

A Systematic Assessment of Barriers to Successful Malaria Control in Rural African Communities: Implications for Public Health Policy

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Abstract: Globally, malaria infections result in 500,000 deaths and 300 million illnesses each year. Although malaria control programs have attempted to implement interventions to reduce malaria prevalence, these strategies are often hampered by social, cultural, and logistical barriers at the community level. In order to gain a clearer understanding of the prevalence of nine key barriers, this paper systematically reviewed 50 studies that have investigated these nine barriers to malaria control in rural African communities. By thoroughly reviewing each study's results for the presence of these barriers, the overall prevalence of each barrier across all 50 studies was determined. The most common barriers were the use of herbal or traditional treatment or prevention methods (68% of studies), the belief in non-mosquito etiology (50% of studies), and limited knowledge of the symptoms of severe malaria (46% of studies). In light of these findings, it is recommended that health policy leaders expand health education programs in rural communities, reduce costs of antimalarial products to the extent possible, and promote research on novel herbal treatments for malaria. Additionally, since this review focuses exclusively on rural African settings, additional systematic analyses should be conducted in other geographical settings, such as Southeast Asia and Central America, to gain a better understanding of the sociocultural and logistical barriers to malaria control that exist globally.

Keywords: Malaria, Barriers to Malaria Control, Rural African Communities, Health Policy.

I. INTRODUCTION

Globally, malaria is responsible for an estimated 500,000 deaths and 300 million illnesses each year.^[1] In order to reduce morbidity and the prevalence of malaria infections, numerous interventions have been implemented in areas where malaria is present. Common interventions employed by malaria control programs include the dispensation of antimalarial drugs and the distribution of insecticide-treated bed nets in local communities, among others.^[2] Merely implementing these interventions, however, is not sufficient to effectively reduce the burden of malaria.

In recent years, several barriers such as increased drug and insecticide resistance have hindered efforts to reduce malaria prevalence.^[3] In addition to biological obstacles such as drug resistance, health policy leaders must also consider social and cultural obstacles at the community level. This is true because although antimalarial interventions may be implemented in communities, they will only successfully reduce malaria in those communities if they are well received by the individuals living within those communities.^[4] In other words, the success of antimalarial interventions depends heavily on both the attitudes of individuals towards the interventions and on the ability of individuals to properly utilize the antimalarial resources that they are provided with. For example, if cultural beliefs lead individuals to prefer herbal treatment methods to modern treatment methods, a policy that makes modern antimalarial drugs available may not have the desired effect because individuals will most likely continue to prefer herbal treatments.^[5] As a result, the knowledge, attitudes, and practices of individuals in malarious communities can greatly impact the efficacy of antimalarial interventions.

Numerous studies have examined sociocultural obstacles to malaria reduction in African communities. When analyzed merely as an individual study, each of these studies presents only a limited amount of relevant information. However, when a large number of these studies are analyzed together as part of a meta analysis, the findings of these studies have greater statistical meaning because common themes and common findings can be observed. Therefore, in order to ascertain the most prevalent beliefs and practices that may hinder malaria eradication efforts, this paper assembles the results from 50 recent studies that have investigated sociocultural obstacles in rural African communities and identifies the themes that are most commonly observed in the literature. Systematic reviews of sociocultural obstacles to malaria reduction have previously been conducted.^[6,7] However, these reviews only assessed papers published between 1992 and 2008. This paper updates the findings of the two aforementioned reviews by examining 50 papers published between 2000 and 2016 and by focusing specifically on rural African settings.

Objective:

Since the success of malaria eradication efforts depends so heavily on the knowledge, attitudes, and practices of individuals living in malarious communities, this paper systematically reviews 50 studies pertaining to this area of research. Through this systematic assessment, this paper aims to identify the most prevalent beliefs and practices that represent the greatest obstacles to malaria reduction in rural African communities. Using the results of this systematic review, health policy makers will be able to design more effective antimalarial interventions that take into consideration the barriers found at the community level.

II. METHODOLOGY

This paper systematically reviews the findings of 50 previously published studies that have investigated barriers to malaria reduction in rural African communities. Through this systematic assessment, this paper identifies the specific cultural, behavioral, and educational barriers that represent the greatest obstacles to the success of antimalarial intervention policies.

