ORIGINAL ARTICLE

Understanding Malaria Prevention Behaviors Among Pregnant Women in the Gambia: Insights From the Health Belief Model.

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ABSTRACT

Introduction: Malaria poses a significant threat to pregnant women, increasing the risk of fetal infection and severe health complications. First-time pregnant women are especially vulnerable due to their lower immunity levels. **Methods**: Using a cross-sectional design and multiple linear regression test results, the study investigated the correlation between Health Belief Model components and malaria prevention behaviors among pregnant women in the Upper River Region, Gambia. **Results**: The findings revealed that perception of severity significantly influenced malaria prevention behaviors, with a coefficient of 0.238. T-test analyses revealed that only the perception of severity significantly and positively affected malaria preventive actions among pregnant women, with a t-value of 2.344 and a p-value of 0.025. In contrast, other components of the Health Belief Model (HBM), such as perceived vulnerability ($t = 0.710$, $p = 0.482$), perceived barriers ($t = 1.006$, $p = 0.322$), and self-efficacy ($t = -1.260$, $p = 0.216$) didn't show significant impacts. The perceived benefits component also significantly affected preventive actions ($t = -2.252$, $p = 0.031$). The simultaneous f-test demonstrated that the collective influence of the five HBM components was not statistically significant, with an F-value of 2.376 and a p-value of 0.064. **Conclusion**: These results suggest that while the perception of malaria severity positively influences preventive behaviors, other HBM components do not significantly impact the adoption of malaria prevention measures among pregnant women. The study underscores the intricate nature of factors influencing malaria prevention behaviors in pregnant women, underscoring the need for customized interventions to enhance these practices.
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Keywords: Malaria Prevention, Health Belief Model (HBM), Pregnant Women, The Gambia, Behavioral Analysis.

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INTRODUCTION

A report by The World Health Organization (WHO) stated that 11 million pregnant women in 38 countries are affected by malaria (1,2). The prevalence of malaria in The Gambia based on blood tests is 0.4%, with the highest prevalence in the Gambia's province of Central River Region at 12% (3). The trend data of positive malaria cases and the number of malaria cases (Annual Parasite Incidence/API) indicated 250,644 malaria cases in The Gambia in 2019. The highest number of malaria cases among pregnant women in 2019 was recorded in the Central River Region, with approximately 1,769 cases, accounting for about 0.5 percent of the total malaria cases (4,5).

The incidences of malaria among pregnant women reported in The Gambia in 2018 were 75, 48 in 2019, and had increased to 77 in 2020 (6,7). Data from another department also showed that Basse District Hospital had a relatively high incidence of malaria among first-time pregnant women in the last three years: 12 cases in 2018, decreasing to 10 cases in 2019 and increasing again to 21 cases in 2020 (7). This is surprising considering the existence of various government programs to eliminate malaria among pregnant women, such as distributing insecticide-treated bed nets. The health center under study is strategically located close to the Upper River Region's Health Office in the city center. This proximity should ideally result in a lower incidence of malaria among pregnant women compared to health centers situated farther from the city and the Health Office (8). The geographical location of a health center significantly affects the number of malaria cases reported. Urban areas, particularly those near major health offices, typically benefit from better healthcare infrastructure, increased accessibility to medical services, and more frequent public health interventions (9). Consequently, these areas often experience lower disease incidence rates. Conversely, health centers in remote or rural locations may encounter higher malaria incidence due to limited access to healthcare resources, fewer health education campaigns, and reduced availability of preventive measures like insecticide-treated nets and antimalarial medications. In the Upper River Region of The Gambia, the health center's urban setting and closeness to the Health Office are crucial factors contributing to managing and reducing malaria cases among pregnant women. Moreover, this health center is close to the Upper River Region's Health Office. It is located in the city center, where malaria incidence among pregnant women should ideally be lower compared to health centers located far from the city and the Health Office (7).

Malaria infection during pregnancy poses significant risks to both the mother and the fetus (10). Pregnant women are the most vulnerable population due to their increased susceptibility to malaria infection compared to non-pregnant adults. Findings from the Eijkman team suggested that first-time pregnant women have lower immunity compared to those with subsequent pregnancies, making them more susceptible to malaria infection (11). Malaria infection can also has negative impacts on pregnant women and their fetuses, including maternal anemia, preterm delivery, fetal death, and low birth weight infants (12,13).

Malaria infection during pregnancy can be prevented through preventive measures, but before these measures are taken, it is essential to understand their perceptions of the risks of malaria infection (14,15). These perceptions can be assessed using behavioral theories or approaches, such as the Health Belief Model (HBM) (16,17). Based on our literature review, there is no existing research to investigate the relationship between HBM components and malaria prevention actions among pregnant women in health centers, specifically in The Gambia and generally in malaria-endemic regions (3,4).

