Household Water Treatment Practice and Associated Factors in Sub-Saharan Africa: A Systematic Review and Meta-Analysis

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ABSTRACT

INTRODUCTION: Household water treatment practices, also known as point-of-use water management, offer means to enhance the overall drinking water quality and reduce the prevalence of diarrheal diseases. Nevertheless, there is a scarcity of information on household water treatment practices and related factors in sub-Saharan Africa.

OBJECTIVE: This study aimed to determine the pooled prevalence of water treatment practices and associated factors in sub-Saharan Africa.

METHODS: We conducted a search of eligible primary studies in PubMed, Google Scholar, and Hinari, as well as gray literature available in online repositories. The Stata v.17 software was utilized to extract and analyze the data obtained from these studies. To determine the overall pooled prevalence of water treatment practices and their predictors, a weighted inverse-variance random-effects model was employed. We assessed variations across the included studies using forest plots, funnel plots, I^2 statistics, and Egger's tests.

RESULTS: In this study, we reviewed a total of 927 articles, 28 of which were eligible for inclusion. The overall pooled prevalence of water treatment practices in sub-Saharan Africa was 36.31(95% CI: 27.64, 44.98). The factors associated with water treatment practices included having formal education (AOR: 2.38, 95% CI: 1.70, 3.34), being male (AOR: 1.78, 95% CI: 1.39, 2.29), having a higher income (AOR: 2.12, 95% CI: 1.39, 3.25), and having received training in water treatment (AOR: 2.25, 95% CI: 1.59, 3.18).

CONCLUSIONS: In this review, the pooled prevalence of water treatment practices in sub-Saharan Africa was found to be considerably low. Therefore, we recommend that household heads receive enhanced information on water treatment practices through strengthened health education and intensive training in small-scale water treatment practices.

KEYWORDS: Associated factors, meta-analysis, practice, small scale, sub-Saharan Africa, systematic review, water treatment

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Introduction

Household water treatment refers to the procedures involved in treating and securely storing water within a household setting. Household water treatment practices encompass the utilization of household water treatment, which consist of a range of devices and procedures for purifying water within the household. These methods may include boiling, filtration, or chemical disinfection, commonly referred to as point-of-use (POU) water treatment technologies.[1,2]

The availability and ability to obtain clean water are important for safeguarding the well-being and respect of people. Safe water and sanitation as fundamental human rights. Every person has the right to sufficient, secure, satisfactory, affordable, accessible, and continuous water for personal and domestic use.[3,4]

In situations where water sources are contaminated, the implementation of Household Water Treatment and Safe Storage (HWTS) methods can enhance the quality of water when it is being consumed.[5] It is crucial, particularly in cases where the water source is not upgraded, and there exists a risk of recontamination throughout the stages of transportation, storage, and consumption. Moreover, it can be used even in areas with piped water supply as water supply interruptions happen.[1,6]

Globally, the prevailing water treatment technologies for households include chlorination, filtration, solar disinfection, and boiling. Among these methods, boiling is the most commonly employed technique. The selection of the most suitable treatment method relies on various factors such as the quality of water, cultural acceptance, feasibility, availability of technology, and other prevailing conditions.[7]

On a global level, an estimated 2195 children die from diarrheal disease each day, exceeding the collective mortality rates of AIDS, malaria, and measles. This alarming data underscores the status of diarrheal disease as the second most common contributor to mortality in children below the age of 5.[8]

A considerable percentage of cases of diarrheal illness can be mitigated by ensuring access to uncontaminated drinking water and proper sanitation and hygiene practices, commonly referred to as WASH.[9]

Globally, the provision of safely managed drinking water within households was at 74%. But, in Sub-Saharan Africa, this figure stood at a lower level of 30%. Furthermore, the situation in Ethiopia was even more challenging, with only 13% of households having access to safely managed drinking water in 2020.[4]

Although there has been some improvement in the provision of safely managed drinking water to households, a significant number of individuals worldwide continue to face challenges in accessing basic water services. Specifically, 844 million people do not have access to basic water services, while over 2.1 billion people lack access to safely managed drinking water within their premises.[4] According to the findings of the Demographic and Health Survey (DHS), it has been discovered that a mere 18% of households in Sub-Saharan Africa possess evidence to support their claims[10] and only 7% of households in Ethiopia appropriately treat their drinking water effectively.[11]

Access to safe drinking water is significantly limited in low and middle-income countries, where even the water provided at distribution points is prone to frequent and significant contamination throughout the processes of collection, transportation, and storage.[12] In the meantime, there is a limited availability of traditional water treatment facilities, and even the ones that do exist are susceptible to frequent disruptions and technical glitches. Furthermore, even enhanced water sources frequently fall short of delivering clean water due to the infiltration of fecal contamination during the supply process and manner of utilization. The most economically viable approach to prevent diarrheal disease is the treatment of water at the point of use within households, which involves methods like boiling and chlorination.[13,14]

However, in most of the developing countries in the world, waterborne disease has been becoming the consumption of unsafe drinking water poses a significant public health issue, as the quality of the water being provided is frequently overlooked despite a significant increase in access to water supply.[15] The centralized treatment systems that supply drinking water may be at risk of contamination as a result of substandard distribution networks, insufficient management practices, and unhygienic handling procedures before consumption.[3]

To our knowledge, A comprehensive examination of this topic in sub-Saharan Africa has yet to be undertaken at a national level. Therefore, this review can provide well-organized data on the HWT practice and associated factors in sub-Saharan Africa. The results of this research could be valuable for health authorities, policymakers, NGOs, and the World Health Organization (WHO) in devising and executing suitable strategies and interventions to improve small-scale water treatment practices.

Methods

Protocol and registration

This meta-analysis was conducted utilizing the Preferred Reporting Items for Systematic Review and Meta-analysis methodology[16] (**S1 Table**). A comprehensive examination of the relevant primary studies on the implementation of small-scale water treatment in sub-Saharan Africa was undertaken. The review protocol has been submitted to an international prospective register for systematic reviews to ensure transparency and accountability.

