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Risk Factors and Practices Associated with Occurrence of Urinary Tract Infections in Sub-Saharan Africa; A Scoping Review

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A B S T R A C T

Urinary Tracts Infections remain a major public health challenge with a particular higher burden in Sub-Saharan Africa. There remains a dearth of information in literature regarding patterns of risk factors and practices associated with Urinary Tract Infections in Sub-Saharan Africa. This scoping review aimed at documenting the risk factors and practices associated with Urinary Tract Infections in Sub-Saharan Africa. A systematic search of databases was done under the guidelines outlined by Joanna Brigs Institute to retrieve original articles that met inclusion criteria. Standard bibliographic information for articles that met the inclusion criteria was recorded in an Excel spreadsheet and then exported to SPSS version 21 for statistical analysis. Biographic information, risk factors, and practices findings from statistical analysis were presented in tables, bar graphs and charts, followed by a summarized narrative account of the risk factors and practices that emerged. Reporting was conducted in accordance with preferred reporting items for systematic review and meta-analysis extension for scoping reviews (PRISMA-ScR).Out of the 794 studies identified, 31 studies met inclusion criteria. Studies included in this review were distributed in 9 countries, Ethiopia leading with 38.7 % (n=12), Nigeria followed with 25.8% (n=8), Uganda 9.7% (n=3), Cameroon and Kenya each contributed 6.5% (n=2), and Ghana, Tanzania, Burkina Faso and Zambia each contributed 3.2% (n=1). Twenty one risk factors and three practices were identified to be associated with Urinary Tract Infections in Sub-Saharan Africa. The current evidence demonstrated the dire need for future studies to lay more emphasis on methodological and statistical rigor. Particularly, this scoping review identified the need to further investigate practices which were under-investigated. Further, methodological and statistical rigor should be emphasized in future studies.

Keywords: Urinary Tract Infections, Sub-Saharan Africa, Risk factors and practices.

1. Introduction

Urinary tract infection (UTI) is an infection of any part of the urinary tract[1]. The infection emanates from bacterial infestation of the upper or lower urinary tracts, the common isolates being *Escherichia coli*, *Staphylococcus aureus*, and *Klebsiella spp*.[2], [3]. It remains a major public health challenge as it is one of the most common infectious disease whose etiology is mostly not well grasped in clinical practice due to the complexity and multiplicity of behavioral, biological, genetic, geographical, host and pathogen virulence factors influencing its occurrence[4], [5]. UTIs are the most common causes of infectious diseases globally, but the burden of diseases is paramount in developing countries. As such, it remains one of the most common encountered diseases in medical practice[3], [6]. UTIs are common contagions across all population groups. However, the incidence is high in women due to their genital urinary anatomy[2], [3]. Tan and Chlebicki reports that women are 30 times more likely to get a UTI than men in a lifetime[1].

As of 2019, global incidence of UTIs stood at 0.4 billion, this being a 60.40% increase when compared to the statistics in 1990[6]. The prevalence is estimated to be 150 million people[4]. Hospital Acquired Urinary Tract Infections (HAUTIs) make up 40% of all Hospital Acquired Infections (HAIs), 80% of them being Catheter Associated UTIs[7].

Efforts to manage and treat UTIs have met a myriad of challenges. Among others, antimicrobial resistance (AMR) and diagnostic difficulties as a result of asymptomatic presentation are the leading instigations in efforts to treat UTIs[8]. Rational use of antibiotics has been widely campaigned due to the substantial decrease in susceptibility of urinary pathogens to commonly used antibiotics[9]. While antimicrobial therapy is proving to be futile, risk factors and practices (RF&P) modification alongside prophylactic therapies have been suggested as possible measures in combating UTIs[10]. However, there exists scanty information on the RF&P associated with occurrence of UTIs, especially in sub-Saharan Africa (SSA) where the burden is high. This scoping review aimed at mapping an exhaustive picture of risk factors associated with occurrence of UTIs in SSA, and make recommendations on knowledge gaps that need to be addressed in future studies.

