable activity. Nonetheless, such medications are seen by many as an acceptable treatment of malaria and, in all fairness, also need to be distinguished clearly from more “magical” forms of treatments, such as the ones offered by fetish priests [8]. In other words, whilst such herbal remedies may not be able to rely on a firm scientific basis and scrutiny, they can rely on centuries of experience and “history” [9–12].
Based on these considerations, and with the assistance of widely distributed questionnaires, we investigated the possible preference of the local population in Ghana for locally produced herbal versus unnatural or “Western” medications. We tried to determine why patients prefer herbal medicines, if side effects deter the choice for such remedies, where patients obtain their antimalaria medicines, and if there are any specific deterrents or causes which may count for or against herbal remedies on one side and modern unnatural medications on the other.

2. Materials and Methods

In order to address these questions, a questionnaire which can be found in Supplementary Material 1 was devised. The Ethics Committee on Human Research Publication and Ethics, School of Medical Sciences and Komfo Anokye Teaching Hospital, Kwame Nkrumah University of Science and Technology (KNUST) Kumasi, Ghana approved this study and the questionnaire as not requiring ethical clearance. A total of 1200 questionnaires were distributed by qualified personnel trained by experienced lecturers in such survey studies, i.e., five postgraduate and three final year pharmacy students from the department of Pharmacy Practice, Pharmacology and Pharmaceutical Chemistry at KNUST, in some towns and regions of Ghana, as shown in Figure 2.

![Regions and specific towns in Ghana where data were collected](image)

| Region       | Town               | Questionnaires issued | Questionnaires received |
|--------------|--------------------|-----------------------|-------------------------|
| Northern     | Tamale             | 150                   | 138                     |
| Brong Ahale  | Sunyant, Goaso, Techiman | 250                   | 242                     |
| Ashanti      | Kumasi, Obuasi, Ejisu, Asante Akim Agogo | 300 | 277 |
| Greater Accra| Accra              | 300                   | 235                     |
| Central      | Cape Coast         | 200                   | 125                     |
| Total        | 1,200              | 1,017                 |                          |

**Figure 2.** (a) Areas where data were collected and the quantity of questionnaires issued; (b) geographical location of areas data was obtained (marked with orange location pointers) (sketch provided by Leja Nessis).

Questionnaires were handed out to the population in various locations, including marketplaces, the streets, houses, schools, retail shops and pharmacies, hospitals, offices and workplaces, etc. Respondents were selected randomly among persons who had undergone malaria treatment in the past six to twelve months. All persons residing in Ghana for at least twelve months were eligible for inclusion in the study. The questionnaire was read, explained, and translated into the local language to the participants as needed, especially for illiterates. Some respondents were guided through in filling the questionnaire which was collected after completion of the interview. In order to prevent bias, the interviewers followed a standardized pattern in translating and explaining the content of the questionnaires “as is” to respondents. Questionnaires were filled anonymously. Respondents aged 18 to 15 were only included in the study if consent could be sought from a parent or guardian.

A total of 1017 questionnaires were obtained, of which 19 records (1.9%) were filled inconsistently—these were edited and corrected—and there were a few records with changing and unsystematic illogical answer patterns, and these were treated as missing data on item level. Hence,
all data collected could be processed further. Analyses of the data was conducted at the Faculty of Economics and Empirical Human Sciences at Saarland University employing R including packages for general and multinomial logistics and logistic regression models [13–16]. The answers provided in these questionnaires were processed at the Department of Pharmacy Practice at KNUST with the statistics programs IBM-Statistical Package and Service Solutions IBM-SPSS version 25 tool for data [16].