Health Belief Model (HBM) is a popular psychological paradigm for comprehending and forecasting health behaviours, especially those related to illness prevention and control (16,18). The HBM, which has its roots in social cognition theory, contends that people's views of their vulnerability to an illness, its severity, the advantages of acting, and the obstacles to acting all have an impact on their choices to adopt health-promoting behaviours (19). The probability of behaviour adoption is further influenced by other factors such as self-efficacy and signals to action. Together, these elements provide light on how attitudes and beliefs influence the adoption of preventive measures, such using insecticide-treated nets or getting appropriate prenatal care, in the context of preventing malaria in pregnant women (20). This concept is especially pertinent to tackling the complex issues of pregnancy-related malaria, which may result in serious health problems for both the mother and the foetus, such as low birth weight, anaemia, and premature delivery (10).

Identifying HBM components and exploring their relationships with malaria prevention actions among pregnant women is crucial. It also serves as an advantage of using this model because, on the one hand, the government has launched various policies or programs, such as indoor residual spraying campaigns and the free distribution of insecticide-treated bed nets. However, on the other hand, the incidence of malaria among pregnant women remains high (20,21). This could occurs when individuals, particularly pregnant women, are unaware that they are at risk of malaria infection (4). If this is the case, various government policies or programs will be ineffective. Therefore, effective prevention measures can be implemented when vulnerable individuals or communities have prior knowledge of specific health threats, including malaria during pregnancy (22).

In The Gambia, where malaria is still a major public health issue, using the HBM provides a methodical way to comprehend pregnant women's behaviour in areas where the disease is prevalent. Pregnant women continue to have a disproportionately high rate of malaria cases, even with government-led programs like the distribution of insecticide-treated nets and intermittent preventative therapy (4,11,21). The HBM offers a prism through which to view these disparities, highlighting how perceived susceptibility and severity influence preventative measures. For example, the research finds that while preventative behaviours and perceived severity have a positive correlation, action is hampered by obstacles including poor perceived benefits and financial limitations. This complex understanding emphasises the need of customised interventions that target particular obstacles and belief patterns, making sure that tactics are in line with the real-life realities of pregnant women in The Gambia.

Several research findings indicated a relationship between HBM components and positive behaviors or preventive actions (4,23). Studies conducted by Ijioma and also Ahmad, for instance, revealed a correlation between HBM components and preventive actions against sexually transmitted infections (STIs) among commercial sex workers in Surakarta (10,13). Similarly, Barus found that six HBM components were significantly associated with condom use behavior (18). Center for Disease Control (CDC) 2022 indicated a significant positive relationship between HBM and community compliance with Large-Scale Social Restrictions (PSBB) during the malaria pandemic (24). Lee and Cheongs's study also identified perception factors influencing efforts to prevent dengue fever, including perceived vulnerability, cues to action, and perceived benefits, while perceived severity and barriers showed no significant effect (21). Based on the evidence above, we believe conducting research using the HBM model is feasible at Basse District Hospital, as this area is endemic for malaria in Basse.

The conceptual framework in this research (Figure I) investigates the complex connections between maternal health outcomes among pregnant women in The Gambia, health belief model constructions, malaria control practices, and sociodemographic characteristics. In order to comprehend how these demographic traits interact with and impact individual perceptions of malaria risk, the study looks at specific categories such as age differences, occupational backgrounds, educational attainment, wealth stratification, and social media access (4). The theoretical underpinning is the Health Belief Model, which analyses important concepts such as perceived vulnerability, severity, advantages, obstacles, cues to action, and self-efficacy in order to unravel the intricate cognitive processes that influence health-related decision-making and preventative measures (23).