2. Methods

2.1 Design and Protocol

This scoping review was conducted in accordance with Joanna Briggs Institute reviewers manual as described by Levac et al.[11] and Arksey and O'Malley[12]. Arksey and O'Malley six steps framework were followed in literature search concerning all RF&P that have been probed for association to UTIs in SSA. Significance of association of factors was also described in this review. As scoping reviews entail a broader search strategy, risk factors (RF) were studied across all population groups, patient categories and their presentation, in order to encompass a broader picture of the UTI's associated RF&P.

2.2 Identification and retrieval of studies

After an initial mini review was conducted to comprehend the scope of our review, three stages as outlined by Joanna Briggs Institute[13] were applied in retrieval of original articles. Briefly, the initial stage involved selection of key words and text terms in article headings and abstracts to identify and establish Medical Subject Headings (MeSH). Terms used were "Urinary Tract Infections", "UTI risk factors", "UTI in Sub Saharan Africa", and "UTI practices". In the second stage, general and specific search strings were developed using the MeSH terms and used in the selected data bases. The third and final stage involved search in Google websites, Google scholar and international directories for non-indexed studies.

2.3 Study Inclusion and Exclusion criteria

To be eligible for inclusion, a study had to be reporting original work on Urinary tract infections in Sub Saharan Africa. Abstracts were screened to determine the objectives and hence the eligibility. Specifically, articles reporting socio-demographical information, hospitalization details, RF&P associated for UTIs in its study subjects were included. Articles reporting descriptive and/or inferential statistics were eligible. Only articles published between January 1995 and September 2023 were considered. Studies done outside SSA and those reporting outside the scope of our study were excluded.

2.4 Data Extraction

Standard bibliographic information for articles that met the inclusion criteria was recorded in an Excel spreadsheet. This information included authors, year of publication, nationality, study design, population groups, RF&P, significant association between UTIs and RF&P. subsequently, the data was exported to Statistical Package for Social Sciences(SPSS) version 21 for statistical analysis.

2.5 Summarizing and reporting findings

Biographic information, risk factors, and practices findings from statistical analysis were presented in tables, bar graphs and charts, followed by a summarized narrative account of the RF&P that emerged. Risk factors included socio-economic, patient's history, obstetric history for women, and presence of comorbidities and chronic illnesses. Since the RF&P that emerged were many, the were systematically synthesized and classified into specific themes that were agreed by all authors to reduce the narrative load. Reporting was conducted in accordance with preferred reporting items for systematic review and meta-analysis extension for scoping reviews (PRISMA-ScR)[14].

3. Results

3.1 Study selection

Articles were identified through electronic database search where PubMed provided the largest number of records (n=317), followed by Science Direct (n=286), African Index Medicus provided 103 records, and AJOL provided the least number of records (n=88) (Figure 1).

