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Video-based education messaging to enhance optimal uptake of malaria preventive therapy in pregnant women: a mixed methods study involving pregnant women and midwives in Uganda

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Abstract

Background Malaria prevention during pregnancy significantly minimizes maternal–fetal adverse events. However, optimal uptake of malaria preventive therapy in pregnancy (MPTp) remains a major challenge for both women living with HIV and those without. In Uganda, suboptimal uptake of MPTp is primarily due to inadequate knowledge among women. This study aimed to develop and assess the feasibility and acceptability of an educational video to improve knowledge of MPTp among pregnant women living with and without HIV.

Methods This study describes the second phase of a mixed methods study conducted among pregnant women (living with and without HIV) and midwives from a public antenatal care clinic in Kampala, Uganda. The study was conducted from October 2022 to Jan 2024, and the first phase involved qualitative data collection from pregnant women, health workers, and Ministry of Health officials to develop a video-based intervention to enhance uptake of MPTp. The second phase involved administration of the developed intervention to a group of purposively selected pregnant women living with and without HIV. Questionnaires, focus group discussions, and interviews were used to collect data among women and midwives, and to assess feasibility and acceptability of the intervention. Quantitative data were summarized using descriptive statistics and analysed using different scales of measurement including the modified system usability scale and the Evidence-based Practice and Attitude Scale (EBPAS), which assessed acceptability among pregnant women and midwives, respectively. The qualitative data were coded and analysed using inductive and deductive thematic methods in Atlas ti.8.

Results A total of 45 women and six midwives were enrolled in the current study phase. The mean age (± standard deviation, SD) of the women was 26 ± 6 years, and the median gestational age (interquartile range, IQR) was 24 (20–32) weeks, and less than half (42%, n = 19) were living with HIV. On the system usability scale, most women (91%, n = 41) rated the intervention as good or excellent, and most (93%, n = 42) were satisfied or very satisfied with the intervention. On the EBPAS, midwives perceived the intervention as reliable with Cronbach's alpha of 0.74,

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and all midwives found the intervention appropriate and feasible in their facility. All women comprehended and highly accepted the intervention.

Conclusion The video-based intervention for uptake of MPTp was found acceptable among women and midwives and was feasible and appropriate to a public health facility. Future studies would test the effectiveness of the intervention in improving knowledge and uptake of MPTp.

Keywords Malaria, Preventive therapy, Pregnancy, Educational video, Qualitative study

Background

Malaria during pregnancy is a major public health problem worldwide, with sub-Saharan Africa (SSA) remaining the most affected region with more than 50 million pregnant women at risk [1, 2]. Malaria during pregnancy is associated with various adverse events, including miscarriage, low birth weight, stillbirth, and maternal morbidity. This infection remains the leading cause of preventable fetal and maternal deaths [3–5]. The effect of malaria on maternal and neonatal health is worsened by coinfection with HIV [6–8], and SSA harbours more than 75% of all HIV infections, with women being at greatest risk [9]. Therefore, the adverse effects of malaria and HIV coinfection are more common in SSA [10]. Uganda bears a double burden of malaria and HIV [11–16] with a prevalence of malaria during pregnancy of 8.9–51.1% [17–19] and a prevalence of HIV among women of reproductive age of 8% [20].

Intermittent prophylaxis with sulfadoxine-pyrimethamine (IPTp-SP) and cotrimoxazole (CTx) is highly effective for the prevention of malaria in pregnant women without HIV and those with HIV, respectively [21, 22]. MPTp during pregnancy effectively reduces malaria parasitaemia by approximately 80% [22, 23]. In women living without HIV, IPTp-SP is taken monthly after the 1st trimester throughout pregnancy [24, 25], whereas in women living with HIV, CTx is taken daily throughout pregnancy [13, 26]. Despite an increase in attendance of antenatal care (ANC) in Uganda to at least 95% in 2019, a commensurable increase in the optimal uptake of MPTp has not been achieved especially in urban areas [3, 27]. For instance, in the country's capital, Kampala, the optimal uptake of MPTp among women living without HIV was 39% in the latest malaria survey assessment conducted in 2018–2019 [3].

The suboptimal MPTp may be due to multiple factors, particularly inadequate knowledge among pregnant women[28]. This results from inadequate education and awareness about MPTp among pregnant women [3, 29–32], primarily due to the persistent low ratio of health workers to patients in low-resource settings (LRSs), such as Uganda [33]. Hence, there is a critical need for new approaches to enhance the knowledge and uptake of MPTp.

Approaches using educational videos have improved health-related knowledge among various populations [34]. Video-based educational interventions are highly cost-effective [34, 35] and foster behavioural changes in various health-related fields, including HIV, by improving the health related knowledge of the target individuals [34, 36–38]. However, there were no similar approaches for improving the knowledge and uptake of MPTp among pregnant women.

Therefore, this study was conducted to develop a video-based intervention termed PreVent (Prevention of malaria during pregnancy using Video-based Education to eNhance opTimal uptake of malaria preventive therapy) and assessed its feasibility and acceptability among pregnant women receiving ANC at a public health facility in Uganda.

Methods

Study design and setting

This was part of a two-phased mixed sequential cross-sectional study that employed both qualitative and quantitative methods. The study utilized a client-centred and stakeholder consultative approach to develop the PreVent intervention from October 2022 to Jan 2024. The first phase of the study solicited input from pregnant women, health workers, and Ministry of Health (MoH) officials to develop the intervention[28] In the second phase, the developed intervention [28] was administered to a group of pregnant women and assessed the satisfaction, feasibility, and acceptability of the intervention among women and midwives. The study was conducted at Kisenyi Health Center IV (KHCIV) from October 2023 to Jan 2024. KHCIV is a public health facility in the Uganda's capital, Kampala that is administered by the Kampala Capital City Authority (KCCA). In Uganda, an HCIV provides general health services plus minor surgeries [39, 40]. KHCIV has a catchment area of ≈2,000,000 people from Kampala and its suburbs, and serves more than 200 people per day [41]. The facility offers free HIV/TB care services, ANC services, and other services. On a daily basis, the facility had ANC attendance of approximately 100 women and conducted approximately 20 births.

Study population

The study population included pregnant women living with and without HIV at any gestational age attending ANC at KHCIV during the study period and midwives from maternal and child health departments at KHCIV.