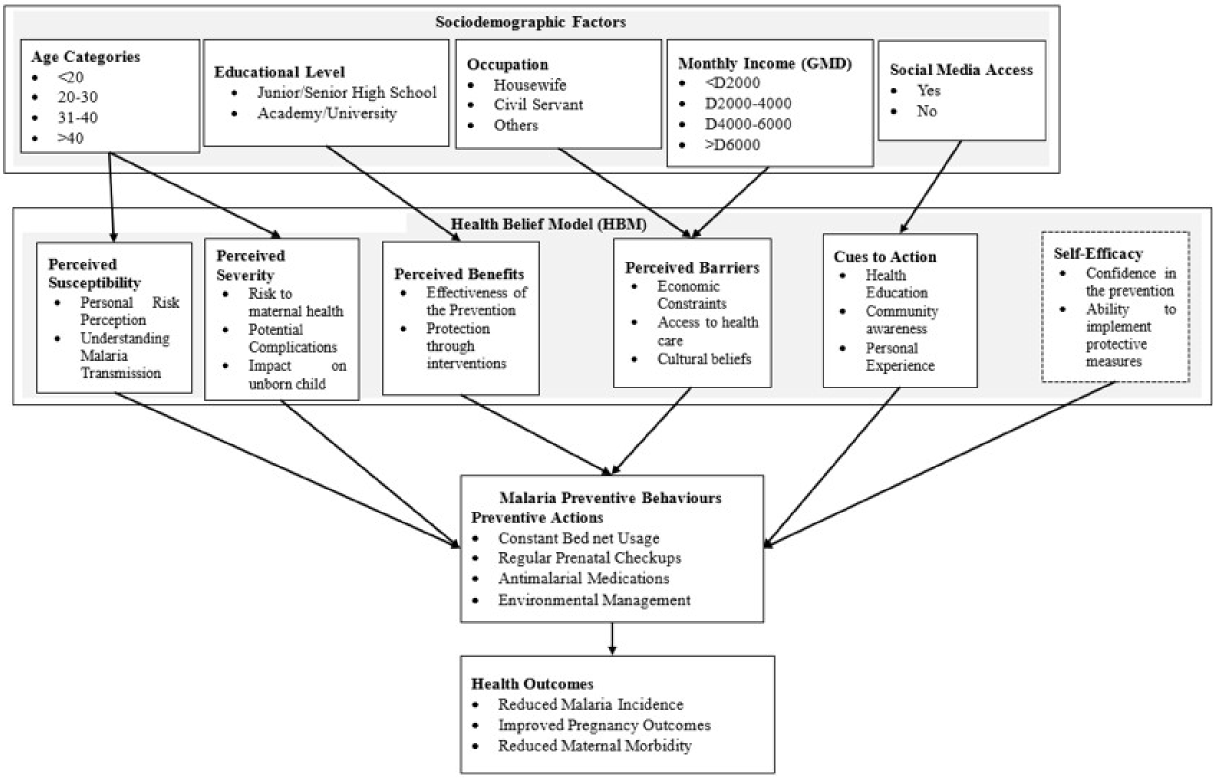

Figure 1: Conceptual Framework of the Health Belief Model (HBM) in Understanding Malaria Prevention Behaviors among Pregnant Women in The Gambia.
The associations between sociodemographic characteristics and HBM factors (perceived vulnerability, severity, barriers, advantages, and self-efficacy) and their impact on pregnant women's malaria prevention behaviors are depicted in this framework. The relationship between personal perceptions and preventive measures like ITN use, prenatal care, and medication adherence is illustrated through data visualization. These factors influence behavioral patterns that lead to better maternal health outcomes.

According to the framework, pregnant women's malaria preventive practices are greatly impacted by the health belief model constructions, which are directly influenced by sociodemographic determinants. The use of bed nets, prenatal care, medication adherence, and environmental management are all examples of preventative behaviours that are thought to be crucial intermediate stages that eventually result in better maternal health outcomes (3,18,20,23). In order to reduce malaria incidence, improve pregnancy outcomes, and minimise maternal morbidity in the Gambian context, the research intends to map these relationships in order to provide a thorough understanding of the various factors contributing to malaria prevention strategies.

The specific objective of this study was to determine the relationship between HBM components, including perceptions of vulnerability, perceptions of the severity of poor health, perceived barriers to action, perceived benefits of behavior change, and self-efficacy, with malaria prevention actions among first-time pregnant women.

Malaria In Pregnancy (MIP)

MIP and Strategic Approach

The National Malaria Control Program (NMCP) in The Gambia aims to ensure that at least 90 percent of the population at risk receives effective malaria preventive therapies for Malaria in Pregnancy (MIP) and Seasonal Malaria Chemoprevention (SMC). For MIP, the NMCP advocates for a comprehensive strategy, including Intermittent Preventive Treatment in pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP), distribution of insecticide-treated nets (ITNs) during the first antenatal care (ANC) visit, and appropriate case management for malaria during pregnancy (4,7). To promote early ANC registration and IPTp initiation, the NMCP conducts Social and Behavior Change (SBC) activities targeting households. Coordination with the Reproductive, Maternal, Neonatal, Child, and Adolescent Health Program (RMNCAH) ensures alignment with broader maternal and child health objectives (25). While a national technical working group advises on MIP policy, regular meetings have yet to be established.

IPTp with SP is administered to pregnant women under direct observation during ANC visits in both public and private nonprofit health facilities. According to guidelines, the first IPTp dose is given at 16 weeks of pregnancy or later, followed by monthly doses up to four during pregnancy (7,13). In March 2023, the NMCP updated treatment guidelines to include artemether-lumefantrine (AL) as the first-line treatment for uncomplicated malaria in pregnancy, following the WHO recommendations (6,25,26). Severe cases are referred to primary health centers or hospitals for treatment with artesunate. Maternal and neonatal care guidelines have also been revised to include the WHO recommendation of six ANC contacts during pregnancy.