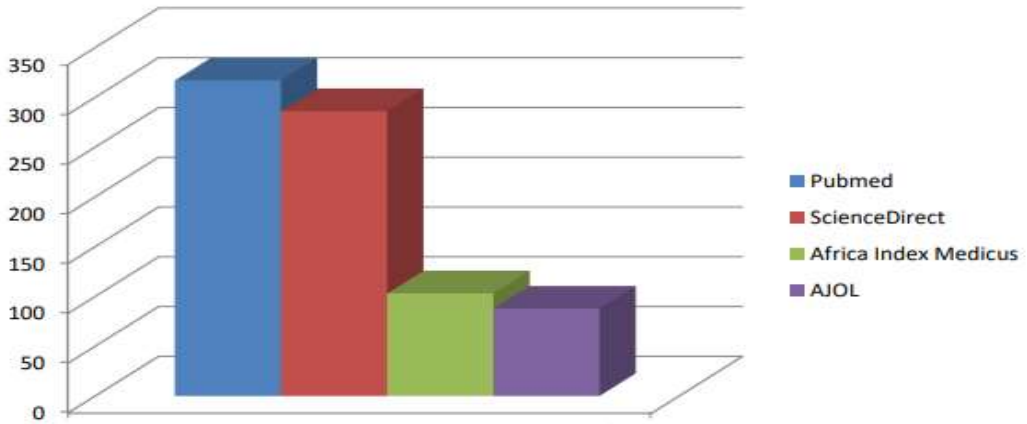

Figure 1. A bar chart representing the number of studies retrieved in databases

The initial database search yielded 794 records. Of these, 10 records were excluded on the basis of being duplicates. Further, on screening the titles and abstracts for relevance, 717 records were removed for being irrelevant. 20 records were excluded for being reviews and short communications as they could not provide adequate data for this study, while 16 more records were not included in this study due to irretrievability or their language not being English. Finally, 31 studies met inclusion criteria and were thus included in the final analysis (Figure 2).

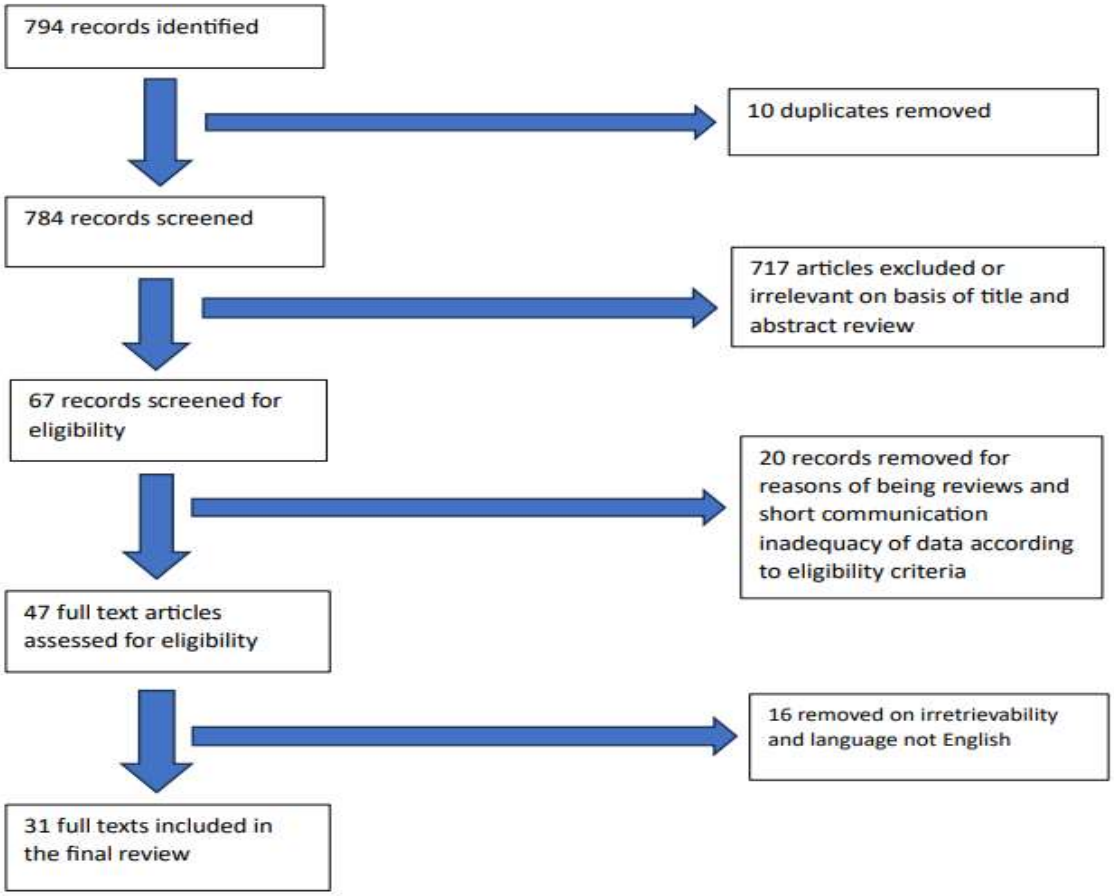

Figure 2. Flow chart illustrating the process of search and identification of studies in this scoping review