Study outcomes

The study outcomes were acceptability, feasibility, appropriateness, and levels of satisfaction with the intervention among pregnant women and midwives.

Sample size and sampling procedures

Forty-five pregnant women attending ANC at the KHCIV were purposively selected and enrolled in the study. Women were stratified by age and HIV status (i.e., HIV-negative women aged: 15–17 years, 18–24 years, and 25–49 years; and women living with HIV aged: 15–17 years, 18–24 years, and 25–49 years). A total of six groups of women, each comprising 7–10 women were each administered the video once on different days. After watching the video, each group was engaged in a focus group discussion (FGD). In each focus group, discussions continued until saturation was reached [42].

The intervention

The PreVent intervention consisted of (1) a three-minute video focused on malaria prevention in pregnant women living with HIV and without HIV and (2) a five-minute question-and-answer (QA) session between the woman and the midwife. The QA session was a one-on-one and was meant to address any personal inquiries and reinforce the information presented in the video.

Development and design of the video

The video development and design was an iterative and multistep process that involved pregnant women, health workers, researchers, and MoH officials as previously reported [28]. The process was client-centred and involved obtaining input, opinions, and attitudes from the participants on the vital information that could be included in the video. Data collection was guided by gain- and loss-framed messaging [43] and the health belief model (HBM) theory [44, 45]. The obtained information was reviewed, organized and synchronized by the Research Project Advisory Committee (RPAC), which included pregnant women, researchers, a behavioral scientist, obstetricians, and a malaria expert from the MoH. The RPAC identified key areas the intervention would target, and these were organized into a script. The script underwent an iterative review and editing by the RPAC and scriptwriter until the script was able to address all the key issues. The final script was converted into a video by a well-recognized design firm in Uganda and Africa known as Design without Borders (DwB) Uganda Limited. DwB generated iterative versions of the video based on feedback from the advisory committee, and a final version of approximately 3 min long was produced for use in the intervention[28].

Data collection procedures

Pregnant women attending ANC clinic at KHCIV were purposively selected and informed about the study, and those who were interested consented to participate. Every week, women of the same age group and HIV status were selected from the clinic and scheduled to receive the intervention and participate in the FGDs. During the clinic/study visit for scheduled women, women were consented and their demographics and clinical information were collected using a questionnaire before receiving the intervention. Thereafter, participants were administered the intervention in groups of 7–10 women. After receipt of the intervention, participants were engaged in FGDs to qualitatively assess the acceptability of the intervention. The FGDs were conducted based on open discussion, and each typically lasted for approximately two hours. Focus groups for women living with HIV were held separately, ensuring that participants were aware that they were part of a group of pregnant women with similar experiences. However, confidentiality was strictly maintained throughout the discussions. Participants were informed that their individual health information would remain private, and the facilitator was trained to manage sensitive topics discreetly. The FGDs were conducted by a trained social scientist (facilitator) in a calm place where conversations could not be overheard using an FGD guide (Appendix 1). The FGDs were conducted in the respondents' preferred language, which was Luganda. All discussions were audiotaped and transcribed by a professional.

Using researcher administered questionnaires, The study quantitatively assessed acceptability, feasibility, appropriateness, and satisfaction with the intervention among participants and midwives. The responses to the questions or statements in the questionnaires were obtained using a five-point Likert scale [46]. For participants (women), The study used individual questionnaires (Appendix 2) of a system usability scale (SUS) [47, 48] to assess acceptability of the intervention. It also assessed their satisfaction with the intervention using a modified Larson et al. satisfaction questionnaire [49]. This questionnaire specifically assessed participants' satisfaction with the procedures and processes experienced during the intervention, including the length of the video, the

waiting time associated with the use of the intervention, and the clarity of the video (Appendix 3). For midwives (health workers), The study used the Evidence-based Practice and Attitude Scale (EBPAS) for health providers [50] to assess their acceptability of the intervention (Appendix 4). It also assessed the appropriateness and feasibility of the intervention at KHCIV among midwives using the modified Bartholomew et al. appropriateness rating scale [51] (Appendix 5) and modified Hides et al. feasibility tool [52] (Appendix 6), respectively. The study documents, such as the FGD guides and consents, were translated from English to Luganda, the local language. These were then back-translated to English, and compared the new translation with the original text and reconciled any meaningful differences between the two to ensure that the translations were accurate.

Data management

The audio recordings were transcribed verbatim in Luganda and then translated directly into English by the study team within one week of collection. The study used back-translation to minimize potential loss of meaning during translation. Quality checks were performed for each transcript, with corrections and revisions made to the identified errors. The quantitative data were double checked for errors and then transferred from REDcap to StataCorp version 17 for analysis.

Data analysis

Using Stata version 17 (StataCorp, College Station, TX, USA), descriptive continuous variables, such as age, were summarized using the mean and standard deviation (SD), while categorical variables were summarized using frequencies and proportions (%) in tables and graphs. The modified SUS for acceptability of the intervention among participants was evaluated on a five-point Likert scale [46], and the intervention was considered acceptable if > 70% of participants rated 70% (7/10) of the items on the SUS as very good or higher [48]. The modified Larson et al. satisfaction questionnaire [49] for assessing participant satisfaction with the intervention was also scored on a five-point Likert scale with a single item score of 5 and a total score of 25 indicating the highest level of satisfaction [36]. Participants were considered satisfied if > 75% of participants rated 60% (3/5) of the items as very satisfied or higher. The EBPAS [50] for assessing the acceptability of the intervention among midwives consisted of 15 items measured on a 5-point Likert scale ranging from 0 (not at all) to 4 (to a very great extent). The EBPAS also comprised of four subscales (Appeal, Requirement, Openness, and Divergence) and a total scale score, which represented respondents' global attitudes toward the adoption of EBPs. For the subscales, the Appeal subscale assessed the extent to which the health worker would adopt the PreVent intervention if it wereintuitively appealing. The Requirements subscale assessed the extent to which the health worker would adopt the intervention if it were required by an agency, supervisor, or state. The openness subscale assessed the extent to which the health worker was generally open to trying out PreVent as a new intervention. The Divergence subscale assessed the extent to which the health worker would perceive PreVent intervention as not clinically useful or less important than the routine clinical experience. The EBPAS total score was computed by first reverse scoring of the divergence scale and thereafter computed the overall mean and reliability. Cronbach's alpha reliability for the EBPAS was considered acceptable if alpha was ≥ 0.7 as previously reported for group and individual comparisons [53, 54]. The modified Bartholomew et al. appropriateness rating scale [51] was also scored on a Likert scale, and the intervention was considered appropriate if > 75% of the midwives rated 65 (2/3) items appropriate/necessary or higher. The modified Hides et al. feasibility assessment scale of the intervention [52] was also scored on a five-point Likert scale, and the intervention was considered feasible if ≥ 70% of the midwives rated 70% of the items on the scale agree or higher.