Literature search:

The Google Scholar and Medline (PubMed) databases were used to identify and select studies for this systematic review. The terms “knowledge of malaria”, “attitudes towards malaria,” and “malaria practices” were searched separately and in various combinations to identify papers that have examined sociocultural barriers to malaria control. Since this review focuses on barriers exclusively in rural African communities, all studies conducted in urban settings or in locations outside of the African continent were not included in the analysis. Moreover, in order to update the findings of a previous meta analysis^[6] and to analyze a relatively recent body of research, only studies published in 2000 or later were included in the review. The references of the selected studies were also examined to add additional studies that met the primary criteria (rural African setting, publication date of 2000 or later). Furthermore, in order to eliminate the possibility of publication bias, the authors of studies and journals of publication played no role in the process of selection of studies for review. After conducting this thorough literature search and filtering the results to include only studies in rural Africa that have been published in 2000 or later, a total of 50 papers were identified. The basic characteristics of these 50 studies can be found in the first column of Table 1, and citations of all 50 studies can be found in the References section at the end of this paper.

Analysis of themes in each paper:

For each of the 50 selected papers, the abstract, methods, results, and discussion sections were thoroughly read, with an added emphasis on the results and discussion sections because this systematic review aims to compile and analyze the data presented in each study. In each paper, this review examined the presence of nine themes, or barriers, similar to the themes analyzed in two previous reviews of sociocultural barriers to malaria prevention.^[6,7] These nine barriers were as follows: Belief in non-mosquito etiology, belief that malaria cannot be prevented, belief that traditional or herbal treatments should be used in lieu of modern treatments, limited knowledge of the signs and symptoms of severe malaria, use of modern medicines only as a secondary alternative or last resort, use of health care facilities only as a secondary alternative or last resort, use of herbal or traditional treatment or prevention methods, excessive cost of modern treatment and prevention methods, and excessive distance to nearest health care facility. With analytical methods that have been used and described extensively^[6,7,8,9], each of the 50 papers was thoroughly reviewed to determine whether or not each of the nine themes was present in the study’s results. In this way, after reviewing each paper, a checklist for the nine themes was created, with checks next to each theme that was identified in the study’s results.

Meta analysis of all themes:

After thoroughly reviewing the 50 selected papers, 50 theme checklists were created (one for each paper). These checklists were subsequently inputted into Microsoft Excel, and a bar graph (Figure 1) was created to illustrate and rank the nine themes by their prevalence in the 50 papers reviewed.

III. RESULTS

Through the previously described literature search strategy, a total of 50 studies were selected for analysis. The basic characteristics of the selected studies are shown in the first column of Table 1. The publication dates of the studies ranged from 2000 to 2016, with a median publication date of 2006. Additionally, the locations of the studies included a total of 15 Sub-Saharan African countries.

Once all 50 studies were selected, the results of each study were thoroughly reviewed for the presence of nine barriers. The presence of the nine barriers in each of the 50 papers can be found in Table 1. Subsequently, the prevalence of each barrier (percentage of 50 studies in which each barrier is found) was used to create Figure 1, a bar graph that illustrates the nine barriers in order of their prevalence.

Table.1. Presence of Nine Barriers to Malaria Reduction in Each of the 50 Reviewed Studies

| STUDY (First Author Name, Publication Year, and Country Where Study was Conducted) | THEMES REVIEWED IN EACH PAPER | | | | | | | | |
|---|--|---|--|--|--|--|--|---|--|
| | Beliefs or mentalities that may lead to inadequate or improper usage of antimalarial interventions | | | | Practices that may be at odds with the most effective antimalarial interventions available | | | Logistical obstacles that may reduce access to antimalarial interventions | |
| | Belief in non-mosquito etiology | Belief that malaria cannot be prevented | Belief that traditional or herbal treatments should be used in lieu of modern treatments | Limited knowledge of the signs and symptoms of severe malaria* | Use of herbal or traditional treatment or prevention methods | Use of health care facilities only as a secondary alternative or last resort | Use of modern medicines only as a secondary alternative or last resort | Excessive cost of modern treatment and prevention methods | Excessive distance to nearest health care facility |
| Baume 2000 (Zambia) | | | — | — | — | — | | — | — |
| Oberlander 2000 (Tanzania) | — | | | | | | | | |
| Mboera 2002 (Tanzania) | | | | | — | — | — | — | |
| Muela 2002 (Tanzania) | — | | | — | | — | | | |
| Nuwaha 2002 (Uganda) | — | | — | | — | | | — | |
| Nyamongo 2002 (Kenya) | | | — | — | — | — | — | — | — |
| Okrah 2002 (Burkina Faso) | — | | | — | — | — | — | | |
| Comoro 2003 (Tanzania) | | | — | | — | — | | | |
| Deressa 2003 (Ethiopia) | | | | | — | | | | |
| Mutalemwa 2003 (Tanzania) | | | — | | — | — | — | — | |
| Amuge 2004 | | | | — | — | — | — | — | — |