Searching strategies

Published studies were searched in the PubMed, Cochrane Library, Science Direct, and AJOL. The literature search was limited to studies published in English that examined small-scale household water treatment practices in sub-Saharan African countries.

An advanced search on PubMed was conducted using a systematic approach. In the beginning, search terms were developed for eight key areas: "Household Water Treatment," "Small Scale Water Treatment," "Household Water Treatment and Safe Storage," "Point-of-Use Water Treatment," "Household Water Treatment Practice," "Household Water Treatment Methods," "Associated Factors," "Sub-Saharan Africa." These keywords were retrieved from Google Scholar and then individually searched in PubMed to identify relevant MeSH terms within the MeSH hierarchy tree. These terms were then combined using advanced Boolean search logic, specifically using the "AND" and "OR" operators to effectively bring the concepts together. The search was also made by combining the above search terms with the names of all countries included in Africa. The articles were searched from 02/03/2023 to 4/15/2023.

Inclusion and exclusion criteria

This study included studies that met specific criteria. These criteria included having a population of household heads, focusing on the prevalence of household water treatment practice and its associated factors. The studies were conducted exclusively in sub-Saharan Africa and were published in English. However, certain primary studies were excluded for various reasons. These reasons included a lack of information on the prevalence of HWT practice, unavailability of the full text, low-quality score, inability to access the full text after multiple attempts to contact the corresponding author, and exclusion of narrative reviews, editorials, correspondence, abstracts, or methodological studies.

Outcome variable measurements

The prevalence of small-scale water treatment practices was the main outcome variable. The second outcome was to assess factors that affect the pooled prevalence of small-scale household water treatment practices. It was determined using the pooled odds ratio that was calculated by a two-by-two table.

Quality assessment

The Joanna Briggs Institute's (JBI) quality appraisal tools for cross-sectional studies were used to assess the quality of the included articles and the risk of bias in each study.[17] Two authors (Y.A.A and K.A.G) independently assessed the standard of the included studies.The discrepancies identified in the quality evaluation were addressed through a deliberation facilitated by the third author, N.A.G. The conflict was resolved and a consensus was achieved. The assessment tool contains ten (10) criteria: (1) population representation; (2) sampling frame; (3) participant selection techniques; (4) non-response bias; (5) data collection directly from subjects; (6) acceptance of case definition; (7) reliability and validity of study instruments; (8) type of data collection; (9) length of prevalence period; and (10) sufficiency of numerator and denominator. It was evaluated using the JBI critical appraisal checklist of cross-sectional study options: yes, no, unclear, and not applicable. The potential biases were categorized as either low (with a total score of 6-9), moderate (with a total score of 3 or 5), or high (with a total score of 0-2). Ultimately, only articles with a minimal risk of biases were included in this comprehensive evaluations (**S2 Table**).

Study selection and extraction process

The necessary data was extracted by the investigators utilizing a pre-tested data extraction format on Microsoft Excel 2010. The following information was taken from the studies: the first author, the Country where the study was conducted, specific study setting, study design, study publication year, study sample size, and the prevalence of small-scale household water treatment practice.

The differences between the two authors in terms of the data extraction process were effectively resolved through thorough discussion and mutual agreement. The inclusion of a third reviewer further contributed to addressing any discrepancies and ensuring consistency in the findings.

Statistical methods and data analysis

The essential information was extracted utilizing Microsoft Excel 2010 and transferred to Stata 17 for further analysis. The prevalence of small-scale household water treatment practices in each primary article was determined by the authors through the calculation of standard errors using a binomial formula. We also checked the level of Heterogeneity among the reported prevalence of the studies using the Cochrane Q^2 and I^2 statistics. The heterogeneity was quantified as high (considerable), moderate, low as 75% and more, 50% to 75%, and 25% and less respectively. The random effects model was used to estimate the der Simonian and Laird's pooled effects since test statics showed there was considerable heterogeneity among studies ($I^2 = 99.3$, $P = .000$). The publication bias was conducted using a subjective funnel plot and objectively using Egger's test with a 5% significant level. In Egger's test *P*-value, less than 5% indicates the presence of publication bias. In addition, subgroup analysis was done using the country and setting of studies to reduce the random heterogeneity between the estimates of the primary studies.

Results

Literature searching outcomes

A total of 927 articles were retrieved after searching both published and unpublished sources. Out of 927 articles, 924 were collected from databases. The remaining three articles were obtained from the institutional research repository. After removing duplicate studies, we received 577 studies that were selected for full title and abstract screening. Of these, 461 studies were excluded based on title and abstract, and the remaining 116 articles were assessed as full-text articles. After reviewing the full text, 88 articles were deleted because they contained missing full titles and abstracts and reported findings from developed countries. Finally, 28 articles with 11 960 study participants were included as criteria for this systematic review and meta-analysis study (Figure 1).

Characteristics of the primary studies

The characteristics of 28 studies included in this review have been described in detail in Table 1. By design, all included studies were cross-sectional. This study included twenty-eight primary studies[18-45] involving 11 960 study subjects. In this review, 10 studies were conducted in Ethiopia[18,19,25,26,30-32,35-37], six studies in Tanzania[28,29,38,39,42,45], 4 studies in Uganda[40,41,43,44], 3 studies in Nigeria[21,22,27], 2 studies in Kenya[33,34], 2 studies in South Africa,[23,24] and 1 study in Cameroon.[20] In addition, 13 studies were conducted in rural areas, 6 studies were in Urban, and 9 studies were in both rural & urban settings. The risk level of each study was assessed and we found that all studies were rated as low risk of bias (Table 1).