The sociodemographic of respondents were 505 (50%) males, 490 (48%) females, and 19 (2%) preferred not to state. The age ranged between the youth 15–19 years, 87 (9%); 20–24 years, 257 (25%); early adulthood 25–29 years, 202 (20%); adulthood 30–39 years, 218 (21%); and late adulthood ≥40 years 253 (25%). The educational levels were reported as Basic education, 449 (44%); Secondary education, 369 (36%); Tertiary education, 137 (14%); and no formal education, 60 (6%). Respondents cut across different sectors of the economy: Farmers, 375 (37%); Traders, 200 (20%); Professional workers, 135 (13%); Businessmen/women, 112 (11%); Drivers, 97 (10%); and Students, 89 (9%).

3. Results

One of the initial hypotheses of our study has been that the limited availability and/or high costs of modern synthetic antimalaria medicines prevent the local population from taking such medicines and encourage them to rely on less efficient and often dubious herbal remedies obtained from non-conventional distributors [17–20]. To our great surprise, the results obtained as part of this study paint a different, more differentiated picture. It actually looks as if around two-thirds of the population rely exclusively, or in part, on herbal medications which are purchased in response to advertising or from drug peddlers, and in less than one-fifth of the cases, from pharmacies. Interestingly, the usage and preference of herbal over synthetic medications correlate with education and age respectively. In fact, the higher the education, the higher the chances of choosing “herbal”. It is also curious that herbal preparations advertised as low in side effects actually show more adverse effects, and that although these adverse effects are common, they still hardly prevent patients from relying on such potions. Indeed, although extensive scientific studies on the efficiency and side effects of locally produced herbal medicines are still missing, the data collected as part of this study supports a correlation between the application of such herbal preparations and a wide spectrum of adverse reactions, from “significant disability involving swollen, sore mouth, boils” (73.4%) to “general body weakness” (49%) and “nausea and vomiting” (36.1%), with half of respondents reporting severe to very severe (49.8%) forms of adverse drug reactions (ADRs). These often-unexpected findings will now be presented and discussed in more detail.

3.1. Herbal or Orthodox

Among the 1017 probands questioned about their choice of antimalaria drugs, only 31.0% prefer orthodox, i.e., synthetic medicines produced by local pharmaceutical companies or imported into Ghana, as shown in Figure 3a.

![Figure 3. (a) Type of antimalarial agent used; (b) Reasons for choosing the type of antimalarial agent.](image-url)
It is interesting to note that the choice for herbal remedies is not simply one of ease of access or costs. In fact, most respondents, i.e., over half of all 1008 persons questioned, consider “effectiveness” as the most important aspect for choosing herbal ($n = 665, 63.6\%$) and also orthodox medications ($n = 343, 72.6\%$), closely followed by “minor side effects”, as indicated in Figure 3b. Whilst the issue of “costs” is still important to around 43.3% ($n = 669$) of persons choosing herbal medications compared to just 10.2% ($n = 341$) of respondents preferring orthodox products, it is not the main reason for “going herbal”. The same applies to “ease of access”, which only matters to 24.8% ($n = 669$) of customers of herbal and 17.3% ($n = 344$) of customers of orthodox medications. These findings reject the common conception that limited access to Western antimalaria medication may be a reason for switching to herbal products and point towards other reasons for this apparent preference [21]. By contrast, 36.8% rely on locally produced herbal remedies, and 32.2% on a combination of orthodox and herbal.

As Table 1 indicates, this general application of herbal medicines increases with education and is independent of gender. Indeed, there is a statistically highly significant correlation between the type of antimalaria medicine chosen and education. The choice for herbal in comparison to orthodox ($p < 0.02$) or both orthodox and herbal ($p < 0.01$) is statistically significant.

