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Ineffectiveness of Tonic Water as Malaria Prophylaxis: an literature review of Quinine content and pharmacokinetics[1]

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Abstract: Tonic water contains Quinine, an alkaloid historically used for malaria prevention and treatment. This historical association may contribute to the belief that its consumption can prevent or treat the disease. The aim of this study was to evaluate the effectiveness of tonic water as a malaria chemoprophylactic measure, considering its quinine content and pharmacokinetic aspects. An integrative literature review was conducted in January 2025 using PubMed, Google Scholar, and Scopus. Articles published in English between 2014 and 2024 were considered. The search retrieved 218 records, including 188 from PubMed, 27 from Google Scholar, and 3 from Scopus. After applying the filters, 52 records remained. Five duplicates were removed, and 47 articles were assessed through full-text review. Of these, 39 were excluded because they were outside the scope of the research, resulting in 8 studies included in the qualitative synthesis. The selected literature addressed three main aspects: the historical use of quinine in malaria, the efficacy and limitations of quinine, and the ineffectiveness of tonic water as an antimalarial measure. The quinine concentration in tonic water is substantially lower than the doses required to produce an adequate antimalarial effect. Even large-volume consumption produces only transient and insufficient plasma concentrations for effective protection. The available evidence does not support the use of tonic water for malaria chemoprophylaxis or treatment. Therefore, its consumption should not replace recommended malaria prevention and chemoprophylaxis measures.

Keywords: Tonic water; Quinine; Malaria; Chemoprophylaxis; Pharmacokinetics.

Ineficácia da água tônica como profilaxia da malária: uma revisão da literatura sobre o conteúdo de Quinina e a farmacocinética

Resumo: A água tônica contém Quinina, um alcaloide historicamente utilizado na prevenção e no tratamento da Malária. Essa associação histórica pode contribuir para a crença de que seu consumo previne ou trata a doença. O objetivo do presente estudo foi avaliar a eficácia da água tônica como medida de quimioprofilaxia contra a malária, considerando seu conteúdo de Quinina e aspectos farmacocinéticos. Foi realizada uma revisão da literatura em janeiro de 2025, utilizando PubMed, Google Scholar e Scopus. Foram considerados artigos publicados em inglês entre 2014 e 2024. A busca recuperou 218 registros, sendo 188 do PubMed, 27 do Google Scholar e 3 do Scopus. Após a aplicação dos filtros, 52 registros permaneceram. Cinco duplicatas foram removidas e 47 artigos foram avaliados por texto completo. Destes, 39 foram excluídos por estarem fora do escopo da pesquisa, resultando em 8 estudos incluídos na síntese qualitativa. A literatura selecionada abordou três aspectos principais: o uso histórico da quinina na malária, a eficácia e as limitações da quinina e a ineficácia da água tônica como medida antimalárica. A concentração de quinina na água tônica é substancialmente inferior às doses necessárias para produzir efeito antimalárico adequado. Mesmo o consumo de grandes volumes produz concentrações plasmáticas transitórias e insuficientes para proteção eficaz. A evidência disponível não sustenta o uso da água tônica para quimioprofilaxia ou tratamento da malária. Portanto, seu consumo não deve substituir as medidas recomendadas de prevenção e quimioprofilaxia.

Palavras-chave: Água tônica; Quinina; Malária; Quimioprofilaxia; Farmacocinética.

Ineficacia del agua tónica como profilaxis de la malaria: una revisión bibliográfica del contenido de Quinina y su farmacocinética.

Resumen: El agua tónica contiene quinina, un alcaloide utilizado históricamente para la prevención y el tratamiento de la malaria. Esta asociación histórica puede contribuir a la creencia de que su consumo puede prevenir o tratar la enfermedad. El objetivo de este estudio fue evaluar la eficacia del agua tónica como medida de quimioprofilaxis contra la malaria, considerando su contenido de quinina y los aspectos farmacocinéticos. Se realizó una revisión integrativa de la literatura en enero de 2025 utilizando PubMed, Google Scholar y Scopus. Se consideraron artículos publicados en inglés entre 2014 y 2024. La búsqueda recuperó 218 registros, de los cuales 188 procedían de PubMed, 27 de Google Scholar y 3 de Scopus. Después de aplicar los filtros, quedaron 52 registros. Se eliminaron 5 duplicados y 47 artículos fueron evaluados mediante revisión del texto completo. De estos, 39 fueron excluidos por estar fuera del alcance de la investigación, resultando en 8 estudios incluidos en la síntesis cualitativa. La literatura seleccionada abordó tres aspectos principales: el uso histórico de la quinina en la malaria, la eficacia y las limitaciones de la quinina y la ineficacia del agua tónica como medida antipalúdica. La concentración de quinina en el agua tónica es considerablemente inferior a las dosis necesarias para producir un efecto antipalúdico adecuado. Incluso el consumo de grandes volúmenes produce concentraciones plasmáticas transitorias e insuficientes para una protección eficaz. La evidencia disponible no respalda el uso del agua tónica para la quimioprofilaxis o el tratamiento de la malaria. Por lo tanto, su consumo no debe sustituir las medidas recomendadas de prevención y quimioprofilaxis.