Pooled prevalence of household water treatment practice in Sub-Saharan Africa

Prior to conducting a meta-analysis on the effect sizes of the studies included, it was necessary to assess the presence of statistical variability among these studies. This was accomplished by employing 2 methods: forest plots and conducting statistical

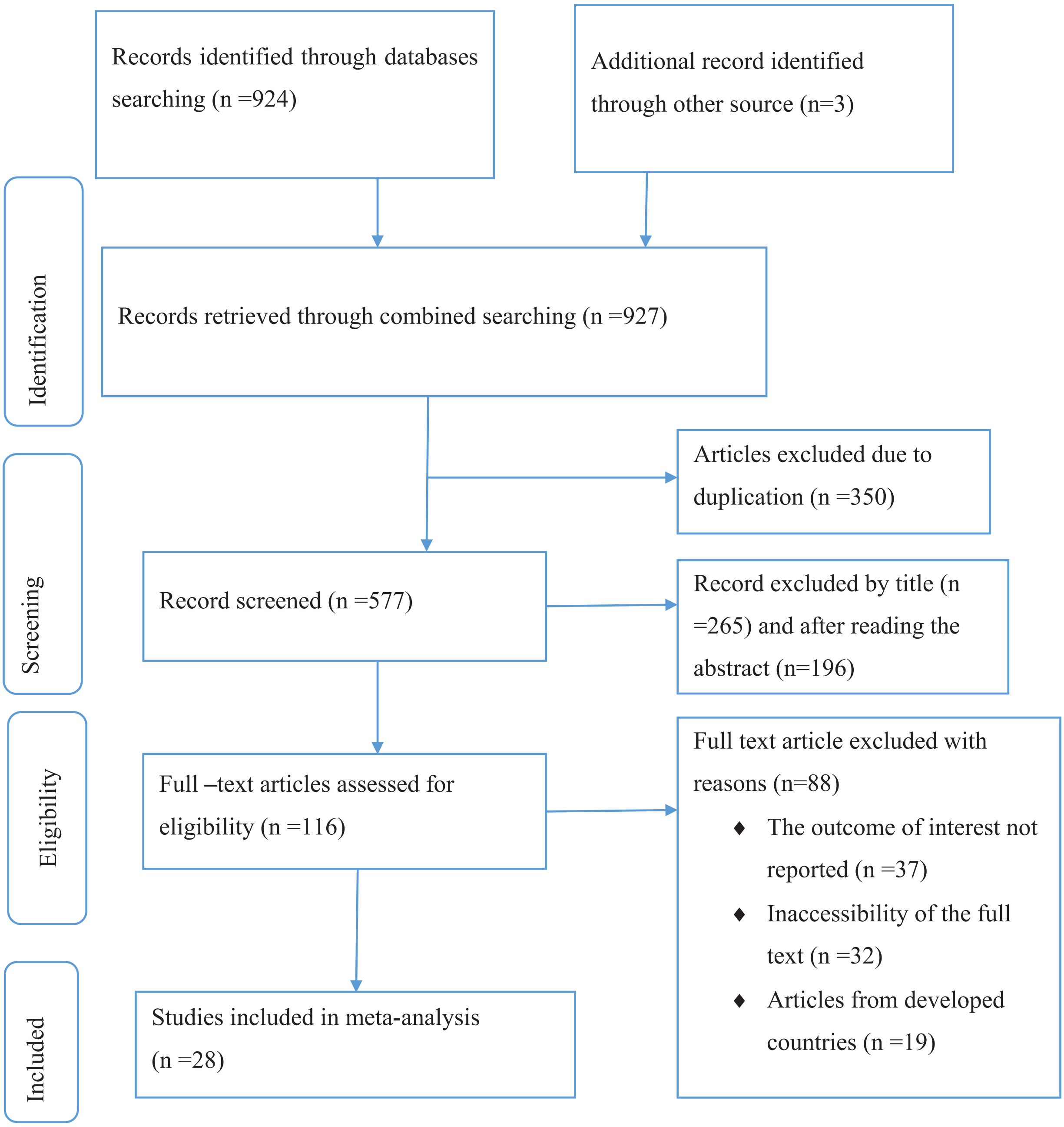

Figure 1. Flow chart diagram for small-scale water treatment practice in sub-Saharan Africa, 2024.

tests. There was high/considerable heterogeneity among the included studies in the pooled prevalence of small-scale household water treatment practice. The Stata generated statistical test of variation ($I^2 = 99.3\%$ and $P < .001$) indicating high heterogeneity. Therefore, the random effects model was used to estimate the pooled prevalence of small-scale household water treatment practices in sub-Saharan Africa. The overall pooled prevalence of HWT practice was 36.31 (27.64, 44.98) (Figure 2).

Subgroup analysis

Given the significant heterogeneity observed among the reviewed articles, we conducted a subgroup analysis to examine the underlying causes of heterogeneity between studies. This analysis focused on the study country and setting. As a result, based on country, the highest pooled estimates of the prevalence of small-scale household water treatment practice was seen in Nigeria at 71.40 (95% CI: 47.58, 95.23). Whereas, the lowest pooled estimate was seen in South Africa at 16.98 (95% CI: 14.88, 19.08).

On the other hand, a subgroup analysis based on study settings of rural, rural & urban, and urban of the pooled prevalence of HWT practice was found to be 41.31% (95% CI: 26.24, 56.38), 36.51% (95% CI: 26.56, 46.47), and 25.77 (95% CI: 20.16, 31.37), respectively (Table 2).

Sensitivity analysis

In addition to conducting subgroup analyses, we performed a sensitivity analysis by excluding each study to investigate the

Table 1. Descriptive summary of 28 studies reporting household water treatment practice, 2024.