### Table 1. Variables influencing the use/choice of herbal antimalarials against orthodox antimalarial and combination of herbal antimalarial medicine with orthodox antimalarial medicine.

| Variable | 95% Confidence Interval for Odds Ratio | 95% Confidence Interval for Odds Ratio |
|----------|----------------------------------------|----------------------------------------|
|          | $B$ *(SE)  | Lower  | Odds | Upper | $p$-Value | $B$ *(SE)  | Lower  | Odds | Upper | $p$-Value |
| Age      | -0.10     | (0.06)  | 0.80 | 0.90  | 1.01      | 0.08     | 0.01   | (0.06) | 0.90  | 1.01  | 1.13  | 0.93 |
| Education| 0.22      | (0.09)  | 1.04 | 1.24  | 1.48      | <0.02    | 0.28   | (0.09) | 1.12  | 1.33  | 1.57  | <0.01 |
| Gender   | 0.15      | (0.13)  | 0.91 | 1.17  | 1.50      | 0.23     | -0.02  | (0.13) | 0.76  | 0.98  | 1.26  | 0.88 |

$B$-Beta Value; * SE (standard error); 95% CI; (statistically significant numbers are in bold).

The impact of the advice of a caregiver, i.e., medical practitioner or pharmacist, on the choice of the type of antimalarial drug was also studied. The analysis to stick to preferred type of antimalarial, herbal or orthodox, when one is given a different type reveals that age contributes significantly to the preference to go herbal over orthodox medicines ($p < 0.01$) as increasing age corresponds to an increase in herbal antimalarial preference as illustrated in Table 2.

### Table 2. Impelling variables to stick to preferred type of antimalarial when given a different type.

| Variable   | 95% Confidence Interval for Odds Ratio |
|------------|----------------------------------------|
|            | $B$ *(SE)  | Lower  | Odds | Upper | $p$-Value |
| Age        | -0.14     | (0.05)  | 0.79 | 0.87  | 0.96      | <0.01 ** |
| Education  | 0.15      | (0.08)  | 0.98 | 1.16  | 1.37      | 0.08     |
| Gender     | -0.10     | (0.11)  | 0.72 | 0.90  | 1.12      | 0.37     |

$B$-Beta Value; *SE (standard error); VIF > 10 (implying no problems with multicollinearity; (statistically significant numbers are in bold). ** ($p$-value <0.01).

#### 3.2. The Role of Drug Advertisements and Peddlers

The claim by many respondents that such herbal medications are particularly effective, which is implicit in Figure 3b, is rarely supported by scientific evidence. Indeed, there are only a few studies on the composition and activity of such herbal medicines against malaria [1,2]. Nonetheless, there is a major local industry behind such herbal medications, which relies on “tradition” to support its distribution. Indeed, when asked about the sources of such herbal medicines, less than one-fifth of
respondents mentioned a prescription or pharmacy (18.4%), while a smaller fraction cited a licensed chemical shop (14.1%), i.e., a small-scale retail drug store operated by a non-pharmacist licensed to sell over-the-counter medications in Ghana. A vast majority of the respondents obtained such remedies from advertised agents (30.7%), i.e., local herbal producers and sellers who mostly publicize their herbal medications on all kinds of media platforms, including print media, broadcast news and the internet, and drug peddlers (23.2%), i.e., a group of vendors who sell medications without license in public places such as in the streets, in passenger vehicles, and at people’s residences or workplaces. By contrast, traditional healers, i.e., practitioners, licensed or unlicensed, who produce medications from animal and/or plant sources to cure diseases which one may associate spontaneously with such herbal remedies, only represent a very minor source of such products (7.3%) (Figure 4a).

The influence of such adverts is also reflected in the answers to the question regarding factors influencing the choice of source of herbal medications, where virtually all respondents felt affected by “advertisement” on places such as local TV stations, radio stations, and advertising signboards in streets (n = 1017, 99.9%), with “friends’ recommendation” second (n = 1015, 93.6%), before “prescription/pharmacy” (n = 1004, 87.7%) and “drug peddlers” (n = 1017, 73.1%) (Figure 4b).

Together, these numbers point towards a very differentiated and perhaps unexpected image of the choice and acquisition of antimalaria drugs in countries such as Ghana. Rather than simply visiting a doctor or pharmacist, obtaining a prescription or counseling, and then purchasing a prescription antimalaria drug in the pharmacy, locally produced herbal medications are being advertised and sold openly “on the street” to customers of all ages, gender, educational backgrounds, and occupations.