Qualitative data analysis

Using an inductive and deductive content analytic approach, recorded data from the FGDs were transcribed and analysed by the study team supervised by a qualitative research expert using Atlas t.8 software. The initial review was performed during the debriefing process to provide a baseline understanding of the data. As part of the steps of the inductive analysis approach, a constant comparison process continued to identify new information until there was no redundancy in the themes. The Consolidated Criteria for Reporting Qualitative Studies checklist was used to report the study findings [55]. Open coding was carried out to identify specific portions of text corresponding to the acceptability, attitudes, and opinions about the intervention. Provisional labels were defined and illustrated to become codes, which were assembled into a codebook. The data were coded by two coders (a social scientist and corresponding author). The initial codebook was reviewed for consistency of text segmentation and code application with continued intercoder agreement. Upon reaching a consensus, the coders grouped the identified codes into grouped subcategories, categories, subthemes, and finally themes. Coded themes from all the data were compared to obtain generalized themes after removing inconsistent codes. The choice of thematic headings was guided by both the core concepts emerging from the data [56] and the theoretical concepts

of the HBM [57]. During the second phase of analysis, specific topics were designated as core categories; axial coding and constant comparison were used to explore the relationships between the discussion of sensitive data and the contextual situation [58]. Findings and interpretations of the data were discussed until there was group consensus on the dominant themes and meanings contained in the data. The study methodologically triangulated [59] the collected data from FGDs with quantitative results at the thematic analysis stage, which increased the perspectives and deepened the understanding of the meanings attached to the acceptability and feasibility of PreVent intervention.

Ethical approval

Approval to conduct this study was obtained from the Makerere University School of Medicine Research Ethics Committee (Mak-SOMREC-2021-279) and the Uganda National Council for Science and Technology (NS384ES). Administrative clearance was obtained from the Director of Health Services at KCCA and KHCIV administration. Written informed consent was obtained from all participants; confidentiality and anonymity were strictly observed. Informed consent for illiterate participants was obtained in the presence of an impartial witness (a guardian or other literate person not part of the study team). The procedure of obtaining informed consent from illiterate participants was approved by the above IRB. All methods were performed in accordance with the relevant guidelines and regulations of good clinical practice and human subject protection for ICH-6 patients.

Results

A total of 45 pregnant women were enrolled and organized into six FGDs and less than half 42% (n = 19) were living with HIV. The mean age (± SD) was 24 (± 6), and the majority (49%, n = 22) were aged between 18 and 24 years. The majority (80%, n = 36) were from urban areas, and most (49%, n = 22) had completed a secondary level of education. The majority (71%, n = 32) were currently living with their sexual partners. The median gestational age (interquartile range, IQR) was 24 (20–32) weeks, and the average number of ANC visits (range) was 4 (1–8) visits, as shown in Table 1.

A total of six midwives were interviewed, all of whom were female midwives, and their average experience of working in maternal and child health was 4 years.

Acceptability of the PreVent intervention using the SUS among women

Women rated the intervention using the SUS, and the majority (91%, 41/45) rated the intervention as good or excellent, as shown in Fig. 1.

Table 1 Sociodemographic characteristics of the pregnant women attending antenatal care at Kisenyi Health facility

Characteristic		Frequency	Percentage (%)
Age (n = 45)	**Mean (± SD)**	**24 (± 6) years**	
Education level (n = 45)	Primary education level	20	44.4
	Secondary education level	22	48.9
	Tertiary education	03	6.7
Currently living with partner (n = 45)	Yes	32	71.1
	No	13	28.9
Residence	Urban	36	80
	Semi-Urban	9	20
Financial Support from partner (n = 45)	Yes	41	91.1
	No	4	8.9
Time taken to reach the health facility (n = 45)	Less than 1 h	22	48.9
	1–2 h	20	44.4
	More than 2 h	3	6.7
Monthly income (n = 45)	No income	21	46.7
	< $25	2	4.4
	≥ $25	22	48.9
Number of ANC attended (n = 45)	≤ 2 ANC visits	28	62.2
	> 2 ANC visits	17	37.8
Weeks of gestation (n = 45)	Median (IQR)	24 (20–32)	

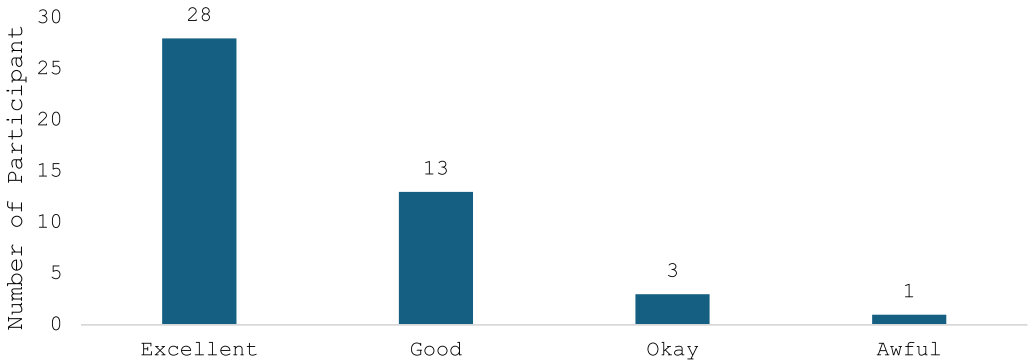

Fig. 1 Participant system usability scale (SUS) for assessment of prevent intervention acceptability

Table 2 Participant satisfaction with the key elements of the PreVent intervention at Kisenyi Health facility

Satisfaction parameters	Very satisfied	Satisfied	Ok	Dissatisfied	Very dissatisfied	Total
Video length	29	12	3	1	0	45
Waiting time associated with the use of the intervention	24	18	3	0	0	45
Place of watching the video	20	19	3	3	0	45
Video clarity	34	11	0	0	0	45
Contents of the video	35	10	0	0	0	45

Participant (women) satisfaction with the intervention

Women rated the five questions on satisfaction questionnaire. The majority rated the questions as"satisfied" or "very satisfied". The average number of women who rated the questions as satisfied or very satisfied was 42, with a range of 11 to 35, as shown in Table 2.