AUTHORS	PUB. YEAR	COUNTRY	STUDY SETTING	STUDY DESIGN	SAMPLE SIZE	HWT PRACTICE (95%CI)	STUDY QUALITY
Admasie et al[18]	2022	Ethiopia	Rural	CS	836	44.1	Low risk
Berhanu and Hailu[19]	2015	Ethiopia	Rural	CS	604	26.5	Low risk
Ngouakam et al[20]	2021	Cameroon	Urban	CS	237	34.3	Low risk
Miner et al[21]	2015	Nigeria	Rural & Urban	CS	368	54	Low risk
Olannye[22]	2017	Nigeria	Rural & Urban	CS	400	65.2	Low risk
Gumbi[23]	2020	South Africa	Urban	CS	264	18.5	Low risk
Moropeng et al[24]	2021	South Africa	Rural	CS	960	16.6	Low risk
Belay et al[25]	2016	Ethiopia	Rural	CS	797	44.8	Low risk
Sisay W/tsadik et al[26]	2022	Ethiopia	Urban	CS	418	29.9	Low risk
Oloruntoba and Olannye[27]	2019	Nigeria	Rural	CS	80	95	Low risk
Ojomo et al[28]	2015	Tanzania	Rural & Urban	CS	79	25.2	Low risk
Mshida et al[29]	2019	Tanzania	Rural	CS	310	15.5	Low risk
Tafesse et al[30]	2021	Ethiopia	Rural & Urban	CS	633	34.5	Low risk
Bitew et al[31]	2017	Ethiopia	Rural & Urban	CS	845	23.2	Low risk
Eticha et al[32]	2022	Ethiopia	Rural & Urban	CS	413	30.4	Low risk
Ondieki et al[33]	2022	Kenya	Rural	CS	422	39.6	Low risk
Goodman et al[34]	2016	Kenya	Rural & Urban	CS	335	34.8	Low risk
Gedamu Kassie and Hayelom[35]	2017	Ethiopia	Rural	CS	834	3.1	Low risk
Birara et al[36]	2018	Ethiopia	Rural	CS	459	76.3	Low risk
Worku and Nigatu[37]	2023	Ethiopia	Rural & Urban	CS	418	44.6	Low risk
Mohamed et al[38]	2016	Tanzania	Rural	CS	390	40.8	Low risk
Ngasala et al[39]	2020	Tanzania	Rural	CS	364	40.1	Low risk
Kevin[40]	2019	Uganda	Rural	CS	397	51.9	Low risk
Saturday[41]	2016	Uganda	Urban	CS	40	13.6	Low risk
Masanyiwa et al[42]	2019	Tanzania	Urban	CS	417	31.2	Low risk
Wilfred[43]	2023	Uganda	Urban	CS	196	23.3	Low risk
Agensi et al[44]	2019	Uganda	Rural	CS	344	43.2	Low risk
Mwambete and Tairo[45]	2018	Tanzania	Rural & Urban	CS	100	15.6	Low risk

Abbreviations: CS, cross-sectional; HWTP, household water treatment practice.

origin of heterogeneity. This analysis showed that omitting one study had no statistically significant effect on the overall evaluation of the studies (Table 3).

Meta-regression

In addition to conducting subgroup and sensitivity analyses, meta-regression was performed to detect sources of heterogeneity by country, publication year, sample size, and study setting. The meta-regression results revealed no apparent source of heterogeneity in publication year (P = .451), country (P = .501, sample size (P = .134), and study setting (P = .574) (Table 4).

Publication bias

The distribution of small-scale household water treatment practice was examined for asymmetry through a visual inspection of the forest plot presented as a funnel plot. Furthermore, Egger's regression test results demonstrated the non-existence of publication bias (P = .369) (Figure 3).