The Demographic and Health Survey (2019–2020) indicated that skilled providers (98%) have high ANC coverage, meaning they conduct more deliveries than any other health staff, mainly nurses or midwives (86%). However, only 43% of women had their first ANC visit in the first trimester, and 79% attended four or more ANC visits, with only 4% meeting the recommended eight or more ANC visits. While 98% of pregnant women received at least one IPTp dose, coverage of IPTp3+ stands at 52%, with higher rates in urban (54%) than rural areas (49%) (27).

A 2020 midterm review highlighted gaps in staff training and guideline availability, with 71% and 86% of staff trained on MIP in 2018 and 2019, respectively (28). Only 57% of health facilities reported having MIP guidelines, indicating a need for improved guideline dissemination. Strengthening efforts should focus on increasing the uptake of IPTp3+ doses, monitoring MIP activities in private, for-profit health facilities, and ensuring consistent staff training and guideline availability across all health facilities (25).

METHODS

Research Type

The research type employed was observational with a cross-sectional design.

Location and Duration of Research

This study was conducted at Basse District Hospital in the Upper River Region of The Gambia; The research was carried out from January 2024 to July 2024.

Population and Sample

The study population consisted of all pregnant women attending antenatal care during the study period, totaling 500 individuals. This research employed an exhaustive sampling method, ensuring that every member of the target population was included in the study sample. The inclusion criteria were pregnant women of any age who attended antenatal care at the health center during the study period. Women were excluded if they were not pregnant, did not attend antenatal care during the study period, or could not provide informed consent. This approach ensured a comprehensive and representative sample of pregnant women in the region, enhancing the study's validity and reliability

Data Collection

Data collection was conducted using Likert scale questionnaires, which were adapted from the Maternal and Child Health Unit in The Gambia. The statements in the questionnaire were presented as positive/favorable statements with five response options: a score of 5 for 'strongly agree,' 4 for 'agree,' 3 for 'neutral,' 2 for 'disagree,' and 1 for 'strongly disagree.' The questionnaire's validity was tested using Pearson Product-Moment Correlation, while reliability was assessed using Cronbach's Alpha Coefficient technique (25). The Health Belief Model questionnaire comprised 17 statements, all of which were deemed valid. The prevention action questionnaire consisted of 10 statements, of which only five were validated, with the remaining 5 being deemed invalid due to their Pearson correlation coefficient (r) being less than the critical value of 0.3610. The validity test results ranged from 0.364 to 0.905. Invalid statements were excluded from the list before reliability testing. The reliability test values for HBM components were 0.758 (>0.60), while for prevention actions, it was 0.776 (>0.60), indicating that both HBM components and prevention actions questions were reliable.

Questionnaire Sections and Relevance to HBM

The three primary components of the questionnaire utilised in this research were each intended to collect detailed information pertinent to comprehending pregnant women's malaria control practices in The Gambia. Important background information about the participants was gathered in the first section, which concentrated on sociodemographic data. This includes factors including age, income, employment, social media access, and highest educational level attained. In order to discover relevant demographic characteristics impacting health attitudes and behaviours, it was essential to gather these facts.

The elements of the Health Belief Model (HBM) were covered in the second segment. Perceived vulnerability, perceived severity, perceived advantages, perceived limitations, and self-efficacy were among the 17 validated statements that addressed the HBM's main dimensions. A Likert scale approach was used to evaluate each concept, enabling participants to indicate how much they agreed or disagreed with each statement. Participants' perceptions of their risk of catching malaria, the severity of the illness, the benefits of taking preventative measures, the challenges of doing so, and their confidence in carrying them out successfully were all covered in this section.

The third and last segment assessed the participants' preventive measures to lower their risk of contracting malaria. Out of the ten assertions, five were verified and included into the final analysis. This section assessed certain behaviours such using bed nets coated with insecticide, going to prenatal care visits, and taking antimalarial drugs as prescribed. The research sought to determine behavioural patterns and the variables promoting or impeding pregnant women's prevention of malaria by connecting the preventative measures to the sociodemographic information and HBM components

Data Processing and Analysis

The scores of each HBM component and prevention action were totaled to obtain the overall scores. Subsequently, the data were analysed using frequency distribution, multiple linear regression, t-test, and f-test.

Ethical Consideration

The Ministry of Health in The Gambia's Research Ethics Committee cleared this study, which was carried out per ethical standards. The approval given on January 8th, 2024, is suitable for the whole study period as specified in the research protocol and timetable. The reference number for the ethical approval is Et.01/G.10/MoH.01.1/PH.Dir/19.08.021/2024.