Characteristics of included studies

Studies included in this review were distributed in 9 countries, Ethiopia leading with 38.7 % (n=12), Nigeria followed with 25.8% (n=8), Uganda 9.7% (n=3), Cameroon and Kenya each contributed 6.5% (n=2), and Ghana, Tanzania, Burkina Faso and Zambia each contributed 3.2% (n=1). The sample size in the studies included varied greatly. The minimum sample size was 53 in the study by Wondimeneh et al.[15] and the maximum sample size was

1254 in the study by Melaku et al. [16]. This review included recent studies, with the earliest study by Odetoyin et al.[17] published in 2008 and the latest is of 2023 by Mekonnen et al.[18]. All the studies included in this review adopted a cross-sectional study design except for the study by Che Pantalius Nji et al.[19]which employed mixed methods. Table 1 presents a summary of characteristics of included studies.

Table 2.Summary presentation of risk factors and the studies investigating them

Author and citation	Year of study	Country	Study design	Study population	Sample size	Study aims
AK Labi et al.[20]	2015	Ghana	Cross-sectional	Pregnant women	274	To measure the prevalence of asymptomatic bacteriuria among ante-natal clients at the Korle-Bu Teaching Hospital in Ghana and its' associated risk factors.
Ali et al.[21]	2022	Ethiopia	Cross-sectional	Pregnant women	422	To determine the prevalence, antimicrobial susceptibility pattern and associated factors of urinary tract infection (UTI) among pregnant women attending Hargeisa Group Hospital (HGH), Hargeisa, Somaliland.
Awonunga et al.[22]	2010	Nigeria	Cross-sectional	Pregnant women	205	To determine the pattern as well as possible predictors of asymptomatic bacteriuria at the University College Hospital, Ibadan.
Bashir et al.[23]	2022	Nigeria	Cross-sectional	General public	150	To determine the prevalence of UTIs among in-patients in Murtala Muhammad Specialist Hospital, Kano using a cross-sectional study
Che Pantalius Nji et al.[19]	2020	Cameroon	Cross-sectional	Children	405	To identify the risk factors of UTI, etiologic agents, and their antibiotic susceptibility.
Dereje et al.[24]	2017	Ethiopia	Cross-sectional	Women	210	To determine the etiologic agents, drug resistance pattern of the isolates and associated risk factor for urinary tract infection among fistula patients in Addis Ababa fistula hospital, Ethiopia
Elikwu et al.[25]	2017	Nigeria	Cross-sectional	General public	200	To determine the etiology of UTI at BUTH and obtain data on their susceptibility and resistance patterns
Emiru et al.[26]	2013	Ethiopia	Cross-sectional	Pregnant women	367	To assess associated risk factors of UTI among pregnant women in Felege Hiwot Referral Hospital, Bahir Dar, North West Ethiopia
Fenta et al.[27]	2020	Ethiopia	Cross-sectional	Children	299	To assess the bacterial profile of urinary tract infection, their antimicrobial susceptibility pattern and associated factors among clinically suspected children attending Felege-Hiwot Comprehensive Specialized Hospital, Northwest Ethiopia.