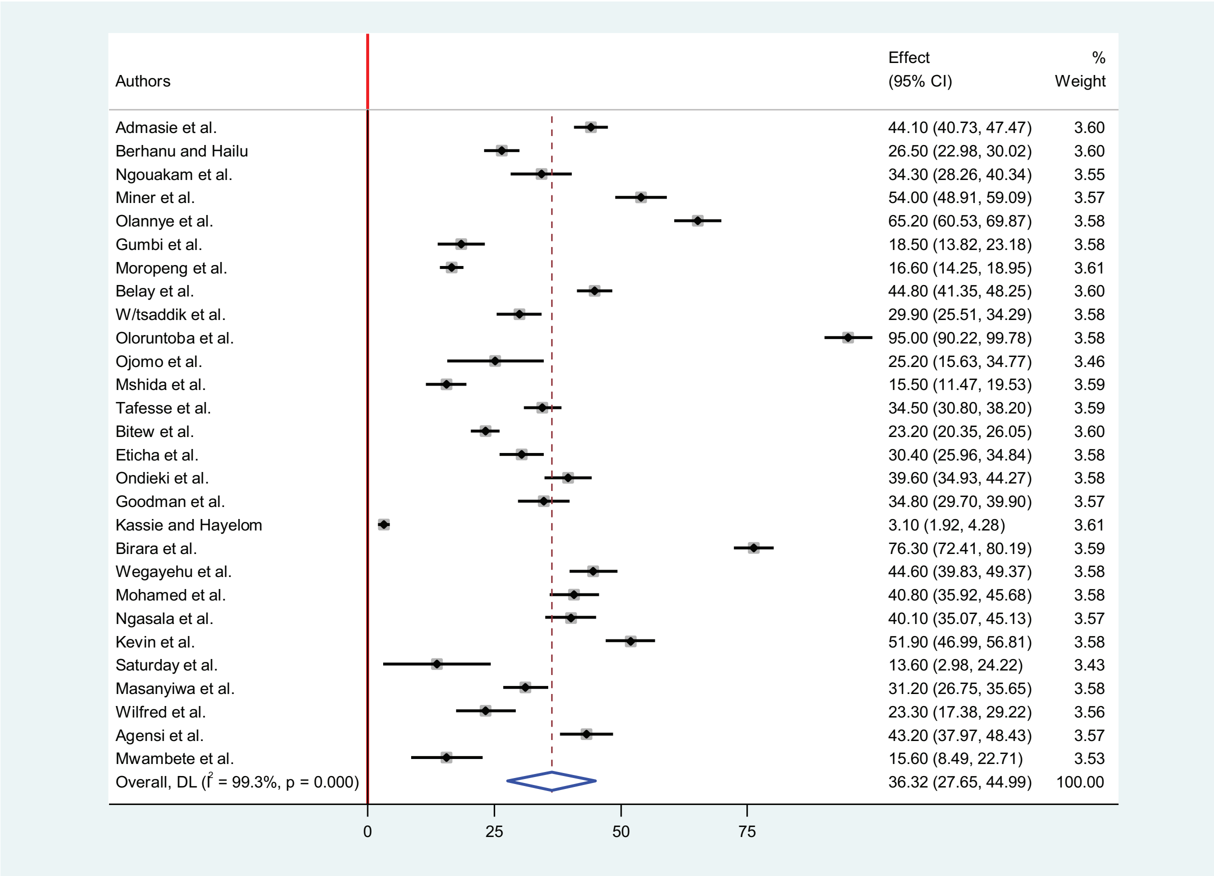

Figure 2. The pooled prevalence of HWT practices in Sub-Saharan Africa 2024.

Table 2. Subgroup analysis for the pooled prevalence of HWT practices in Sub-Saharan Africa 2024.

OUTCOMES	CHARACTERISTICS	INCLUDED STUDIES	TOTAL PARTICIPANTS	EFFECT SIZE (95% CI)	HETEROGENEITY	
					I^2-VALUE (%)	*P*-VALUE
HWT Practices	Country					
	Ethiopia	10	6257	35.71 (20.59, 50.84)	99.6	<.001
	Cameroon	1	237	34.30 (28.25, 40.34)	0.0	<.001
	Nigeria	3	848	71.40 (47.58, 95.23)	98.6	<.001
	South Africa	2	1224	16.98 (14.88, 19.08)	0.0	<.001
	Tanzania	6	1660	28.18 (18.49, 37.88)	95.0	<.001
	Kenya	2	757	37.31 (32.61, 42.01)	46.0	<.001
	Uganda	4	977	33.44 (17.85, 49.03)	96.2	<.001
	Study setting					
	Rural	13	6797	41.31 (26.24, 56.38)	99.6	<.001
	Urban	6	1572	25.77 (20.16, 31.37)	83.9	<.001
	Rural & Urban	9	3591	36.51 (26.56, 46.47)	97.6	<.001
Total		28	11 960	36.31 (27.64, 44.98)	99.3	<.001

Table 3. Sensitivity analysis for the prevalence of HWT practices in sub-Saharan Africa 2024.

S/N	STUDY OMITTED	EFFECT SIZE	(95% CI)
1	Admasie et al	36.02	(27.10, 44.94)
2	Berhanu and Hailu	36.68	(27.63, 45.72)
3	Ngouakam et al	36.39	(27.49, 45.28)
4	Miner et al	35.66	(26.86, 44.45)
5	Olannye et al	35.24	(26.61, 43.87)
6	Gumbi et al	36.97	(28.03, 45.91)
7	Moropeng et al	37.05	(27.81, 46.28)
8	Belay et al	36.00	(27.09, 44.90)
9	Sisay W/tsadik et al	36.55	(27.59, 45.51)
10	Oloruntoba et al	34.14	(26.18, 42.10)
11	Ojomo et al	36.71	27.86, 45.57)
12	Mshida et al	37.09	(28.12, 46.05)
13	Tafesse et al	36.38	(27.38, 45.38)
14	Bitew et al	36.80	(27.65, 45.95)
15	Eticha et al	36.53	(27.57, 45.49)
16	Ondieki et al	36.19	(27.28, 45.10)
17	Goodman et al	36.37	(27.45, 45.29)
18	Kassie and Hayelom	37.58	(30.41, 44.76)
19	Birara et al	34.83	(26.62, 43.03)
20	Wegayehu et al	36.01	(27.13, 44.88)
21	Mohamed et al	36.15	(27.25, 45.04)
22	Ngasala et al	36.17	(27.27, 45.07)
23	Kevin et al	35.73	(26.92, 44.55)
24	Saturday et al	37.12	(28.28, 45.96)
25	Masanyiwa et al	36.50	(27.54, 45.46)
26	Wilfred et al	36.79	(27.89, 45.70)
27	Agensi et al	36.06	(27.18, 44.93)
28	Mwambete et al	37.07	(28.20, 45.94)
Combined		36.31	(27.64, 44.98)

Table 4. Meta-regression analysis based on publication year, country, study setting, and sample size of the studies in sub-Saharan Africa, 2024.

SOURCE OF HETEROGENEITY	COEFFICIENT	STANDARD ERROR	P-VALUE
Year of publication	1.13	0.18	.45
Country	1.16	0.25	.50
Sample size	0.99	0.01	.13
Study setting	1.46	0.82	.57

Factors associated with HWT practice in sub-Saharan Africa

We performed a meta-analysis to identify associated factors for water treatment practice using the random effects model. During the extraction process, we planned to show the association of each factors with the outcome variable. Therefore, we examined the pooled effect of 4 factors on the outcome variable educational level, income status, sex, and water treatment training.

In this meta-analysis, factors associated with small-scale household water treatment practice were assessed using 11 studies.[18,19,21,25,26,30-32,36,37,43] Among 11 articles, the findings of 5 studies[19,25,30,32,37] revealed that small-scale household water treatment practices were significantly associated with educational level (status). As a result, the likelihood of household water treatment practice occurring was 2.38 times higher among households that have formal education than those that do not (OR: 2.38, 95% CI: 1.70, 3.34) (Figure 4).

The relationship between small-scale water treatment practice and sex has been assessed in six studies.[18,21,25,26,32,37] Households headed by men were 1.78 times more likely to practice household water treatment than those headed by women (OR: 1.78, 95% CI: 1.39, 2.29) (Figure 5).