RESULTS

This table (Table I) outlines the demographic characteristics of the 500 pregnant women who participated in the study.

Table I: Frequency Distribution of Respondent Demographics at Basse District Hospital, Upper River Region, The Gambia (n=500)

Demographic Characteristic	n	Percentage (%)
Age		
< 20 years	43	8.6
20-30 years	257	51.4
31-40 years	171	34.3
> 40 years	27	5.7
Occupation		
Housewife	429	85.7
Civil Servant/Teacher	29	5.7
Business	13	2.6
Others	29	5.7
Education		
Junior/Senior High School	71	14.3
Academy/University	286	57.1
Madrasah/non-formal Education	143	28.6
Income		
<D2000	300	60.0
D2000-D4000	128	25.7
D4000-D6000	57	11.4
>D6000	14	2.9
Social Media Access		
Yes	400	80.0
No	100	20.0

A significant portion of the respondents were between 20 and 30 (51.4%), indicating that most women in this age group attended antenatal care. Most were housewives (85.7%), reflecting a standard occupational status among the participants. In terms of education, a considerable number had attended Academy/University (57.1%), suggesting a relatively high level of educational attainment. Income distribution showed that 60% of the respondents earned less than D2000, highlighting economic constraints among the participants. Additionally, 80% had access to social media, pointing towards a high penetration of digital platforms among the respondents.

Table II: Frequency Distribution of Respondents' Perceptions of Malaria Prevention Actions

Variable	n	Percentage (%)
Perceived Vulnerability		
Vulnerable	229	45.7
Not Vulnerable	271	54.3
Perceived Severity		
Severe	129	25.7
Not Severe	371	74.3
Perceived Barriers		
Perceived Barriers	200	40.0
No Perceived Barriers	300	60.0
Perceived Benefits		
Perceived Benefits	157	31.4
No Perceived Benefits	343	68.6
Self-Efficacy		
Negative Self-Efficacy	243	48.6
Positive Self-Efficacy	257	51.4
Prevention Actions		
Insufficient	129	25.7
Sufficient	371	74.3

Table II indicates that respondents perceive malaria prevention actions as beneficial. This table presents the perceptions of the 500 respondents regarding malaria prevention actions. The data shows a split in perceived vulnerability, with 45.7% considering themselves vulnerable to malaria. Perceived severity is low, as only 25.7% viewed malaria as a severe threat. There were notable barriers perceived by 40% of the respondents, which could hinder effective prevention actions. However, perceived benefits were recognized by 31.4% of the respondents, while a significant 68.6% did not perceive notable benefits from the prevention actions. The self-efficacy measure indicates that 51.4% had a positive belief in their ability to perform malaria prevention actions. Overall, 74.3% of the respondents reported sufficient prevention actions, suggesting a high level of engagement despite perceived barriers and benefits.

Table III: Correlation Between HBM Components and Prevention Actions Among Pregnant Women in The Gambia

Research Variable	Correlation Coefficient (r)	p-value	Significance
Perceived Vulnerability	0.123 (weak correlation)	0.482	Not Significant
Perceived Severity	0.037 (strong correlation)	0.025*	Significant
Perceived Benefits	-0.365 (strong negative correlation)	0.031*	Significant
Perceived Barriers	0.172 (moderate correlation)	0.322	Not Significant
Self-Efficacy	-0.124 (weak negative correlation)	0.216	Not Significant

* Statistically Significant as it shows a strong correlation.

The Pearson Correlation Test results indicate varying levels of association between different research variables and prevention actions. A slight positive correlation was observed between perceived vulnerability and prevention actions (0.123), although it was not statistically significant (p = 0.482). Perceived severity showed a significant positive correlation (0.037, p = 0.025), suggesting that those who viewed malaria as severe were more likely to engage in prevention actions. Perceived benefits had a significant negative correlation (-0.365, p = 0.031), indicating that those who did not perceive benefits were less likely to undertake prevention actions. The correlations for perceived barriers (0.172, p = 0.322) and self-efficacy (-0.124, p = 0.216) were not significant, implying that these factors had a minimal impact on the respondents' prevention actions.

Figure II shows a detailed representation of pregnant women's attitudes on malaria prevention in The Gambia is shown by the bar chart. The most important factor is self-efficacy, as 51.4% of respondents said they had a good conviction in their capacity to take preventative action.