| | | | | | | | | | |
|--------------------------------|---|---|---|---|---|---|---|---|---|
| (Uganda) | | | | | | | | | |
| Mboera 2004 (Tanzania) | — | | | | — | | | — | — |
| Muula 2004 (Malawi) | — | | | | | | | | |
| Nsunga-Sabiiti 2004 (Uganda) | | | — | — | — | — | — | | |
| Adongo 2005 (Ghana) | — | — | — | — | — | — | | — | — |
| Agu 2005 (Nigeria) | — | | | | | | | — | — |
| Akogun 2005 (Nigeria) | | | | — | — | | | | |
| Erhun 2005 (Nigeria) | | | | | | | | — | |
| Eriksen 2005 (Tanzania) | | | — | | | | | | |
| Kaona 2005 (Zambia) | | | | — | — | — | — | | |
| Oguonu 2005 (Nigeria) | — | | | — | — | — | | | |
| Onwujekwe 2005 (Nigeria) | — | | | | — | — | | | |
| Falade 2006 (Nigeria) | — | | — | | — | — | | | |
| Kamat 2006 (Tanzania) | — | | | — | | — | | | |
| Makundi 2006 (Tanzania) | — | | — | — | — | — | | | |
| Malik 2006 (Sudan) | | | | | | — | | — | — |
| Montgomery 2006 (Tanzania) | | | | | | | | — | |
| Beiersmann 2007 (Burkina Faso) | — | | | — | — | — | | — | |
| Deressa 2007 (Ethiopia) | | | | | — | | | | |
| Edson 2007 (Tanzania) | | | | | — | | | — | |
| Ndyomugenyi 2007 (Uganda) | | | | | | | | | — |
| Essé 2008 (Cote d'Ivoire) | — | — | — | — | — | — | | — | |
| Idowu 2008 (Nigeria) | — | | | | — | — | | | — |
| Okeke 2008 (Nigeria) | — | | | | — | — | — | — | — |
| Hlongwana 2009 (Swaziland) | | | | | — | | | | |
| Legesse 2009 (Ethiopia) | — | | — | | — | | | | |
| Paulander 2009 (Ethiopia) | — | | | | | | | | |
| Karunamoorthi 2010 (Ethiopia) | — | | | | | | | | |
| Kinung'hi 2010 (Tanzania) | | | | — | — | | | — | |
| Mazigo 2010 | | | | | | | | — | |

| | | | | | | | | | |
|--|---|--|--|---|---|---|---|---|---|
| (Tanzania) | | | | | | | | | |
| Nsagha 2011 (Ethiopia) | — | | | | — | | | | |
| Ouattara 2011 (Cote d'Ivoire) | | | | — | — | — | — | — | |
| Adeneye 2013 (Nigeria) | | | | | | | | — | |
| Aderaw 2013 (Ethiopia) | — | | | — | — | — | | | — |
| Iwueze 2013 (Nigeria) | | | | — | — | | | | |
| Kimbi 2014 (Cameroon) | | | | | — | | | | |
| Singh 2014 (Nigeria) | — | | | — | — | | | — | |
| Orimadegun 2015 (Nigeria) | — | | | | | | | — | |
| Serengbe 2015 (Central African Republic) | | | | — | | | | | |
| Sumari 2016 (Tanzania) | | | | | | | | | — |

*Symptoms of severe malaria include convulsions, anemia, splenomegaly, and jaundice