Acceptability, appropriateness, and feasibility among midwives

A total of six midwives provided responses on the acceptability of the intervention. They also provided responses on the appropriateness and feasibility of the intervention in a public health facility like Kisenyi health facility.

Acceptability of the intervention among midwives at Kisenyi Health Center IV

Midwives rated the intervention using the EBPAS, and the intercorrelations between the items of the subscales ranged from r = − 0.18 to r = 0.92, and the intercorrelations between the subscales ranged from r = − 0.07 to r = 0.27. The divergence subscale had a large positive correlation, with r = 0.27, and Appeal had the lowest negative correlation, with r = − 0.07. The subscale reliabilities ranged from 0.36 to 0.6, with an EBPAS total scale alpha of 0.74, as shown in Table 3.

Appropriateness of the PreVent intervention at Kisenyi Health Facility

Midwives rated the appropriateness of the intervention in their facility using Bartholomew et al. on a Likert scale. All six midwives felt it was easy to provide intervention in their facility, and all of them felt it was either "very necessary" or "necessary" to have such intervention in the facility. Furthermore, five midwives (5/6) felt confident while administering the intervention, as shown in Table 4.

Feasibility of the PreVent intervention at Kisenyi Health Facility

All the six midwives answered the modified Hides et al. scale. All reported no difficulties when using the intervention, had visual resources for the intervention at the facility, and did not need a guiding manual when using the intervention. Therefore, all midwives agreed or strongly agreed with the feasibility questions, as shown in Table 5.

Qualitative results

All 45 women participated in FGDs. A total of six FGDs were conducted, and 3 broad themes emerged from the

Table 3 EBPAS subscales, item means, standard deviations, item–average correlations, and Cronbach's alpha for acceptability of PreVent intervention among midwives at Kisenyi Health facility

EBPAS subscales and total	Mean	SD	Average interitem correlation	α
1. Requirements	**17**	**11**	**0.22**	**0.36**
Agency (institution regulations) required	4.7	0.5	1	
Supervisor required	1	0	0.22	
State (country regulation) required	2.8	1.2	1	
2. Appeal	**26**	**5.4**	**− 0.07**	**0.4**
Intervention makes sense	5	0	0	
intuitively appealing	4.7	0.5	− 0.46	
Colleagues happy with the intervention	4.7	0.5	0	
Enough training	3	3.7	0.25	
3. Openness	**22.5**	**8.5**	**− 0.02**	**0.41**
Will follow intervention manual	4.7	0.5	− 0.18	
Intervention developed by researchers	4.7	0.5	− 0.04	
Like new intervention types	4	0.9	0.19	
Interventions are different than usual	1.7	0.8	− 0.06	
4. Divergence	**9**	**2.8**	**0.27**	**0.6**
Research based interventions are not useful	1.2	0.4	0.06	
Would not use manualized intervention	2.2	1.3	0.92	
Current clinical practice more important	1.5	0.8	0.05	
I know better than researchers	1.2	0.4	0.06	
EBPAS total	**18.7**	**9.4**	**0.17**	**0.74**

The total, subscale, and item mean scores range from 1 to 26. The sample size was 6

Table 4 Responses of midwives about the appropriateness of the PreVent intervention at Kisenyi Health facility

Questions	Number (n) and proportion (%) of midwives who responded				
	Very necessary, n (%)	Necessary, n (%)	Neutral, n (%)	Not necessary, n (%)	Extremely not necessary, n (%)
How necessary is having such an intervention in your facility	5 (83)	1 (7)	0 (0)	0 (0)	0 (0)
How confident did you feel while administering the video	5 (83)	1 (7)	0 (0)	0 (0)	0 (0)
How easy is providing such an intervention in your facility	6 (100)	0 (0)	0 (0)	0 (0)	0 (0)

Table 5 Responses of midwives about the feasibility of PreVent intervention at Kisenyi Health Facility

Questions	Number (n) and proportion (%) of midwives who responded				
	Strongly agree, n (%)	Agree, n (%)	Undecided, n (%)	Disagree, n (%)	Strongly disagree, n (%)
I feel knowledgeable and prepared to use PreVent intervention	6 (100)	0 (0)	0 (0)	0 (0)	0 (0)
Using PreVent intervention reduces clinical workload	4 (67)	2 (33)	0 (0)	0 (0)	0 (0)
Using PreVent intervention reduces client waiting time	2 (33)	4 (67)	0 (0)	0 (0)	0 (0)
Using PreVent intervention makes my work easy	5 (83)	1 (17)	0 (0)	0 (0)	0 (0)

data. These were (1) comprehension of the video-based information, (2) acceptability of the video-based intervention, and (3) preferred channel, frequency, and modes of receiving the video-based information.

Comprehension of video-based information

This involved understanding the contents of the video and the clarity on the contents of the video.