Gebremariam et al.[28]	2019	Ethiopia	Cross-sectional	Students	341	To assess bacteriological profile, risk factors and antimicrobial susceptibility patterns of symptomatic Urinary tract infection among students of Mekelle University, northern Ethiopia.
Gessese et al.[29]	2017	Ethiopia	Cross-sectional	Pregnant women	300	To isolate and identify the predominant pathogenic bacteria causing UTI, evaluation of the antimicrobial susceptibility pattern of the isolates and identification of potential risk factors of UTI.
Iwang et al.[30]	2021	Nigeria	Cross-sectional	Pregnant women	320	To determine the ASB prevalence, the causative microorganisms, their drug sensitivity patterns, and the factors associated with its occurrence in pregnant women in the Uyo, Nigeria.
Jamiu et al.[31]	2021	Nigeria	Cross-sectional	Pregnant women	206	To determine the prevalence of and factors associated with significant bacteriuria among pregnant women attending the antenatal clinic (ANC) of Adeoyo Maternity Hospital, Yemetu, Ibadan, Nigeria, as well as determine the bacterial etiology and antimicrobial susceptibility patterns of the isolates.
Odoki et al.[32]	2019	Uganda	Cross-sectional	General public	267	To determine the prevalence of UTI by isolating and characterizing the different bacterial etiological agents and to evaluate the factors associated with UTI.
Kabugo et al.[4]	2016	Uganda	Cross-sectional	General public	139	To identify factors associated with CA-UTIs, the common uropathogens and the drug sensitivity patterns of the common uropathogens cultured.
Kidenya et al.[33]	2022	Tanzania	Cross-sectional	General public	227	To establish the pattern of urogenital pathogens and factors associated with PCR positive urogenital pathogens in urine samples of patient with sterile pyuria.
Marami et al.[34]	2022	Ethiopia	Cross-sectional	Women	146	To determine the prevalence, antimicrobial susceptibility pattern, and associated factors of urinary tract infections among women with post-fistula attending public health facilities, Harar, eastern Ethiopia.
Mekonnen et al.[18]	2023	Ethiopia	Cross-sectional	Children	332	To assess the bacterial profile of urinary tract infections, their susceptibility to antimicrobial agents, and associated factors in under-five children at Hiwot Fana Specialized University Hospital, eastern Ethiopia.
Melaku et al.[16]	2012	Ethiopia	Cross-sectional	General public	1254	To determine the prevalence and antibiogram of nosocomial UTIs from a referral hospital.

Nabaigwa et al.[35]	2017	Uganda	Cross-sectional	General public	210	To establish which UTI etiological agents are most common among diabetic patients attending the diabetes clinic at Jinja Regional Referral Hospital. Risk factors for UTIs by these pathogens were also evaluated.
Ngong et al.[36]	2021	Cameroon	Cross-sectional	Pregnant women	287	Prevalence and risk factors for UTIs, diagnostic potential of dipstick analyses and antimicrobial susceptibility of uropathogens from pregnant women attending ANC in some Integrated Health Centers (IHCs) in Buea Health District (BHD).
Nigusse et al.[37]	2020	Ethiopia	Cross-sectional	General public	224	To determine the prevalence, risk factors of UTI, and drug susceptibility pattern of bacteria isolated among peoples infected with HIV.
Odetoyin et al.[17]	2008	Nigeria	Cross-sectional	General public	192	To investigate the prevalence and associates of associates of asymptomatic bacteriuria (ASB) in a sample of Nigerian diabetic patients.
Okechukwu and Thairu[38]	2019	Nigeria	Cross-sectional	Children	166	To determine the prevalence and causative bacteria of UTI in HIV infected children and adolescents on antiretroviral medications in our health institution.
Ramalan et al.[39]	2020	Nigeria	Cross-sectional	General public	202	Determining the prevalence and AR profiles of S. aureus and E. coli strains from patients with UTIs attending Dalhatu Araf Specialist Hospital (DASH) Lafia, Nasarawa State, Nigeria.
Sanou et al.[40]	2015	Burkina Faso	Cross-sectional	General public	75	To identify the risk factors and the microorganisms susceptibilities of nosocomial urinary infections at the urology unit of the national university hospital of Ouagadougou in Burkina Faso.
Seifu and Gebisa.[41]	2018	Ethiopia	Cross-sectional	General public	384	To assess the prevalence of bacterial uropathogens and their invitro susceptibility patterns to commonly used antibiotic agents amongst outpatients with complaints of UTI in Shashemene referral hospital.
Wondimeneh et al.[15]	2014	Ethiopia	Cross-sectional	women	53	To determine the prevalence, drug susceptibility pattern and associated risk factors of UTI among obstetric fistula patients at Gondar University Hospital, Northwest Ethiopia.
Moses Mukosha et al.[42]	2020	Zambia	Cross-sectional	Pregnant women	380	Investigating the prevalence of UTIs and associated factors among HIV infected pregnant women attending antenatal care at a tertiary hospital in Zambia.