As shown in Table 1, the nine barriers were categorized into three groups based on their similarities: Beliefs or mentalities that may lead to inadequate or improper usage of antimalarial interventions, practices that may be at odds with the most effective antimalarial interventions available, and logistical obstacles that may reduce access to antimalarial interventions. The barrier that was found to be most prevalent was the use of herbal/traditional treatment and prevention methods, appearing in 34 (68%) of the studies reviewed. Furthermore, 25 (50%) of the studies reported that the majority of their study populations believed in non-mosquito etiology. The least common barrier mentioned in the 50 studies' results was the belief that malaria cannot be prevented, which was mentioned in just 2 (4%) of the studies analyzed. Figure 1 below illustrates the nine barriers in order of their prevalence in the 50 reviewed studies.

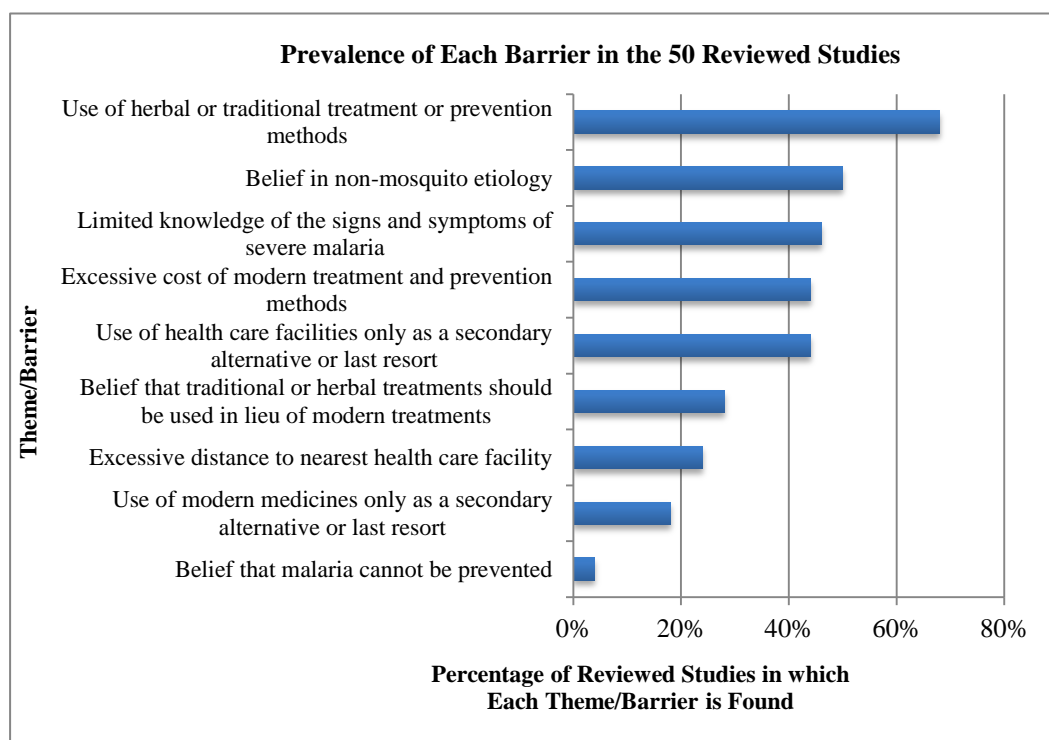


Fig. 1- Prevalence of Each Barrier in the Body of Research Reviewed

IV. DISCUSSION AND RECOMMENDATIONS

This systematic assessment successfully analyzed 50 studies for the presence of nine barriers to malaria control and ranked these barriers in order of their prevalence (Fig. 1). In light of the findings illustrated above, there are three key recommendations to health policy leaders regarding malaria control in rural African communities: strengthen health education programs, reduce the cost of antimalarial products, and promote research on herbal treatments for malaria.

Strengthen health education programs:

This findings of this systematic review reveal that there is a severe lack of health education in rural African communities. For example, 25 (50%) of the studies reported a prevalent belief in non-mosquito etiology, meaning that a majority of individuals in these studies believed that malaria is transmitted by something other than mosquitoes. In these studies, malaria transmission was commonly attributed to witchcraft^[10,11] and drinking dirty water^[12,13] rather than mosquito bites. Additionally, nearly half (46%) of the reviewed studies found that individuals had an inadequate understanding of the symptoms associated with severe malaria, which include convulsions, anemia, splenomegaly, and jaundice. From these statistics, it is evident that there is a lack of basic knowledge of malaria in numerous rural African communities. Without having accurate knowledge of malaria transmission and malaria symptoms, individuals in these communities will not be able to utilize the most effective methods available for malaria prevention and treatment. Thus, it is important to improve health education programs in these communities so that individuals have greater awareness of the fundamentals of malaria.