The relationship between household water treatment and income status has been assessed in five studies.[18,19,26,31,36] The result showed that the combined effect of income status was significantly associated with HWT Practices. Households with a better income status were 2.12 times more likely to practice HWT than those with a lower income status, according to the pooled results of this meta-analysis (OR: 2.12, 95% CI: 1.39, 3.25). Moderate heterogeneity was observed across studies (I^2 = 80.80%, P = .00), for this reason, we used a random effects model (Figure 6).

Finally, the 4 studies showed that water treatment training was significantly associated with HWT Practice.[18,30,32,43] Household heads who received training about water treatment were 2.25 times more likely to practice HWT than those who did not (OR: 2.25, 95% CI: 1.59, 3.18). Because heterogeneity

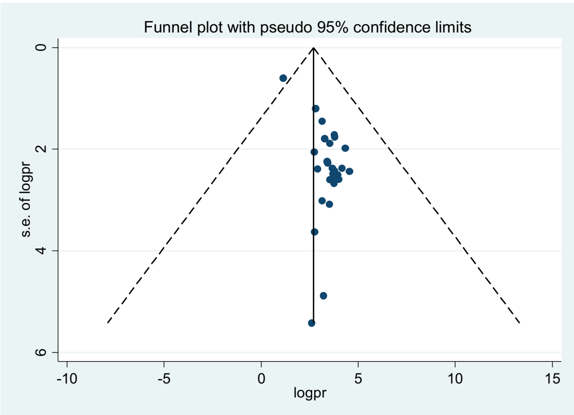

Figure 3. Funnel plots for publication bias of HWT practices in sub-Saharan Africa, 2024.

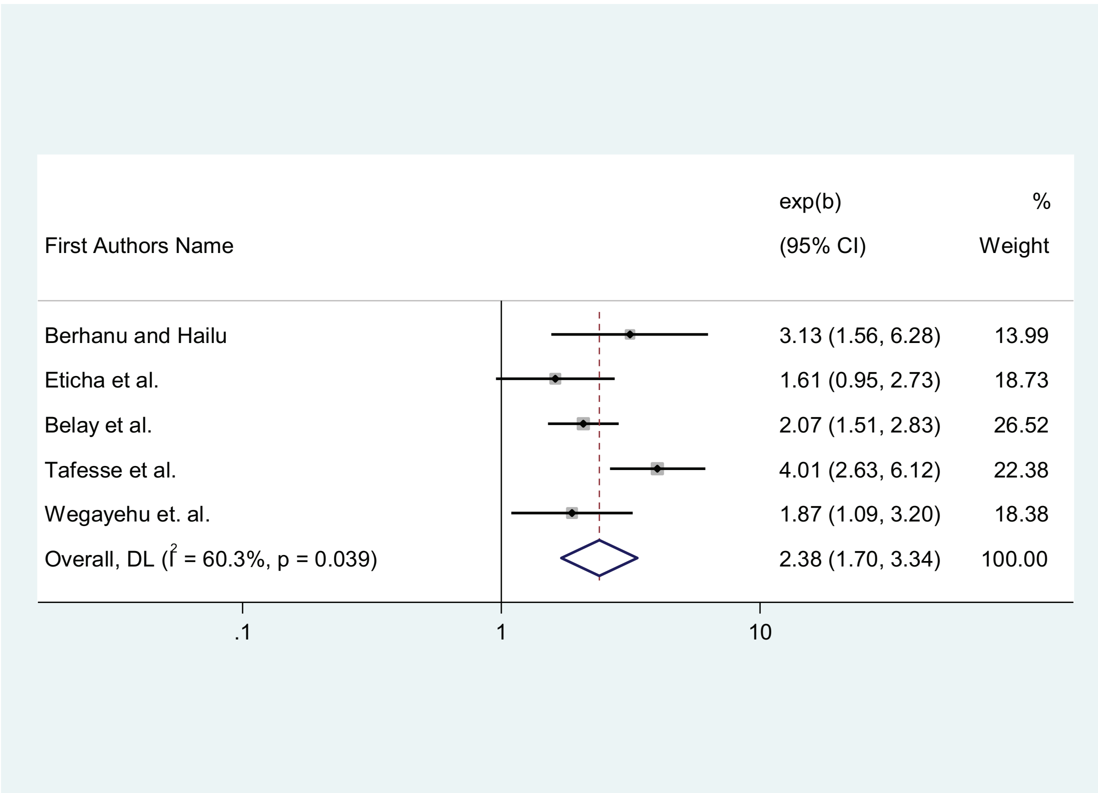

Figure 4. Forest plot showing the association between HWT practice and educational level.