Understanding the contents of the PreVent video

Participants across various age groups expressed understanding of the video content, and the video met its comprehension targets. Participants were able to reproduce and explain some statements which were in the video. For instance, participants acknowledged that mosquito bites can occur everywhere, and a pregnant woman can contract malaria anytime, as one participant noted:

> *"I am now aware that malaria can be contracted from various sources because mosquito bites are everywhere."*

HIV-negative woman aged 18–24. They perceived a need to swallow and adhere to malaria prevention medication during pregnancy even if one is sleeping under a mosquito net:

> *"I have seen and have learned that you have to swallow malaria prevention tablets even if you sleep under a mosquito net." a teenager living with HIV aged 15-17years.*

They perceived a need to follow the healthcare workers' instructions and advice regarding malaria prevention, as one of that participant mentioned that:

> *"...what I have seen in the video is that we, pregnant women should do what our health workers tell us to do and take responsibility for swallowing those drugs given to us to protect ourselves and unborn babies." Woman living with HIV aged 18–24.*

Women also perceived the role of male partners and treatment supporters in supporting women during pregnancy. They mentioned the need for men to understand the benefits of attending ANC and uptake of malaria prevention medication. They acknowledged that men can be important in supporting women to adhere to the malaria prevention medication, as noted by one participant:

> *"...what I have learned from the video is that our male partners too have to understand the benefits of women coming to the health facilities and the importance of getting malaria prevention malaria," Woman living with HIV, aged 18–24.*

The clarity of the video content

Women appreciated the clarity of the words, actors, and actions used in the video. They mentioned that the use of simple and understandable language facilitated comprehension, as expressed by one of the participants:

> *"It was easy for me to understand the information in the video because of the language used" HIV-negative teenager, aged 15–17.*

Women also agreed that the language used in the video was generally understandable to everyone. Additionally, the actions and body language exhibited by the actors and the use of appropriate actors enhanced the clarity and eased understanding of the video:

> *"It was easy for me to understand the information in the video because the video was illustrative with actions and examples which enables someone to learn very fast" HIV-negative teenager, aged 15–17.*

The clarity of the video ensured an adequate understanding of malaria prevention during pregnancy. This caused some women to express their willingness to encourage other women to adhere to malaria prevention medication:

> *"I encourage pregnant women to follow what the health workers tell them to do and to swallow the malaria prevention drugs on time." Women living with HIV, aged 18–24.*

Acceptability of the video-based intervention

This involved high acceptance of the information contained in the video and the use of the PreVent video information in improving services for pregnant women at health facilities.

There was high acceptance of the information contained in the video

All participants found the intervention to be client-centred and acceptable. They highlighted the appropriateness of the actors, illustrations, and the language used as noted by several participants:

> *"The video illustrates and shows actions for every word mentioned. Therefore, it's easy to understand." HIV-negative teenager aged 15–17*
> *"The voices in the video are good." Teenagers living with HIV, aged 15–17.*

There was also a noticeable willingness to watch the video several times because it was noted edutaining to several participants:

> *"I want to watch the video repeatedly because it's interesting and educative." HIV-negative woman, aged 18–24.*

The use of the video-based intervention to improve services for pregnant women at health facilities.

The PreVent intervention video was perceived as valuable for promoting a healthy pregnancy and reducing waiting time at health facilities:

"That video can help a pregnant woman to swallow drugs and be healthy, and hence, give birth to a healthy baby." HIV-negative teenager aged 15–17
"It can reduce the waiting time because during ANC, the health workers have to examine us, educate us, and give us medications, but if we watch that video, that reduces the time health workers would spend educating us and therefore able to attend to us very quickly and we return home early." Woman living with HIV, aged 25–49
"When you watch this video, you will learn many things, and you may not take a long time with a health worker because you might have understood most of the things from the video." Teenager living with HIV, aged 15–17.

The preferred channel, frequency, and modes of receiving video-based intervention

This included the preferred channels in which the intervention can be delivered, the preferred frequency of watching the video, and the modes of watching the video.

The preferred delivery channels and frequency of watching the video

Participants suggested various channels for watching the video. These included television and social media as quoted by several participants:

"That video should be made an advert and be aired on all television channels so that many women are able to watch it." Teenager living with HIV, aged 15–17
"Someone out there with a smartphone like me would like to download that video on the phone. I can also share it with other women." Woman living with HIV, aged 25–49.

Generally, women mentioned that the video should be aired on the television sets at health facilities:

"Women should come to the health facility and watch the video." HIV-negative teenager, aged 15–17.

To obtain optimal benefits, women suggested the frequency of watching the video. The majority mentioned watching the video approximately 2 to 10 times a week for various reasons:

"I would watch that video about ten times a week because it's helpful for me and the unborn baby." HIV-negative teenager, aged 15–17
"I would watch the video about three times a week because it's very edutaining." HIV-negative teenager, aged 15–17
"I would watch the video about seven times a week because we tend to forget and so I would watch it several times so that I don't not forget the message." Woman living with HIV, aged 18–24.

The modes of watching the video, group versus individual watching

Opinions varied regarding group versus individual viewing of the video. The majority of the participants advocated for group viewing to stimulate discussion and sharing of ideas:

"That video needs to be watched in a group because when we are in a group, it helps us to share ideas such as discussing the idea of not throwing away the drugs given us by health workers, as seen in the video." HIV-negative teenager, aged 15–17
"What is better is watching the video as a group because when you are in a group and there is something I did not understand, I can ask someone I am watching with to explain..." Teenagers living with HIV, aged 15–17.

However, a few, mostly HIV-positive women, preferred individual watching of the video for better concentration and comprehension. For example, one woman stated:

"That video should be watched individually if one has the time because when you watch it alone, you are able to concentrate and listen to what is being said unlike when you are in a group where people can be making noise..." Women living HIV, aged 25–49.

Discussion

In this study, the aim was to develop a video-based intervention termed PreVent to enhance the knowledge and use of malaria preventive therapy among pregnant women and to assess its feasibility and acceptability among pregnant women and midwives. The PreVent intervention was designed to include a 3-min educational video on malaria prevention during pregnancy and a 5-min QA session with a midwife. The feasibility and acceptability of the developed intervention were subsequently assessed. The findings indicated that the intervention was highly acceptable among pregnant women and midwives. Women were also highly satisfied with

the intervention, and the intervention was feasible and appropriate at the public health facility. The implications of these findings are mentioned below.

Acceptability of the intervention. According to the participants' responses in questionnaires and FGDs, the intervention was highly acceptable to women. Women mentioned that the video part of the intervention was "edutaining" and felt they would watch the video frequently and would also recommend other women to watch the video. Generally, women felt that the use of PreVent intervention will be helpful and would improve ANC services for pregnant women at health facilities. This acceptability of video-based interventions among clients is consistent with what has been reported in other fields that have used similar interventions [34, 60]. Regarding the acceptability of the intervention among midwives, the internal consistency of the responses to the EBPAS subscales ranged between 0.36 and 0.6. However, the internal consistency of all the responses to the EBPAS scale was highly reliable at 0.74. According to the Lee Cronbach, a higher Cronbach's alpha indicates greater internal consistency, and a score above 0.7 is generally considered acceptable [61], meaning that the responses to the questions to the EBPAS were closely related as a group**.** However, alpha values close to 0.6 have also been considered acceptable for relatedness in the responses [62, 63]. Therefore, using this notion, the responses in the EBPAS subscales may also be related. Thus, the intervention was generally acceptable among midwives based on the main scale and subscales of the EBPAS, which was consistent with other findings in related fields [64, 65].