The most surprising finding was that in more than a quarter (28%) of the studies, individuals believed that herbal or traditional treatment methods may be more effective than modern treatments, and that herbal/traditional methods should therefore be used in lieu of modern methods. A robust health education program is needed in these communities to emphasize the fact that at the present time, modern medicines are significantly more efficacious than herbal or traditional remedies. As a result, when individuals have the ability to use either traditional remedies or modern medicines as the first line of treatment, they will be more likely to choose the latter option.

Several studies have shown that a higher level of health education significantly increases one's likelihood of using the most effective antimalarial intervention available.^[14,15,16,17] Thus, in order to maximize effective usage of antimalarial interventions in rural communities, it is strongly recommended that malaria control programs increase opportunities for health education at the community level.

Reduce the cost of antimalarial products:

This systematic review found that in nearly half (44%) of the studies analyzed, individuals reported excessive cost of modern antimalarial products as a major barrier to usage of these products. This cost barrier is most likely what accounts for the very high usage of herbal or traditional treatment methods (the use of herbal or traditional antimalarial practices was reported in more than two thirds of the studies analyzed). While it may not be possible to offer antimalarial products such as insecticide-treated bed nets and antimalarial drugs for free, the costs of these antimalarial products should be reduced to the extent possible in order to maximize accessibility to these products. Prior literature has indicated that the costs of malaria treatment and prevention represent a major economic burden on individuals in Sub-Saharan Africa, and that in order to alleviate this burden, costs of antimalarial products ought to be reduced to the extent possible.^[18,19]

Promote research on herbal treatments for malaria:

This systematic review found that more than two thirds (68%) of the studies reported the usage of herbal or traditional antimalarial practices. Common antimalarial practices of this type include the topical application of elephant dung^[13] and bathing in water with mango leaves.^[16] Since the usage of herbal treatments is so high, it is important for malaria control programs to improve education on modern antimalarial practices and to reduce costs of modern antimalarial products, as explained in the previous two recommendations. However, there exists another possible solution to the high usage of herbal treatments that has not yet been considered in this paper: increasing funding for research on novel herbal malaria treatments. A growing body of research suggests that novel herbal treatments may be able to effectively treat malaria illnesses. For example, one study found that an antimalarial herbal tea reduced the risk of suffering from malaria in a Ugandan community by 55 percent.^[20] Another study found that a traditional Indian herb successfully demonstrated antiplasmodium inhibitory activity in *Plasmodium falciparum*, the primary vector of malaria transmission.^[21] Research of this nature has the potential to reveal herbs that could efficaciously treat and prevent malaria illnesses. Therefore, malaria control programs ought to consider increasing funding for research in this rapidly growing field.

V. CONCLUSION

This systematic review analyzed 50 relatively recent studies conducted in rural African communities for the presence of nine potential barriers to malaria control and successfully ranked the nine barriers in order of their prevalence. The most common barriers in the body of research reviewed included the use of herbal and traditional antimalarial practices (68% of studies), the belief in non-mosquito etiology (50% of studies), and limited knowledge of symptoms associated with severe malaria (46% of studies). Additionally, excessive cost was identified as the chief logistical obstacle that reduces access to modern antimalarial products. In light of these findings, there are three key recommendations to health policy leaders regarding malaria control. Health education programs ought to be expanded at the community level, the costs of antimalarial products must be reduced to the extent possible, and research on novel herbal treatments for malaria should be promoted. Furthermore, since this systematic review focused exclusively on rural African communities, additional systematic analyses of this nature should be conducted in other settings, such as Southeast Asia and Central America, to gain a better understanding of the sociocultural and logistical barriers to malaria control that exist globally. As a result, health policy leaders will be able to design more effective antimalarial intervention policies that take into account the various sociocultural and logistical barriers that exist at the community level.

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