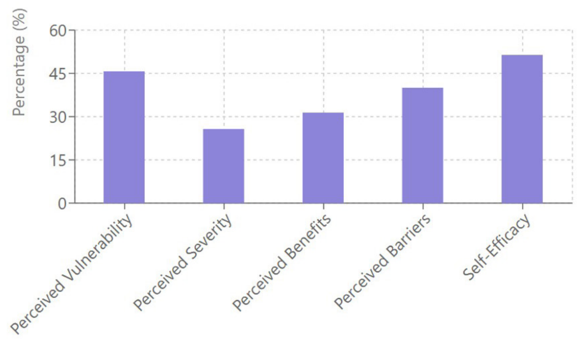

Figure 2: Percentage Distribution of Health Belief Model (HBM) Components Among Pregnant Women in The Gambia.
The percentages of respondents who expressed favorable opinions on vulnerability, severity, barriers, benefits, and self-efficacy in relation to malaria prevention are shown in this bar chart. With self-efficacy being the most highly reported positive component (51.4%) and perceived severity being the lowest (25.7%), the data demonstrates a notable range in awareness and attitudes. These results highlight the necessity of focused efforts to narrow perceived severity and benefit gaps and improve malaria control strategies.

With 45.7% of women admitting they might be at risk of contracting malaria, perceived vulnerability comes in second, suggesting a modest degree of risk awareness. 40% of interviewees identified perceived barriers to malaria prevention, indicating possible difficulties in putting preventative measures into practice. This provides important information. With just 31.4% acknowledging the importance of preventative techniques, Perceived Benefits has a lower representation, which can point to a serious weakness in health education and awareness initiatives.

The most alarming result is Perceived Severity, which shows that just 25.7% of women consider malaria to be a serious health risk. A critical area for focused interventional strategies is highlighted by this low impression of severity, which may jeopardise preventative efforts. The differences among these components of the Health Belief Model highlight the intricacy of health behaviours and the need of customised, situation-specific treatments that target the multiple beliefs affecting pregnant women's prevention of malaria in The Gambia.

Table IV: Multiple Linear Regression Analysis (t-test) of Factors Influencing Malaria Prevention Actions Among Pregnant Women in The Gambia

Model	t	P-Value
Constant		
Perceived Vulnerability	0.710	0.482
Perceived Severity	2.344	0.025*
Perceived Barriers	1.006	0.322
Perceived Benefits	-2.252	0.031*
Self-Efficacy	-1.260	0.216

*Statistically Significant

The multiple linear regression analysis provides insight into the influence of different variables on malaria prevention actions. The constant value of 7.217 represents the baseline level of prevention actions when all predictors are zero. Perceived vulnerability negatively influenced prevention actions (-0.043), though not significantly. Perceived severity (0.238) had a positive and significant impact, suggesting that recognizing the severity of malaria increases prevention efforts. Perceived barriers (0.133) had a positive but non-significant impact. Perceived benefits (-0.176) negatively influenced prevention actions significantly, indicating that lack of perceived benefits reduces prevention actions. Self-efficacy (0.012) had a minimal and non-significant positive influence.

The t-test results highlight the statistical significance of each variable in relation to malaria prevention actions. Perceived vulnerability ($t = 0.710$, $p = 0.482$) and self-efficacy ($t = -1.260$, $p = 0.216$) were not significant predictors. However, perceived severity ($t = 2.344$, $p = 0.025$) was a significant positive predictor, implying that the more severe the respondents considered malaria, the more likely they were to take preventive actions. Perceived barriers ($t = 1.006$, $p = 0.322$) were insignificant, while perceived benefits ($t = -2.252$, $p = 0.031$) were significantly negative, indicating a reduction in preventive actions when benefits were not perceived.

Table V: F-test for the Model Regression to Indicate Model Fitness for Predicting Malaria Prevention Actions (n=500)

f	*P-Value (Sig)*
2.376	0.044

Table V: $F = 2.376$, $p = 0.044$, the F-test result, evaluates the regression model's overall significance. At the traditional 0.05 threshold, the model is statistically significant with a p-value of 0.044. This suggests that a considerable amount of the variation in the respondents' malaria preventive practices may be explained by the predictor factors combined. The statistical significance indicates that the combined effect of the predictor variables is significant in explaining the respondents' preventative behaviours, even when the degree of model fit (as shown by the F-value) may not be very great.

DISCUSSION

The research on malaria preventive practices among pregnant women in The Gambia shows a complex network of demographic and health belief determinants. The group, mostly comprised of young housewives (20-30 years old) with a university degree and modest monthly wages, showed a nuanced attitude toward malaria prevention. The Health Belief Model analysis revealed interesting correlations, even though 80% of respondents had access to social media and 74.3% thought their preventative measures were adequate: perceived benefits showed a significant negative correlation with prevention measures ($r = -0.365$, $p =$

0.031), while perceived severity significantly positively correlated with prevention measures (r = 0.378, p = 0.025). The regression model showed that perceived severity and benefits were important predictors of preventative behaviours, even though most respondents did not think of themselves as very sensitive to malaria (54.3%) or as especially severe (74.3%). A moderate model fit is suggested by the statistical analysis (F=2.376, p=0.064), suggesting that developing focused malaria intervention strategies for pregnant women in The Gambia requires an understanding of the complex relationships between sociodemographic traits, health beliefs, and prevention behaviours.