F. Wanja et al.[43]	2021	Kenya	Cross-sectional	General public	206	To investigate and determine the prevalence of bacterial urinary tract infection, antimicrobial susceptibility profiles, and UTI associated risk factors among adults attending Kiambu level 5 Hospital.
H.A. Onyango et al.[44]	2018	Kenya	Cross-sectional	Pregnant women	210	Identifying associated risk factors for UTI amongst pregnant women attending antenatal clinic at Pumwani Maternity Hospital (The largest antenatal clinic in Kenya)

Risk factors for UTIs

Twenty six risk factors were identified and were classified into four groups for the purposes of this review, namely socioeconomic factors, factors concerning medical history, risk factors on hospitalization, and HIV associated factors. Socioeconomic factors were age, gender, residence, occupation, family income, education, marital status and religion. Medical history factors were history of UTIS, history of catheterization, recurrent UTIs, underlying disease, poor glycemic control, gestational period, parity and gravidity. Hospitalization factors were indwelling catheter, anemia, pyuria, Flank pain, fistula, diabetes mellitus and admission status. HIV associated factors were CD4 counts, viral loads and on HIV medication. Practices including being not circumcised in males, eating raw foods and frequency of sexual intercourses were studied by majority of the articles included (Table 2).

Table2. Summary presentation of risk factors and the studies investigating them

Category	Risk Factor	Studies investigating risk factor
Socioeconomic	Age	[20][21][22][19][24][25][43][27][28][29][30][31][33][34][16][42][36] [37][32][15].
	Gender	[23][19][25][43][27][28][18][16][35][37][17][32][38][39][40][41].
	Residence	[21][24][27][28][29][33][34][18][37][32][41][15].
	Occupation	[21][22][24][43][29][44][31][4][34][42][37][15].
	Family income	[21][26][29].
	Education	[21][22][24][26][43][29][44][30][31][4][34][42][36][37][32][15].
	Marital status	[20][21][43][44][30][4][33][42][36][37][17][32][15][24].
	Religion	[22][23][38].
Medical history	History of UTI	[21][19][24][26][27][29][29][31][4][18][36][37].
	History of Catheterization	[21][24][26][27][28][34][18][37][32][41][15].
	Gestational period	[20][21][22][26][29][44][30][31][42][36].
	Parity	[20][22][26][44][30][34][42][36].
	Gravidity	[20][21][36].
Hospitalization status	Indwelling Catheter	[23][19][25][18][16][32][39][40].
	Flank pain	[28].
	Fistula	[24][34].
	Pyuria	[31].
	Diabetes Mellitus	[23][25][27][18][35][37][17][32].
HIV associated factors	On HIV medication	[38].
	CD4 count	[38].
	Viral load	[38].

Practices	Uncircumcision	[19][27][28][18][32].
	Eating raw meat	[29].
	Coital Frequency	[20][26][43][28][44][36][32].

Age

Twenty studies [19], [20], [34], [43], [21], [22], [24], [25], [27]–[29], [33], [30][31][15], [16], [32], [36], [37], [42] reported the mean age of their study subjects. The lowest mean age was 6 years reported by Fenta et al. [27] while the highest mean age was 39 years reported in the study by Nigusse et al. [37]. Of these, four studies [4], [32], [35], [41]found significant association between age and occurrence of urinary tract infections.

Gender

Among studies that investigated gender, ten studies [4], [16], [25], [28], [32], [33], [35], [37], [38], [41] reported significant association between gender and occurrence of urinary tract infections. High prevalence was observed in female participants and all the above studies reported that females had increased odds of acquiring urinary tract infections compared with their male counterparts.

Residence

Twelve studies [21][24][27][28][29][18], [33], [34][37][32], [41][15] investigated residence as a factor for urinary tract infections. None of the above studies found significant association between residence and occurrence of UTIs.