3.3. Adverse Side Effects and Drug Reactions (ADRs)

These findings are rather alarming as such herbal remedies can result in serious adverse side effects (adverse drug reactions, ADRs), such as blocked/ringing ears, blurred vision, itching, nausea and vomiting, general body weakness, and significant disability. Indeed, most of the consumers (n = 1008, 68.2%) of such herbal preparations have reported such ADRs, which either resolved by themselves (61.4%) or, in extreme cases, required hospitalization (17.4%) (Figure 5).
The observed ADRs could indeed be linked to herbal remedies as they occurred only during treatment in 94% of reported cases. Furthermore, in 86% of reported cases, these ADRs resolved themselves after discontinuing the treatment. Interestingly, only 42% of respondents affected by such ADRs (n = 687) refrained from further administration, whilst 58% continued treatment despite experiencing these ADRs and despite the option to obtain an orthodox drug. It is interesting to note that the source of such herbal medication correlates strongly with ADRs, with remedies from traditional healers (p < 0.01) or those purchased from drug peddlers (p < 0.02) particularly prone to causing ADRs. In stark contrast, with medication recommended by friends, i.e., offered or directed to buy by a friend (p < 0.04), per the odds ratio, the probability of ADRs actually decreases (Table 3).

Table 3. A possible relationship between sources of herbal antimalarials and ADRs with odds ratios of experiencing no ADRs in relation to the probability to experience ADRs.

| Source                          | B (SE) | 95% Confidence Interval for Odds Ratio | p-Value |
|---------------------------------|--------|----------------------------------------|---------|
| Advertised agents               |        | Reference category                      |         |
| Prescription/pharmacy           | −0.09 (0.19) | 0.62 0.91 1.33 | 0.63    |
| Drug peddlers                   | −0.45 (0.19) | 0.44 0.64 0.92 | 0.02    |
| Friends’ recommendation         | 0.65 (0.32)  | 1.02 1.92 3.62 | 0.04    |
| Licensed chemical shop          | −0.08 (0.22) | 0.61 0.93 1.41 | 0.72    |
| Traditional healer              | −1.17 (0.35) | 0.16 0.31 0.61 | <0.01   |

B-Beta Value; * SE (standard error); (statistically significant numbers are in bold).

Herbal remedies from pharmacies and licensed chemical shops show no correlation with the reporting of ADRs. It is also noteworthy that respondents who have selected specific herbal medicines for the reasons of “cost” per the odds ratio have higher chance of experiencing ADRs. Ironically, drugs advertised as having “minor side effects” were significantly positively correlated with an increased chance of experiencing ADRs (p < 0.01) (Table 4).
Table 4. A possible relationship between the reason for choosing type of antimalarial agent and ADRs with odds ratios to experience no ADRs in relation to experience ADRs.

| Reason                  | 95% Confidence Interval for Odds Ratio | p-Value |
|-------------------------|---------------------------------------|---------|
|                         | B (SE)                                 | Lower   | Odds Ratio | Upper   |         |
| Cost                    | −1.84 (0.21)                           | 0.11    | 0.16       | 0.24    | <0.01 ***|
| Ease of access          | −0.36 (0.19)                           | 0.48    | 0.70       | 1.02    | 0.06    |
| Effectiveness           | −0.31 (0.18)                           | 0.52    | 0.73       | 1.04    | 0.08    |
| Minor side effects      | −0.65 (0.16)                           | 0.38    | 0.52       | 0.70    | <0.01 ***|

B: Beta Value; * SE (standard error); VIF > 10 (Meaning no problems with multicollinearity); (statistically significant numbers are in bold). ***(p-value is <0.001).

4. Discussion

The results obtained as part of this study point towards a rather unexpected and quite differentiated situation of antimalaria drugs in Ghana. A naïve observer may initially expect that antimalaria drugs in Ghana would be prescribed by qualified medical personnel and then obtained as a modern prescription drug in a pharmacy [4,22,23]. Whilst one may also expect that this may differ in the countryside, such a Western-style acquisition of drugs should be common in larger cities such as Accra and Kumasi.