1. Perceived Vulnerability to Malaria Prevention Actions

Individual beliefs and perceptions are crucial in shaping one's action plans. The Health Belief Model (HBM) emphasizes the importance of individual beliefs and perceptions. These perceptions are closely linked to one's insights derived from previous knowledge (4). Prevention actions represent an active behavior that can be observed (29). The behavioral domain or prevention action consists of several factors, including knowledge and attitudes (30). Research by Ashley in 2020 (29) demonstrated a relationship between knowledge, attitudes, and preventive actions against malaria. Similarly, other studies showed a correlation between knowledge, attitudes, and preventive actions against malaria among adolescents (7,31,32). The construct of perceived susceptibility also influences the emergence of healthy behaviors. When individuals perceive themselves at risk of contracting a disease, they develop a belief in their vulnerability, leading them to take measures they believe can reduce this risk (31).

However, in this study, perceived vulnerability did not influence preventive actions. This finding contradicts the results of Armando et al. in 2023, who found a relationship between perceived vulnerability and preventive behaviors against malaria among health science students (33). This suggests that respondents may perceive themselves as not at risk or vulnerable to malaria, perhaps because they are immune or have frequently encountered malaria, leading them to perceive the disease as commonplace. They may also believe that if they contract malaria, it will only affect them and not others. Additionally, they may consider themselves currently unaffected by malaria, leading them to perceive the disease as trivial (33,34).

Behavioral scientists refer to the concept of HBM as individual-centered, meaning individuals learn through observation. (34) All these theories focus on an individual's vulnerability to health threats, the benefits of behavioral change, and the barriers to such change. They assume that people are rational and will act correctly once provided with adequate information and understand that change is in their personal interest. However, these models may be ineffective if individuals are indifferent or fearful of adverse health consequences, irrational, or not currently in a rational thinking framework (34,35).

The reason why respondents feel less vulnerable to malaria can be explained by the theory of adaptation proposed by Roy Calista (36). According to this theory, individuals adapt to their environment, including the risks involved. If someone has been living in an area for a long time, they may feel accustomed to certain risks, including the risk of contracting malaria (3,36). Additionally, some respondents may have previously contracted malaria but successfully recovered, making them feel more immune and less vulnerable to the disease (37). They may perceive a recurrence of malaria as a common occurrence and believe that they will recover as they did before. Furthermore, if dangers are threatening their fetus, they may perceive the effects as something that will happen in the future rather than immediately (10,12). These impacts can be felt or realized in the short, medium, or long term. In this context, respondents may feel that malaria's impact is insignificant to them because they have become accustomed to or not significantly affected by the disease over time (38). Therefore, they may feel less vulnerable and less concerned about the possibility of contracting malaria.

2. Perception of Severity Influences Malaria Prevention Measures

Perception of severity, as a construct, reflects an individual's belief regarding the seriousness of a disease. The regression model showed that perceived severity and benefits were important predictors of preventative behaviours, even though most respondents did not think of themselves as very sensitive to malaria (54.3%) or as especially severe (74.3%). This perception can be acquired through medical knowledge or information and can stem from belief about a disease's potential impacts on one's life (39). The research findings indicate an influence of perceived severity on malaria prevention measures. This finding is inconsistent with the study by Katje in 2022, which stated that the perception of severity does not significantly affect the behavior of pregnant women in preventing malaria (40). However, present study aligns with the results of several studies, which found an influence of perceived severity on infectious disease prevention behavior (24,29,32,39).

Pregnant women perceive danger if their fetus's life is at risk, thus necessitating preventive measures (10). In contrast to vulnerability, the perception of severity is more emotional as it concerns the safety of the fetus (10,13,30). Research has shown that more than 80% of respondents who primarily had access to social media indicate sufficient knowledge about various aspects, including the severity perception.

Severity of a disease or a condition can lead respondents to neglect their roles as homemakers and breadwinners for their families or those who assist their husbands in earning a living. Economically, this can adversely affect household income (33). A decrease in household income can have negative consequences on other aspects, such as meeting the needs of other family members (20). The perception of severity associated with threatening one's life or death prompts individuals to make every possible effort to prevent harm. Every mother wants the best for her children, so every effort is made to protect her fetus from contracting malaria.