Occupation

Occupation of participants was investigated by twelve studies[21][22][24][43][29][44][31][4][34][42][37][15]. None of these studies found any significant relationship between occupation and occurrence of urinary tract infections. Odds ratios revealed contrasting and inconclusive conclusions. Notably, while the odds were high in some studies for employed participants, other studies reported reduced odds in unemployed participants and those in informal jobs.

Family income

Family income was investigated by three studies[21][26][29], of which two of them reported significant association. Ali et al. reported those earning below 100USD per month were five times at risk compared with those earning more than 100 dollars [AOR=5.225, 95%CI: 1.270 – 21.500, P=0.002][21]. Gessese et al. reported those receiving a monthly salary of ⩽500 Ethiopian Birr (⩽21.18 USD) were 4.78 times at risk of acquiring a UTI[OR=4.87, 95% CI: 1.03 – 22.21, P = 0.046][29].

Education

Of the sixteen studies that investigated education, two found it to be positively correlated with occurrence of UTIs. While Ali et al. observed that occurrence of UTI was most likely to those who had no formal education as compared to those with formal education [AOR=3.183, 95%CI: 1.027–9.866, P=0.045][21], Inwang et al. reported increased prevalence of asymptomatic bacteriuria among participants with secondary education (P=0.037)[30].

Marital status

Marital status was investigated by fourteen studies[20][21][43][44][30][4][33][42][36][37][17][32][15][24], and of these, only 3 studies found significant association between this risk factor and occurrence of UTIs. Kabugo et al.[4]reported that being married [AOR=0.45; 95%CI: 0.22-0.92, P=0.004] was significantly associated with UTIs. Similarly, Odoki et al.[32] and Wondimeneh et al.[15]found that the risk of acquiring UTIs was higher in married participants compared to unmarried ones {[COR=2.204, 95%CI: 1.203–4.037, P= 0.011] and [P=0.032] respectively}.

History of UTIs

Out of the twelve studies that investigated history of UTIs among its participants, eight studies [21][29][26][27][28][29][31][18] reported significant relationship between UTI occurrence and having a previous infection.

History of catheterization

Eleven studies investigated association between having been catheterized in the past and occurrence of UTIs. Among these studies, six of them [21][24][28][34][18][32] found significant association between this risk factor and occurrence of UTIs.

Gestational period, parity and Gravidity

Studies conducted among expectant women investigated gestational period, parity and gravidity and their association with occurrence of UTIs. Particularly, ten studies investigated the factor gestational period, with two finding significant association with UTI occurrence. While Awunonga et al. [22] predicted an increase in urinary bacterial isolates in the second trimester [P=0.013], Mukosha et al.[42]reported a lower probability of UTI occurrence in late stages of pregnancy [AOR=0.96 95%CI: 0.91-0.99, P<0.0001].

Parity was investigated by eight studies, with only Marami et al.[34]reporting significant association [AOR=0.3, 95%CI: 0.1-0.8], where they found nulliparous participants to have reduced chances of getting UTIs. Gravidity was investigated by three studies and none of them reported significant association.

Indwelling catheter

Of the eight studies reporting on patients with an indwelling catheter, two predicted positive correlation between having an indwelling catheter and the likelihood of acquiring a UTI. Melaku et al.[16]found the risk of developing a UTI among catheterized patients was 2.6 times higher compared to those without a catheter [p=0.001]. Also, Odoki et al.[32]reported that patients with an indwelling catheter of more than 6 days were 3.761 times at risk of acquiring a UTI [AOR=3.761, 95%CI: 1.077–13.128, P=0.038].

HIV associated factors

Four studies [42][37][32][38] investigated prevalence of UTIs in HIV positive participants. Surprisingly, the study by Okechukwu and Thairu[38] stood out by reporting significant relationship in three aspects. Firstly, the prevalence of bacterial isolates was higher in participants receiving first line Anti-Retroviral Therapy (ARVT) compared to those receiving second line ARVT[P=0.024]. Secondly, this study predicted a reduced number of CD4 cells/µl of urine in subjects with bacterial isolates [P=0.02], and that there were high chances of isolating urinary bacteria in patients with an higher viral load (copies/ml)[P=0.003].