4.1. Herbal Medications are Preferred Because of Trust

Based on the results obtained as part of this study, and relying on over 1000 participants from across society, this simplistic picture is flawed for a number of reasons. First of all, medications and remedies in Ghana are not distributed solely by pharmacies and licensed chemical shops. As illustrated in Figure 5a, only 32.5% of the population purchase their herbal drugs against malaria in pharmacies or licensed chemical shops. These herbal medications are rather widely available and often sold in some unlicensed shops or by mobile drug peddlers. Here, a rather unexpected picture of locally produced herbal remedies filling the “drug depository” is painted in this study, as these herbal remedies are clearly more readily available to such vendors when compared to prescription drugs, as indicated already in Figure 1c. They must also be considered as one important economic factor in Ghana, which has only a small Western-style pharmaceutical industry. Herbal medication is therefore actively promoted by this national industry.

Nonetheless, availability is not the only reason why herbal medications are preferred in Ghana. In the region we have studied, there is no inherent shortage of orthodox medicines, and “cost” is also not the decisive factor. According to the data shown in Figure 3b, one may assume that trust plays a decisive role. Medications are often recommended by trusted friends or produced locally by trusted companies according to age-old trusted Ghanaian recipes. Advertising, such as the one shown in Figure 5b, also plays on trust. This kind of trust must also be one of the reasons why respondents go for herbal remedies because of “effectiveness”, which is rather curious, as most of these agents might not have been scrutinized for activity at all, let alone proven to be effective against malaria [9,24].

In stark contrast to this trust in and promotion of traditional remedies, imported drugs from major drug companies which, from a scientific point of view, are considerably more trustworthy, are not being advertised in this manner, and may be considered as “foreign” [25–27]. Here, there is a specific distrust felt against drugs produced in countries by themselves not exposed to malaria. At the same time, there is a certain resentment against unnatural substances, in comparison to the “natural” herbal remedies.

4.2. Social Aspects Influencing the Choice of Drug

Both of these social and psychological aspects influencing the choice of cure are neither bizarre nor specific to Ghana. Although we cannot present any firm data on this, local or national products also feature highly on the agenda in countries across the globe. In Germany, for instance, local and national products are preferred, from locally produced vegetables in the supermarket or from the corner, to the fable of German cars. Similarly, alternative medications and, here in particular, herbal
remedies, are also widely sold and administered, from valerian sedatives to concentrated brine to chase your intestinal worms—the majority “made in Germany” or produced at home, just as the brew based on C. sanguinolenta discussed in the Introduction and Figure 1b,c. Likewise, in Ghana, natural “green” products are considered as better or even superior to “chemical”, although most of them may be less active or not active at all, and are also likely to cause adverse reactions. These products are widely advertised on TV and in magazines, and can be sold more widely, without prescriptions and outside pharmacies.

Our data therefore confirms once more that such social aspects influencing the choice of a particular drug must be considered in formulating national and international policy to tackle health issues. It is therefore not sufficient to provide a country such as Ghana with the necessary amounts of modern antimalaria medication. This medication also has to be “sold”, literally, as an effective and trustworthy alternative to traditional remedies. Once again, this matter of trust appears to be strong across the population and regardless of education or occupation. In fact, respondents with higher education are particularly keen on herbal remedies, possibly because of their concern for “natural” rather than “chemical” products. The trust in herbal remedies also overrides justified scientific questions on the effectiveness and risk of ADRs. Indeed, almost half of the respondents stated that they continue to take such herbal remedies despite experiencing ADRs which, in some instances, have actually led to hospitalization.