3. Influence of Perceived Barriers on Malaria Prevention Measures
Another construct in the HBM is perceived barriers, which explains that behavior change, such as adopting new activities to maintain or improve health, is inaccessible due to barriers (41). Research findings indicate no influence of perceived barriers on malaria prevention measures. This result is consistent with Mozambique's and Rwanda's study, which stated that perceived barriers do not influence drug use and is supported by the study conducted in Mozambique (39,41). In this study, Gambian women in rural areas tend to insecticide-treated nets in the garden, which should be used for sleeping as suggested in the research by Haileselassie et al., in 2023 (20).

Perceived barriers or obstacles that the respondents faced in implementing malaria prevention behaviors may be due to economic factors. The need to meet household needs may prevent respondents from fully implementing prevention measures, such as using insecticide-treated nets in the garden (41).

The more vital or significant the barriers, the more courteous many Gambian women will be, and that can affect prevention measures. Substantial barriers, without corresponding benefits or rewards for respondents, will also lead them to reconsider preventive actions (42).

4. Influence of Perceived Benefits on Malaria Prevention Measures
Perceived benefit, as a construct, means that individuals engage in healthy behaviors because they believe their actions will benefit them, especially in reducing the risk of contracting malaria (33). The research's finding indicates a negative influence of perceived benefits on malaria prevention measures.

In the study, engaging in preventive measures makes respondents feel slightly uncomfortable because it involves expenditure and requires consistent action. Respondents feel they have to sacrifice something to experience the benefits of preventive measures. The more benefits they perceive, the less they engage in prevention measures. Additionally, to experience the benefits, respondents must consistently implement preventive measures, which undoubtedly takes considerable time. This is consistent with the studies of Lindblade et al., 2020, which stated that for malaria prevention strategies, the person must feel that he/she is receiving benefits in everything he/she does (42).

5. Influence of Self-Efficacy on Malaria Prevention Measures
Self-efficacy, as an individual's perception of their capabilities, influences their healthy behaviors. If individuals feel they can engage in new behaviors that will make them healthier, this belief will likely manifest in their behavior (10,11). The research's finding indicates no influence of self-efficacy on preventive measures. Respondents in this study are not entirely confident in their abilities to prevent or avoid contracting malaria. Behavior, therefore, requires time to become a positive habit practiced consistently.

Support from close individuals is essential in making pregnant women feel that their environment supports their prevention efforts. This is consistent with the study conducted in Guyana (26).

The constructs or components in the HBM are also influenced by other factors (motivating factors) such as culture, education level, past experiences, skills, and motivation (19). These factors are personal characteristics that vary from one individual to another. Additionally, the HBM is influenced by cues to action, which are events, people, or objects that prompt individuals to change their behavior, such as family members falling ill, health advertisements, and advice from others.

Conclusion

This research identifies significant gaps in other Health Belief Model components while highlighting the important influence of perceived severity in influencing pregnant women's malaria preventive behaviours in the Gambian setting. The negative relationship between perceived benefits and proactive preventative measures highlights a crucial obstacle that has to be addressed, even if awareness of the importance of malaria spurred such measures. Additionally, the non-significant impact of self-efficacy, perceived barriers, and perceived vulnerability indicates that structural and sociocultural elements that go beyond personal perspectives also affect health behaviours.

In addition to raising knowledge of the severity of malaria, interventions should show the concrete benefits of preventative measures like insecticide-treated nets and prenatal care in order to close the perceived benefit gap and successfully battle malaria during pregnancy. Along with addressing obstacles like financial limitations and practical difficulties, efforts must also promote self-efficacy via support networks and community involvement. To guarantee cultural appropriateness and acceptability, intervention approaches should also include the larger sociocultural environment, including traditional beliefs, community norms, and access to healthcare.

The advancement of malaria prevention initiatives requires a thorough, multi-level approach including legislators, healthcare professionals, and community leaders. Pregnant women's empowerment via culturally appropriate initiatives, equal access to resources, and context-specific educational campaigns should be given top priority in this strategy. Significant strides may be achieved in lowering the prevalence of malaria, enhancing maternal and foetal health outcomes, and bolstering public health programs in The Gambia by tackling these complex issues.

Research Limitation

Due to time constraints, this research has a few limitations. First, because of its cross-sectional nature, it is difficult to determine a causal link between malaria preventive practices and the elements of the Health Belief Model (HBM). Secondly, the findings could have been skewed due to social desirability bias brought about by the use of self-reported assessments for preventative measures. Furthermore, several HBM factors cues to actions were not thoroughly examined, which would have yielded more complex findings. Future studies should take into account mixed-method techniques to add qualitative insights to quantitative results, broaden the study scope to encompass a variety of geographic locations, and examine longitudinal designs to demonstrate causal linkages. To increase the efficacy of malaria control measures, further research on the cultural and environmental elements affecting malaria preventative behaviours and treatments designed for certain demographic groups are advised.

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