Intervention satisfaction among women

Women were highly satisfied with the intervention. Specifically, they agreed that the contents of the video were clear and appropriate. They were satisfied with the length of the video and suggested places from where they can watch the video. They were confident that the intervention would reduce the waiting time at the health facility for pregnant women during ANC.

Feasibility and appropriateness of the intervention in the public health facility. The intervention was highly feasible in a public health facility. This is due to the fact that midwives felt knowledgeable and prepared to use the intervention, and also felt that the intervention reduced the clinical workload and waiting time, and made their work easy. The midwives also felt that intervention was appropriate to their facility, as it was necessary to have such an intervention that can be provided to more than one client at a time. They felt confident in providing the intervention and found it easy to provide the intervention in their facility. This was consistent with other video-based interventions that have been found to be feasible in other fields [64, 65].

Frequency of watching the video and preferred channels and modes of watching the video

Women mentioned the number of times they would need to watch the video, which varied from two to 10 times a week. The reasons for these frequencies included the importance of the video to the health of a pregnant woman and the unborn baby, the video being "edutaining" and not boring, and the minimization of forgetfulness among women. Additionally, women mentioned channels through which they would watch the video. They mentioned watching the video through television sets both at home and at health facilities and via smartphones and sharing the video through social media platforms.

Women also commented on watching the video either individually or in a group. The majority preferred watching the video in a group and provided reasons for their preferences of watching in a group versus an individual watching. Those who opted for individual watching mentioned that if you are alone, you can attain maximum concentration to watch and understand the video content with minimal distractions. Those who opted for group watching mentioned that when you are in a group, you can share what you have understood and what you did not understand. This enables someone to get assistance on what they did not understand.

Strengths and limitations

The strengths of the study include the use of iterative, client-centered processes to tailor and develop a video that can improve the knowledge and acceptance of malaria prevention therapy among pregnant women. The study obtained data through a participatory process from pregnant women and key stakeholders in maternal and child health, which ensured the triangulation and complementation of information from different categories of respondents. The study included women living with and without HIV and women of different age groups which enabled us to obtain varied responses and representations from various categories of women. However, the findings are limited by the fact that the study was conducted in an urban public health facility. Therefore, the findings may not be generalizable to rural communities and private health facilities. Another limitation of this study is the potential bias introduced by the power imbalance between midwives and women, particularly for women who required assistance in reading the questions, which may have influenced their responses and led to social desirability bias. However, this was minimized by the fact that most of the questions and questionnaires

were administered by researchers who were cognizant of different categories of women. Additionally, the small sample sizes in demographic groups hindered meaningful analysis of the intervention per sub-group. However, this was outside the scope of the current study. Future studies should focus on increasing sample sizes to facilitate deeper analyses of these critical subgroups.

Conclusions

A video-based intervention was successfully developed and designed to improve the knowledge and acceptance of malaria preventive therapy among pregnant women. The intervention was found to be highly acceptable among pregnant women and midwives and was feasible and appropriate for use in a public health facility. Therefore, video-based interventions may be developed to instill behavioural changes in pregnant women using malaria preventive therapy. Future studies may test the effectiveness of these interventions in improving knowledge, uptake, and adherence to malaria preventive therapy during pregnancy.

Abbreviations

AIDS Acquired immunodeficiency syndrome
FGD Focus group discussion
HIV Human immunodeficiency virus

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Author contributions

R.N. did the Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Supervision; Validation; Visualization; Writing—original draft; Writing—review and editing. D.M, R.N.A, N.M, C.N.K, A.K, and L.A did Data curation; Investigation; Methodology; Writing—original draft; Writing—review and editing. R.M.K and J.N did the investigation, Methodology; writing—original draft; writing—review and editing. C.N, P.M, M.G.F did the Project administration; Resources; Supervision; Writing—review and editing. Z.L did the Funding acquisition; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Writing—original draft; Writing—review and editing.

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Availability of data and materials

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Approval to conduct this study was obtained from the Makerere University School of Medicine Research Ethics Committee (Mak-SOMREC-2021-279) and the Uganda National Council for Science and Technology (NS384ES). Administrative clearance was obtained from the Director of Health Services at KCCA and from KHCIV administration. Written informed consent was obtained from all participants; confidentiality and anonymity were strictly observed. Informed consent for illiterate participants was obtained in the presence of an impartial witness (a guardian or other literate person not part of the study team). The procedure of obtaining informed consent from illiterate participants was approved by the Makerere University School of Medicine Research Ethics Committee IRB. All methods were performed in accordance with the relevant guidelines and regulations of good clinical practice and human subject protection for ICH-6 patients.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. WHO. A strategic framework for malaria prevention and control during pregnancy in the African region. World Health Organization; Regional Office for Africa; 2004.
2. WHO. World Malaria Report 2016. Geneva, World Health Organization, 2016.
3. Ministry of Health. Malaria indicator survey. Uganda Bureau of Statistics, Uganda, Kampala, 2018–2029.
4. Arinaitwe E, Ades V, Walakira A, Ninsiima B, Mugagga O, Patil TS, et al. Intermittent preventive therapy with sulfadoxine-pyrimethamine for malaria in pregnancy: a cross-sectional study from Tororo, Uganda. PLoS ONE. 2013;8: e73073.
5. Saito M, Briand V, Min AM, McGready R. Deleterious effects of malaria in pregnancy on the developing fetus: a review on prevention and treatment with antimalarial drugs. Lancet Child Adolesc Health. 2020;4:761–74.
6. Twabi HS, Manda SO, Small DS. Assessing the effects of maternal HIV infection on pregnancy outcomes using cross-sectional data in Malawi. BMC Public Health. 2020;20:1–15.
7. Enuma JN, Sanni FO, Matur MB, Jean NE, Erhabor T, Egbulefu II. Malaria an opportunistic infection in HIV/AIDS patients?—a Nigerian experience. Afr J Lab Med. 2022;11:1–6.
8. Flateau C, Le Loup G, Pialoux G. Consequences of HIV infection on malaria and therapeutic implications: a systematic review. Lancet Infect Dis. 2011;11:541–56.
9. Haeuser E, Serfes AL, Cork MA, Yang M, Abbastabar H, Abhilash E, et al. Mapping age-and sex-specific HIV prevalence in adults in sub-Saharan Africa, 2000–2018. BMC Med. 2022;20:488.
10. Kwenti TE. Malaria and HIV coinfection in sub-Saharan Africa: prevalence, impact, and treatment strategies. Res Rep Trop Med. 2018. https://doi.org/10.2147/RRTM.S154501.
11. Vashishtha VM. World Malaria Report 2008: a billion-dollar moment for a centuries old disease. Indian Pediatr. 2008;45:985–6.
12. WHO. World malaria report 2020: 20 years of global progress and challenges. World malaria report 2020: 20 years of global progress and challenges. Geneva: World Health Organization; 2020. p. 2020.
13. WHO. HIV treatment and care: WHO HIV policy adoption and implementation status in countries: factsheet. Geneva, World Health Organization; 2019.
14. UNAIDS. In Danger: UNAIDS Global AIDS Update 2022. Geneva: Joint United Nations Programme on HIV/AIDS; 2022.