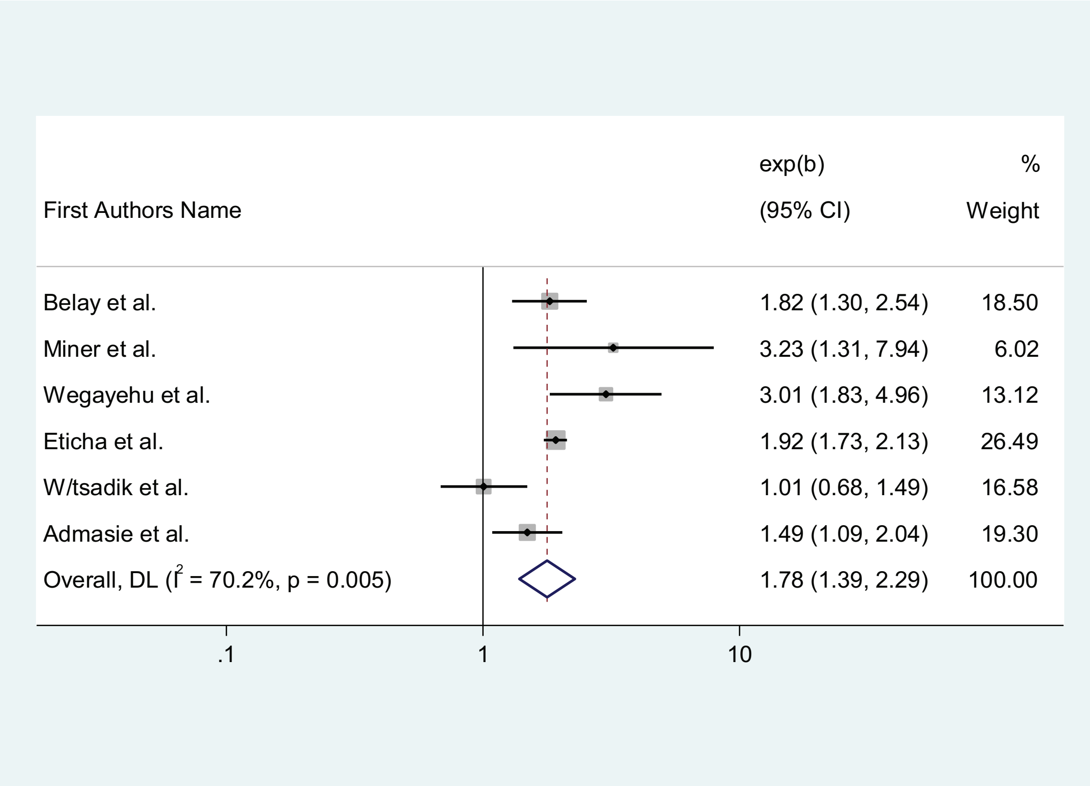

Figure 5. Forest plot showing the association between HWT practice and sex.

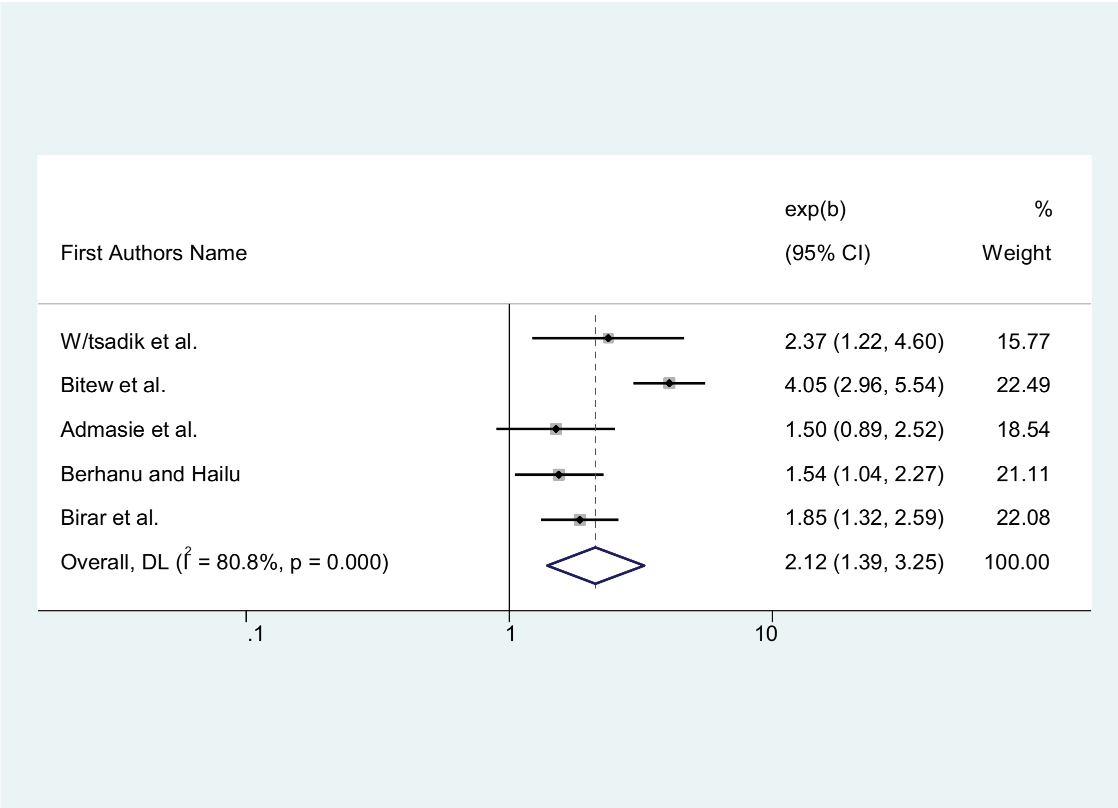

Figure 6. Forest plot showing the association between HWT practice and income status.