Palabras clave: Agua tónica; Quinina; Malaria; Quimioprofilaxis; Farmacocinética.

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Introduction

Tonic water is a beverage primarily composed of Quinine, a pharmacological compound extracted from the bark of the *Cinchona* tree, historically utilized for Malaria treatment (Shaw, 2018). The British, stationed in tropical areas like Africa and India, consumed the drink as a preventive measure against the disease. To make Quinine more enjoyable, it was combined with carbonated water and sugar, resulting in the original version of tonic water (Simonetti et al., 2022). According to Winston Churchill said that *"Gin & Tonic has saved more English lives and minds than all the doctors in the Empire"*. Although it may sound like an exaltation of this ancient drink, the phrase conceals a historical truth, as quinine, an essential component of tonic water, played a crucial role in the prevention and treatment of malaria during the expansion of the British Empire (Simonetti et al., 2022).

Despite being an iconic drink, the origin of the tonic water, like the gin and tonic, is deeply rooted in the history of medicine and public health. As emphasized by Shaw (2018), before it became a recreational choice, this cocktail symbolized a response to a health threat, combining necessity, science and tradition in a practical solution to Malaria. However, habits tend to persist over time, often becoming dissociated from their original contexts. This divergence from the intended purpose of tonic water consumption can foster misconceptions regarding its efficacy, potentially leading individuals to adopt inappropriate practices. Such misconceptions may create a false sense of security, increasing the risk of hazardous behaviors.

This article aims to review the literature to find out what has been said about the use of tonic water as a Malaria prophylaxis.

Methods

An integrative literature review was conducted using the Google Scholar, PubMed, and Scopus databases. In Google Scholar and Scopus, the search was performed using terms related to tonic water and Malaria prophylaxis. In PubMed, these terms were applied specifically to the title field to refine the search for relevant articles on the topic. To enhance the specificity of the results and exclude irrelevant studies, exclusion operators (NOT) were utilized to filter out references related to specific drugs, ensuring that the selected articles focused exclusively on Quinine (see Table 1). Additionally, a filter was applied to include only articles published within the last ten years.

Table 1 Search engine in different data bases.

Databases	Search Terms
Google Scholar	"tonic water" OR "tonic soda" OR "Indian tonic water" OR "fizzy Quinine drink" OR "Quinine water" OR "bitter water" AND "paludism prophylaxis" OR "malaria prophylaxis"
PubMed	tonic water[ti] OR tonic soda[ti] OR Indian tonic water[ti] OR fizzy Quinine drink[ti] OR Quinine water[ti] OR bitter water[ti] AND paludism prophylaxis[ti] OR malária prophylaxis[ti] NOT Primaquine[tiab] NOT Pyrimethamine-sulfadoxin[tiab] NOT Sulphadoxine-pyrimethamine[tiab] NOT Naphthoquine-azithromycin[tiab] NOT Fansidar[tiab] NOT Maloprim[tiab] NOT Tafenoquine[tiab] NOT Chloroquine[tiab] NOT Mefloquine[tiab] NOT Hydroxychloroquine[tiab] NOT Doxycycline[tiab] NOT Proguanil[tiab] NOT ivermectin[tiab]
SCOPUS	TITLE-ABS-KEY ("tonic water" OR "tonic soda" OR "Indian tonic water" OR "fizzy Quinine drink" OR "Quinine water" OR "bitter water") AND TITLE-ABS-KEY ("paludism prophylaxis" OR "malária prophylaxis")

The inclusion criteria were: full articles published between 2014 and 2024, without language exclusion. The exclusion criteria were: articles repeated in more than one database and articles whose content was outside the scope of the research.

The articles were selected in the following stages: Initially, the titles and abstracts were evaluated to identify those with the potential to answer the study's guiding question. The selected articles were then read in full to confirm their suitability and relevance in relation to the study's objectives.