15. Orishaba P, Kalyango JN, Byakika-Kibwika P, Arinaitwe E, Wandera B, Katairo T, et al. Increased malaria parasitaemia among adults living with HIV who have discontinued cotrimoxazole prophylaxis in Kitgum district, Uganda. PLoS ONE. 2020;15: e0240838.
16. Ssentongo P, Ba DM, Ssentongo AE, Ericson JE, Wang M, Liao D, et al. Associations of malaria, HIV, and coinfection, with anemia in pregnancy in sub-Saharan Africa: a population-based cross-sectional study. BMC Preg Childbirth. 2020;20:379.
17. Mangusho C, Mwebesa E, Izudi J, Aleni M, Dricile R, Ayiasi RM, et al. High prevalence of malaria in pregnancy among women attending antenatal care at a large referral hospital in northwestern Uganda: a cross-sectional study. PLoS ONE. 2023;18: e0283755.
18. Braun V, Rempis E, Schnack A, Decker S, Rubaihayo J, Tumwesigye NM, et al. Lack of effect of intermittent preventive treatment for malaria in pregnancy and intense drug resistance in western Uganda. Malar J. 2015;14:372.
19. Okiring J, Olwoch P, Kakuru A, Okou J, Ochokoru H, Ochieng TA, et al. Household and maternal risk factors for malaria in pregnancy in a highly endemic area of Uganda: a prospective cohort study. Malar J. 2019;18:144.
20. Uganda Aids Commission Secretariat. Factsheet—facts on HIV and AIDS in Uganda 2021 (Based on Data ending 31st December 2020) 2021. https://uac.go.ug/media/attachments/2021/09/13/final-2021-hiv-aids-factsheet.pdf.
21. Gasasira AF, Kamya MR, Ochong EO, Vora N, Achan J, Charlebois E, et al. Effect of trimethoprim-sulphamethoxazole on the risk of malaria in HIV-infected Ugandan children living in an area of widespread antifolate resistance. Malar J. 2010;9:177.
22. Mermin J, Ekwaru JP, Liechty CA, Were W, Downing R, Ransom R, et al. Effect of co-trimoxazole prophylaxis, antiretroviral therapy, and insecticide-treated bednets on the frequency of malaria in HIV-1-infected adults in Uganda: a prospective cohort study. Lancet. 2006;367:1256–61.
23. Fokam EB, Ngimuh L, Anchang-Kimbi JK, Wanji S. Assessment of the usage and effectiveness of intermittent preventive treatment and insecticide-treated nets on the indicators of malaria among pregnant women attending antenatal care in the Buea Health District, Cameroon. Malar J. 2016;15:172.
24. WHO. Guidelines for the treatment of malaria. Geneva, World Health Organization. 2015.
25. Al Khaja KA, Sequeira RP. Drug treatment and prevention of malaria in pregnancy: a critical review of the guidelines. Malar J. 2021;20:62.
26. Ministry of Health U. Consolidated guidelines for prevention and treatment of HIV and AIDs in Uganda. 2020.
27. Nekaka R, Nteziyaremye J, Oboth P, Iramiot JS, Wandabwa J. Malaria preventive practices and delivery outcomes: a cross-sectional study of parturient women in a tertiary hospital in Eastern Uganda. PLoS ONE. 2020;15: e0237407.
28. Nakalega R, Nabisere-Arinaitwe R, Mukiza N, Kuteesa CN, Mawanda D, Natureeba P, et al. Attitudes and perceptions towards developing a health educational video to enhance optimal uptake of malaria preventive therapy among pregnant women in Uganda: a qualitative study involving pregnant women, health workers, and Ministry of health officials. BMC Health Services Res. 2024;24:484.
29. Okethwangu D, Opigo J, Atugonza S, Kizza CT, Nabatanzi M, Biribawa C, et al. Factors associated with uptake of optimal doses of intermittent preventive treatment for malaria among pregnant women in Uganda: analysis of data from the Uganda Demographic and Health Survey, 2016. Malar J. 2019;18:250.
30. Rassi C, Graham K, Mufubenga P, King R, Meier J, Gudoi SS. Assessing supply-side barriers to uptake of intermittent preventive treatment for malaria in pregnancy: a qualitative study and document and record review in two regions of Uganda. Malar J. 2016;15:341.
31. Mutulei A. Factors influencing the uptake of intermittent preventive treatment for malaria in pregnancy: evidence from Bungoma East District, Kenya. Am J Public Health Res. 2013;1:110–23.
32. Wanzira H, Katamba H, Okullo AE, Rubahika D. The challenge of using intermittent preventive therapy with sulfadoxine/pyrimethamine among pregnant women in Uganda. Malar J. 2016;15:401.
33. Bolan N, Cowgill KD, Walker K, Kak L, Shaver T, Moxon S, et al. Human resources for health-related challenges to ensuring quality newborn care in low-and middle-income countries: a scoping review. Glob Health Sci Pract. 2021;9:160–76.
34. Kim MH, Tembo TA, Mazenga A, Yu X, Myer L, Sabelli R, et al. The video intervention to inspire treatment adherence for life (VITAL Start): protocol for a multisite randomized controlled trial of a brief video-based intervention to improve antiretroviral adherence and retention among HIV-infected pregnant women in Malawi. Trials. 2020;21:207.
35. Sweat M, O'Donnell C, O'Donnell L. Cost-effectiveness of a brief video-based HIV intervention for African American and Latino sexually transmitted disease clinic clients. AIDS. 2001;15:781–7.
36. Fisher HH, Patel-Larson A, Green K, Shapatava E, Uhl G, Kalayil E, et al. Evaluation of an HIV prevention intervention for African Americans and Hispanics: findings from the VOICES/VOCES Community-based Organization Behavioral Outcomes Project. AIDS Behav. 2011;15:1691–706.
37. Wong IY, Lawrence NV, Struthers H, McIntyre J, Friedland GH. Development and assessment of an innovative culturally sensitive educational videotape to improve adherence to highly active antiretroviral therapy in Soweto, South Africa. J Acquir Immune Defic Syndr. 2006;43:S142–8.
38. Tuong W, Larsen ER, Armstrong AW. Videos to influence: a systematic review of effectiveness of video-based education in modifying health behaviors. J Behav Med. 2014;37:218–33.
39. UBOS. The National Population and Housing Census 2014—Main Report, Kampala, Uganda. 2016.
40. UBOS. Uganda demographic and health survey 2016: key indicators report. Kampala, Uganda. 2017.
41. Ministry of Health Uganda. Annual health sector performance report, financial 2017/2018. Uganda, Kampala, 2018.
42. Walker JL. The use of saturation in qualitative research. Can J Cardiovasc Nurs. 2012;22:37–46.
43. O'Keefe DJ, Jensen JD. The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease prevention behaviors: a meta-analytic review. J Health Commun. 2007;12:623–44.
44. Daniati N, Widjaja G, Olalla Gracìa M, Chaudhary P, Nader Shalaby M, Chupradit S, et al. The health belief model's application in the development of health behaviors. Health Educ Health Promot. 2021;9:521–7.
45. Sheeran P, Abraham C. The health belief model. Predicti Health Behav. 1996;2:29–80.
46. Joshi A, Kale S, Chandel S, Pal DK. Likert scale: explored and explained. Br J Appl Sci Technol. 2015;7:396–403.
47. Peres SC, Pham T, Phillips R, editors. Validation of the system usability scale (SUS) SUS in the wild. Proceedings of the human factors and ergonomics society annual meeting; 2013: Sage Publications Sage CA: Los Angeles, CA.
48. Bangor A, Kortum PT, Miller JT. An empirical evaluation of the system usability scale. Int J Hum Comput Interact. 2008;24:574–94.
49. Larson E, Sharma J, Bohren MA, Tunçalp Ö. When the patient is the expert: measuring patient experience and satisfaction with care. Bull World Health Organ. 2019;97:563–9.
50. Aarons GA. Mental health provider attitudes toward adoption of evidence-based practice: The Evidence-Based Practice Attitude Scale (EBPAS). Ment Health Serv Res. 2004;6:61–74.
51. Bartholomew NG, Joe GW, Rowan-Szal GA, Simpson DD. Counselor assessments of training and adoption barriers. J Subst Abuse Treat. 2007;33:193–9.
52. Hides L, Lubman DI, Elkins K, Catania LS, Rogers N. Feasibility and acceptability of a mental health screening tool and training programme in the youth alcohol and other drug (AOD) sector. Drug Alcohol Rev. 2007;26:509–15.
53. Sharma S. Applied multivariate techniques. New Jersey: Wiley; 1995.
54. Xie F, Thumboo J, Lo NN, Yeo SJ, Yang KY, Yeo W, et al. Cross-cultural adaptation and validation of Singapore English and Chinese versions of the Lequesne Algofunctional Index of knee in Asians with knee osteoarthritis in Singapore. Osteoarthr Cartil. 2007;15:19–26.
55. Booth A, Hannes K, Harden A, Noyes J, Harris J, Tong A. COREQ (consolidated criteria for reporting qualitative studies). Guidelines for reporting health research: a user's manual. 2014:214–26.
56. Creswell JW, Creswell JD. Research design: qualitative, quantitative, and mixed methods approaches. Thousand Oaks: Sage Publications; 2017.
57. Strecher VJ, Rosenstock IM. The health belief model. In: Baum A (ed.). Cambridge handbook of psychology, health, and medicine. 1997;113–7.