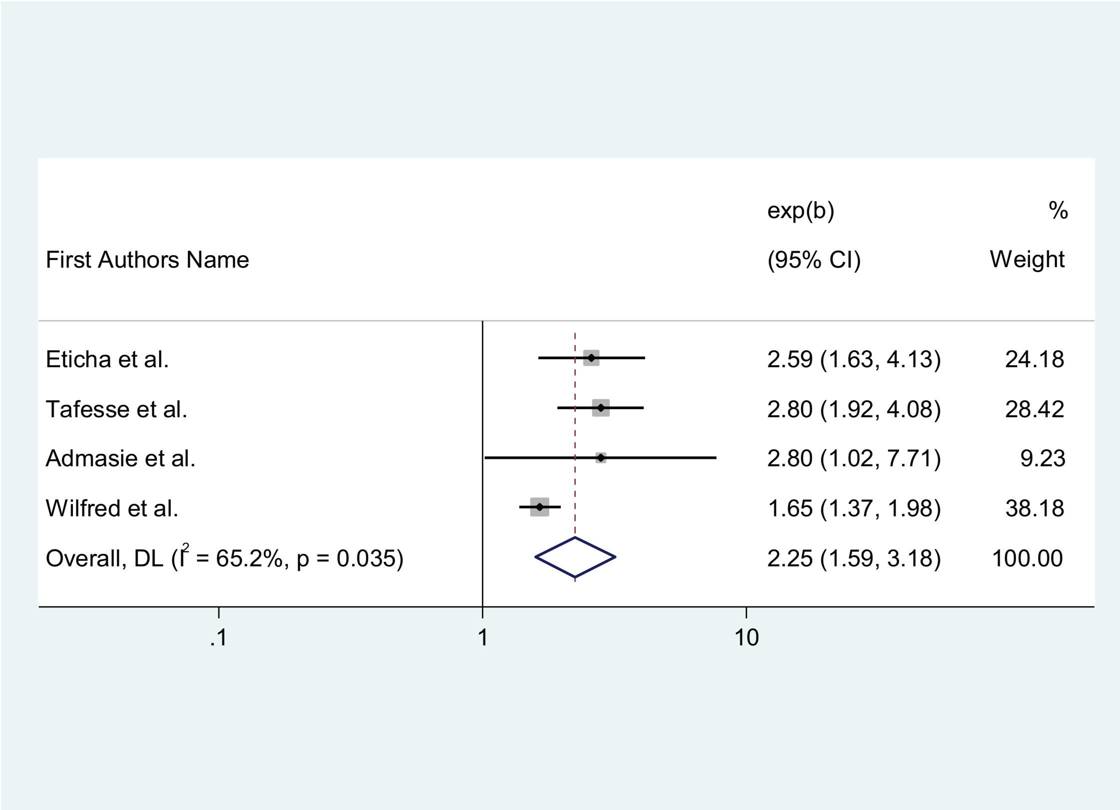

Figure 7. Forest plot showing the association between HWT practice and water treatment training.

was moderate, we used a random effects model (I^2 = 65.2%, P = .035) (Figure 7).

Discussions

Water quality and the potential for waterborne diseases pose significant public health challenges in numerous developing nations. The availability of safe drinking water is crucial in safeguarding the well-being and preserving the dignity of individuals.[3] Hence, small-scale water treatment is one of the possible methods for improving the quality of drinking water and reducing water-related diseases in sub-Saharan countries. In this study, the pooled prevalence of small-scale water treatment practices was 36.31 (95% CI: 27.64, 44.98), and was observed to differ across countries, with variations also noted in the study settings, including rural, semi-urban, and urban areas. This study identified several factors associated with small-scale water treatment practices: educational status, sex, income status, and water treatment training.

The finding of the pooled prevalence of water treatment practices at 36.31% in this study is considerably lower than that reported in studies conducted in Indonesia (51%)[46] and India (53%).[47] this disparity could potentially be attributed to discrepancies in the availability of information about small-scale water treatment, the duration of the study, and the extent of water source coverage across different nations. Furthermore, the limited adoption of small-scale water treatment practices in this particular study may also be attributed to the absence of viable treatment alternatives, prevailing socioeconomic conditions, and a lack of knowledge or awareness.

However, this prevalence of water treatment practices is higher than the WHO estimate for China, which is 20%.[48] Potential reasons for this discrepancy from the WHO estimate in middle- and lower-income countries may stem from factors such as sample size and study methodology. Conversely, the discrepancy in the opposite direction could be attributed to variations in the timing of the studies.

In this review, combined prevalence of small-scale water treatment practices in a study conducted in rural areas was found to be relatively higher than in urban areas. This is supported by Egypt and Colombia.[49,50] Small-scale water treatment methods are commonly utilized in regions where water sources are not adequately developed, particularly in rural areas. This trend could be attributed to the potential threat of contamination associated with unimproved water sources.

Furthermore, in the present study, households with formal education were 2.38 times more likely to practice water treatment than those that did not have formal education (AOR: 2.38, 95% CI: 1.70, 3.34). This finding was supported by a study conducted in Indonesia[47] and Egypt.[49] One potential reason behind this discovery could be attributed to the likelihood that literate individuals may have access to various water treatment techniques through media sources. Moreover, literate individuals may possess a better comprehension of the health hazards associated with consuming contaminated water by perusing posters and leaflets. Similarly, in this study, households that had taken training about water treatment were found to be 2.25 times more likely to practice water treatment than those that had not taken the training. This finding is supported by the study conducted in Indonesia and Nepal.[51,52] They reported that training and education are crucial to ensure HWT practice effectively. Therefore, healthcare professionals would do better to provide intensive training to households on water treatment methods, which encourages changes in health behavior, as it is an appropriate strategy to improve good practice.[53]

In this study, higher-income households' were 2.12 times more likely to practice water treatment practice than lower-income households. This finding is supported by a study conducted in low-and middle-income countries.[53] It has been elucidated that as household income increases, there is a corresponding increase in the ability to access necessary materials for treatment. This phenomenon may be attributed to the fact that low-income households in developing nations prioritize meeting their families' food needs, potentially neglecting the treatment of water within their homes.

Limitations of the Study

This study was regarded as a study implemented utilizing the cross-sectional study design, making it challenging to establish a temporal relationship between the outcome and response variables. Furthermore, this research exclusively focused on articles published in English, which were utilized for the systematic review and meta-analysis. Additionally, it is important to note that this study did not encompass qualitative research.

Conclusions

In this study, the pooled prevalence of water treatment practice in sub-Saharan Africa was low. Because of different factors like education status, a lack of adequate information and training, and low income level. Therefore,the authors recommend that household heads could enhance their understanding of water treatment practices by means of health education and comprehensive training on small-scale household water treatment practices. This would ultimately lead to an improvement in their water treatment practices. Additionally, the relevant authority could also facilitate households' access to water.

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Author Contributions

Y.A.A. writing- original draft data, writing review and editing, data curation, methodology, conceptualization, formal analysis, and software. N.A.G. formal analysis, validation, investigation, visualization, conceptualization, and data curation, K.A.G. writing-review and editing, validation, investigation, visualization, formal analysis, and software. Finally, all authors reviewed and approved the final version of the manuscript.

Ethical Approval

Not applicable.

Research Registration Number

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Not applicable.

Supplemental Material

Supplemental material for this article is available online.

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