Results and discussion

The literature search was conducted in January 2025 using PubMed, Google Scholar, and Scopus. A total of 218 records were retrieved, comprising 188 articles from PubMed, 27 from Google Scholar, and 3 from Scopus. After applying the predefined filters, considering a publication period from 2014 to 2024, 52 records remained for screening. Five duplicate records were removed, leaving 47 records for screening. The 47 records were assessed for eligibility through full-text review. Of these, 39 articles were excluded because they were outside the scope of the research. Consequently, 8 studies met the eligibility criteria and were included in the qualitative synthesis. Analysis of the selected articles revealed three categories:

1- Brief historical review of the use of Quinine in the treatment of Malaria.

2- Efficacy and limitations of Quinine.

3- Ineffectiveness of tonic water as an antimalarial measure.

Brief historical review of the use of Quinine in the treatment of Malaria

Quinine is recognized as the first antimalarial drug in modern medicine and, even after almost 400 years since its first documentation of efficacy, it has maintained a relevant role in the treatment of Malaria (Simonetti et al., 2022).

Quinine bark was used to fight Malaria in soldiers during the siege of Belgrade in 1717, although the Universal Pharmacopoeia describes more than 100 official preparations based on Quinine bark powder or bark extracts, which were believed to have special properties against a wide range of diseases (Jovanović & Krajnović, 2023).

During British colonization in the 19th century, Quinine was widely used as a prophylactic against Malaria, especially among officers and soldiers. To mask its bitter taste, it was mixed with soda and sugar, giving rise to tonic water, essential in the fight against Malaria during the British Raj (1858-1947). The combination became even more popular when it was mixed with gin, creating the classic gin and tonic we know today (Jovanović & Krajnović, 2023; Shaw, 2018).

Efficacy and limitations of Quinine

In contemporary times, the importance of the drug as an effective substance against Malaria cannot be denied. Quinine, as well as other chinchona alkaloids, have proven to be effective against *Plasmodium* spp, the causative agent of Malaria. The efficacy of these alkaloids was initially proven in one of the first clinical trials, between 1866 and 1868, on 3600 patients using sulphates prepared from the alkaloids. As the main outcome measure of “cessation of febrile paroxysms”, all four alkaloids were considered comparable, with cure rates of >98%. However, after 1890, Quinine became the predominantly used alkaloid, mainly due to a shift in the supply of cinchona bark from South America to Java, which contained a higher proportion of Quinine (Simonetti et al., 2022).

Until the availability of effective synthetic antimalarial drugs in the late 1940s, Quinine was the only reliable antimalarial drug. However, because of its side effects, its use as a first-line treatment was limited after the development of other antimalarial drugs, and it was briefly neglected. Later, with the development of antimalarial drug resistance, Quinine experienced its heyday again because it proved to be effective even in resistant strains of Malaria (Jovanović & Krajnović, 2023). Since 2006, the WHO no longer recommends Quinine as a first-line drug for the treatment of Malaria (Joo, 2023).

Ineffectiveness of tonic water as an antimalarial measure

The belief in drinking gin and tonics as a means of preventing and/or treating Malaria during the diaspora is old and widespread. It is reported that in the past, European colonial soldiers took Quinine as a prevention against Malaria (Rudo et al., 2018).

Today, there are still reports of individuals consuming tonic water believing that the Quinine content present in the product can aid in the treatment or prevention of Malaria, based on traditional practices or family experiences (Neave et al., 2014).

Plasma concentrations of Quinine in ten healthy volunteers who ingested 500 mL to 1 L of tonic water with Quinine (58.3 mg/L) reached the minimum effective concentration for the antimalarial zone (0.2-2 mg/L), resulting in a brief and transient suppression of parasitemia, without prolonged effects. Another study with two young volunteers, who consumed 25 cL of tonic water, did not reach this minimum concentration even after 80 hours. Quinine is used in the pharmaceutical and food industries, giving tonic waters their bitter taste. Quinine levels are limited to 100 mg/L by the European Regulatory Commission, 85 mg/L by the German Federal Institute and 83 mg/L by the Foods and Drugs Administration (FDA) (Lefrère et al., 2021).

Despite their presence in tonic waters, the concentrations of Quinine in these drinks are significantly lower than those required for antimalarial therapeutic effects (Rudo et al., 2018).

Table 2 details the Quinine content in different brands of tonic waters, showing significant variations between them, as well as considerably low concentrations for prophylaxis or treatment.

Table 2 Quinine content in different brands of tonic waters.

Brand	Type of beverage	Quinine concentration (mg/L)
Schweppes Indian Tonic®	Tonic water	71.5
Fresh Tonic®	Tonic water	63.9
Fever Tree Indian Tonic®	Tonic water	86.9

Source: Lefrère et al., 2021.