58. Thorne S. Interpretive description, vol. 2. Walnut Creek. CA: Left Coast Press Inc; 2008.
59. Bekhet AK, Zauszniewski JA. Methodological triangulation: an approach to understanding data. Nurse Res. 2012;20:40–3.
60. Poudel KC, Poudel-Tandukar K, Silwal RC, Chalise BS, Bertone-Johnson ER, Vidrine DJ. Feasibility, acceptability, and preliminary effects of a video-based intervention for smoking cessation among people with HIV in Kathmandu, Nepal: a single-armed pilot study. AIDS Behav. 2023;27:3468–77.
61. Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika. 1951;16:297–334.
62. Loewenthal K, Lewis CA. An introduction to psychological tests and scales. 3rd edn. 2020.
63. Au ML, Li YY, Tong LK, Wang SC, Ng WI. Chinese version of Yoon Critical Thinking Disposition Instrument: validation using classical test theory and Rasch analysis. BMC Nurs. 2023;22:362.
64. Godana Boynito W, Tessema GY, Temesgen K, De Henauw S, Abbeddou S. Acceptability and feasibility of video-based health education for maternal and infant health in Dirashe District, South Ethiopia: a qualitative study. PLoS Glob Public Health. 2023;3: e0000821.
65. Kim MH, Ahmed S, Tembo T, Sabelli R, Flick R, Yu X, et al. VITAL Start: video-based intervention to inspire treatment adherence for life—pilot of a novel video-based approach to HIV counseling for pregnant women living with HIV. AIDS Behav. 2019;23:3140–51.

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