4.3. ADRs

According to our study, the majority of those respondents, who have indicated using either only herbal or a combination of herbal and orthodox medicine, have experienced some ADRs during the course of treatment with herbal medicines (n = 687, 95%), ranging from mild (16.6%) to severe (49.8%). Interestingly, these side effects have not deterred the respondents from continuing such treatments. The source of the herbal medicine, i.e., either from a pharmacy or licensed chemical shop, on one side, and from a drug peddler or traditional healer on the other, also impact on the quality. It is therefore important to distinguish between the different types of herbal medicines available in Ghana, as some of them may indeed be more amenable than others. In general, the population study presented here confirms that most of these herbal remedies cause a range of ADRs, and that this situation is far from acceptable and should be addressed in earnest. Ironically, the remedies assumed to show few ADRs have been particularly adverse, possibly because these remedies are taken more widely thanks to their “good reputation” [24,28].

4.4. Improving the Situation

It is obvious that the present situation of antimalaria medication in Ghana is far from satisfactory. This is due to a complicated medley of personal preferences, reputation, trust, and advertisement by local producers and vendors. There are also several social and personal preferences for locally produced herbal remedies, an attitude not unique to Ghana. Indeed, one could probably generalize the outcomes of this study to other countries of Western Africa and beyond.

At the same time, the situation also provides certain clues for improvement. On one side, modern medicines based on extensive scientific research and validation need to obtain a better reputation as they are probably more active and show more limited ADRs. Nonetheless, this may not be simple. One valuable alternative, therefore, is more extensive research and development into the existing herbal remedies [10,11,29–33]. This may provide a refinement of the most active mixtures, i.e., higher efficacy and few ADRs. Indeed, such a strategy has several major advantages. Firstly, such remedies have been taken for centuries by the local population, who is familiar with their dosage and actions [34]. Secondly, such remedies, therefore, are already socially accepted. Moreover, they can be produced locally, which benefits the local industry. Eventually, they can be sold by local vendors. Such refinements are also possible in practice, as the correlation between the source of the herbal remedy and the associated ADRs in Table 3 indicates. Certainly sources, such as pharmacies and licensed shops, are clearly better places to obtain better medications from, regardless if unnatural or herbal.
4.5. Limitations

As any survey-based investigation, our study has also experienced certain methodological limitations which may have impacted on certain details of the study, although probably not on the overall outcomes. A few of the respondents, for instance, had difficulties understanding the questionnaires, and this issue was addressed by our trained interviewers who spent time explaining the various parameters to the respondents. This helped the respondents to respond and provide adequate information for the questionnaire. The fatigue associated with questionnaire answering was reduced by interviewers guiding respondents and collecting most of the answers on the spot. In addition, some of the respondents were skeptical about answering the questions due to fear of exposing their identity. Hence, there was the need to emphasize that the questionnaires were collected anonymously, and the obtained data was to be kept under lock and key, only accessible to the investigators. This also reduced the possibility of giving dishonest answers.

5. Conclusions

In summary, our study on the preferences and uses of antimalaria medications in Ghana has shown that despite the availability of orthodox synthetic drugs, there is a significant preference for and usage of locally produced and sold herbal remedies, in part because of personal trust and in part because of aggressive advertising and sales practices by the local producers and vendors. It can be inferred that going herbal is clearly not a matter of money, education, age, or occupation. It is rather a trust in local and natural products and producers, and here, the respondents in Ghana hardly differ from their peers in other countries. As these herbal remedies are largely undefined and not refined as far as their contents and actions are concerned, they often trigger ADRs. Besides encouraging the local population to simply switch to “Western-style” medicine, which may be considered as interfering and arrogant, and may hence be met with resistance and probably result in little tangible benefits, a closer scientific investigation of some of the local remedies may represent a suitable alternative. Indeed, international research and local industry may both find advantages in such a joint approach to the vast benefit of the millions of patients suffering from this infection each year in Ghana and the rest of Africa.

Supplementary Materials: The following are available online at www.mdpi.com/2413-4155/2/2/45/s1, Supplementary Material 1: Questionnaire entitled, “Ethical Access and pharmacovigilance study of herbal antimalarial products in Ghana.

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