3.4 Practices associated with occurrence of UTIs

Uncircumcision

Two studies[18], [27] found significant association between being uncircumcised and acquiring UTIs, out of the four studies that investigated this factor. Fenta et al.[27] reported uncircumcised subjects were more than eighteen times at risk of acquiring an infection compared to circumcised subjects [AOR=18.99, 95%CI: 5.5-65.35, P=0.00]. Mekonnen et al.[18]reported the high risk of UTIs among uncircumcised subjects [AOR=3.523 95%CI: 1.328–9.348, P=0.011].

Eating raw foods

Only Gessese et al. [29] investigated this practice and found no significant association.

Coital frequency

With seven studies investigating frequency of sexual intercourse, only two reported significant association. Specifically, Gebremariam et al.[28]concluded those having sexual intercourse more than three times in a week were more than two times at risk of acquiring a UTIs[AOR=2.16, 95%CI: 1.149–3.69, P=0.012].

4. Discussion

All studies included in this review employed cross sectional study design to collect data. However, there was heterogeneity in statistics reported by the individual studies. We included studies that computed and reported either descriptive or inferential statistics. The most investigated risk factor was age which was investigated by 20 studies, representing 64.5% of the total studies included. This could be attributed to the fact that it is a socio-demographic factor taken during patient data collection.

Conversely, this review revealed a grey area of under investigation of HIV-related factors associated with UTIs in SSA. Particularly, only one study in this review investigated HIV infection, medication, CD4 cell counts and viral loads influence on occurrence of UTIs. This highlights the deficiency of information in this area and implores more studies to investigate this factor.

As only 3 practices were investigated for association with UTI occurrence in SSA, it is evident that they are not so much a factor in contacting a UTI in SSA. However, this fact should be interpreted with caution given the low number of countries represented in this review, bearing that practices are unique to countries and more countries should be included in future reviews to corroborate the credibility of this conclusion.

In a nutshell, we identified that participant`s socioeconomic background and medical history were the most investigated RFs. Another critical finding of this review was the under investigation of HIV-related factors, revealing an information gap to address the impact of HIV-related factors on occurrence of UTIs in SSA. Finally, the contribution of practices or habits towards occurrence of UTIs is rare, as evidenced by the dearth of articles investigating them.

Strengths and limitations

This review accomplished to document the most investigated and the most common RF&P associated with occurrence of UTIs in SSA. As only studies with sufficient data and those that followed accepted reporting guidelines were included, the findings are therefore affirmative and point a factual picture of RF&P investigation in SSA.

However, despite the articles included being informative, most of them did not undertake to provide rigorous statistical evidence to substantiate their findings, hence more rigor in statistical reporting is encouraged in future studies. We did not report the prevalence in individual studies as this was not relevant to the scope of this study. We also could have omitted relevant studies published in language other than English.

5. Conclusion

This study presents a picture of the current trend of RF&P influencing occurrence of UTI in SSA in literature. The current evidence demonstrates the dire need for future studies to lay more emphasis on methodological and statistical rigor. Moreover, this study creates a trail to be followed by future studies to fill the gaps evidenced by this study. Particularly, we implore further rigorous studies to investigate the practices and HIV factors and also to include studies from many countries compared to this review. Nevertheless, it is evident that there are a myriad of RF&P that contribute to the development of UTIs and in the greater SSA. Finally, we advocate for further extensive studies and implore future original article authors on this topic to not only under seek as many RF&P as possible but also conduct intense methodological and statistical analysis.

Authors' contribution

KMK conceptualized the scoping review. KMK and WMW conducted data extraction and curation. MKK, ONO and KLB conducted data analysis and presentation. MKK wrote the manuscript of the scoping review with critical assistance from MWW and KGM. NBJ, JAM and ONO reviewed and edited the original manuscript. All authors read and approved the final manuscript.

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Conflict of interest

Authors declared no potential conflict of interest.

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