Effective Malaria prophylaxis with Quinine requires a dose of 10 mg/kg of body weight every 8 hours. For an adult weighing 70 kg, this is equivalent to 700 mg every 8 hours. However, to achieve this dosage through tonic water (considering 200 mL per dose), a concentration of 3.5 mg/mL of Quinine would be required, which would be an extremely bitter concentration (Shaw, 2018). In fact, Quinine levels in tonic water are limited for toxicological reasons, a level which, coincidentally, also gives Gin & Tonic a good taste (Shaw, 2018).

The therapeutic range of Quinine varies from 0.2 mg/L to 2.0 mg/L, due to the varying susceptibility of *Plasmodium falciparum* strains. However, even with the consumption of large quantities of tonic water, Quinine concentrations in plasma remain very low after a few hours. This suggests that the levels achieved are well below those required for an effective parasiticidal action, especially in the first 12 hours of treatment. At this stage, unbound concentrations below 0.5 mg/L are considered insufficient, which makes loading doses necessary in standard treatment (Simonetti et al., 2022).

To reach prophylactic levels, around 70 litres of tonic water would be needed, which is impractical. Furthermore, the concentration of Quinine in today's tonic water is considerably lower than in older formulations (Simonetti et al., 2022). Therefore, the consumption of large quantities of tonic water can cause a transient suppression of parasites, these levels are not sustainable, even with continuous consumption, and are insufficient for effective protection, making it unsuitable as a prophylactic measure against Malaria.

Discussions on Malaria chemoprophylaxis offer a crucial opportunity to warn patients about the risks of self-medication, which may contain incorrect doses or even no active substance at all. It

is essential to emphasize that prophylaxis should not be neglected or replaced by ineffective practices. As discussed above, tonic water, even in large quantities, does not offer protection against Malaria, as it contains concentrations of Quinine far below the necessary prophylactic dose, resulting in insufficient plasma concentrations, a doubt that some patients still raise. Therefore, appropriate prophylaxis should be guided by a health professional (Silverberg, 2021).

Conclusions

This study investigated whether tonic water could have a prophylactic effect against Malaria. Effective Malaria prophylaxis with Quinine requires a substantial dose administered every eight hours. However, achieving this dosage through tonic water alone would necessitate an extremely high concentration of Quinine, rendering the drink intolerably bitter and impractical for regular consumption. Furthermore, it was observed that consuming one or two bottles of tonic water results in very low plasma concentrations of Quinine, which are insufficient to reach the levels required for effective parasiticidal action.

Therefore, although tonic water remains a popular drink in many regions, the widespread belief in its effectiveness against Malaria lacks scientific support and should be regarded as a misconception, and its use for Malaria prevention or treatment is therefore discouraged.

References

Joo, J.-H. (2023). Effects and Pharmacological Use of Alkaloids on the Eyes. *In Drug Repurposing—Advances, Scopes and Opportunities in Drug Discovery*. IntechOpen. https://doi.org/10.5772/intechopen.110257

Jovanović, A., & Krajnović, D. (2023). The developmental path of quinine: What can we learn from history? *Acta Medica Medianae*, *62*(2).

Lefrère, B., Barbaud, A., Bagot, M., & Bourgogne, E. (2021). Eau tonique et quinine – un cocktail de bicentenaire servi en pleine effervescence. *Revue Française d'Allergologie*, *61*(6), 425–431. https://doi.org/10.1016/j.reval.2021.04.002

Neave, P. E., Behrens, R. H., & Jones, C. O. (2014). "You're losing your Ghanaianess": Understanding malaria decision-making among Africans visiting friends and relatives in the UK. *Malaria Journal*, *13*(1), 287. https://doi.org/10.1186/1475-2875-13-287

Rudo, A., Zeller, K.-P., Siehl, H.-U., Berger, S., & Sicker, D. (2018). Bitter medicine and bitter pleasure: Quinine, a legendary alkaloid. *Chemie in Unserer Zeit*, *52*(4), 238–248. Scopus. https://doi.org/10.1002/ciuz.201800820

Shaw, I. C. (2018). The chemistry of gin and tonic. *Articles and Features*, 178. https://nzic.org.nz/unsecure_files/cinz/2018-82-4.pdf#page=32

Silverberg, B. (2021). Pretravel consultations in the urgent care setting. *J Urgent Care Med*, *15*(8), 13–20. https://www.jucm.com/wp-content/uploads/2021/05/2021-15813-20-Clinical.pdf

Simonetti, O., Contini, C., & Martini, M. (2022). The history of Gin and Tonic; the infectious disease specialist long drink. When gin and tonic was not ordered but prescribed. *Le Infezioni in Medicina*, 30(4), 619. https://doi.org/10.53854/liim-3004-18