SYSTEMATIC REVIEW

Cranberry extract for urinary tract infection treatment in pregnancy: A systematic review

Rahmawati Abdul Hakim*, Dhian Eka Putri, Rahajeng
Department of Obstetrics and Gynaecology, Faculty of Medicine, Universitas Brawijaya, Saiful Anwar General Hospital, Malang, Indonesia.

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***Corresponding author:**
Rahmawati Abdul Hakim
rahma.hakimtya@gmail.com

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ABSTRACT

Objective: Urinary tract infections (UTIs) rank as the second most prevalent infectious condition globally, impacting approximately 150 million individuals each year. Due to anatomical and physiological changes, UTIs are particularly common during pregnancy, presenting with symptoms such as dysuria, turbid urine, increased urinary frequency, and occasionally hematuria. Recurrent UTIs are characterized by two or more episodes within six months or three within a year. Cranberries are widely acknowledged for their role in preventing UTIs during pregnancy. Their preventive mechanism involves inhibiting uropathogenic bacterial adhesion to the urinary tract epithelium, facilitated by phenolic compounds and A-type proanthocyanidins (PACs).

Materials and Methods: In this systematic review, the authors PubMed, ScienceDirect, ResearchGate, and Google Scholar for relevant articles published between 2013 and 2024. The search strategy utilized Medical Subject Headings (MeSH) and keyword terms related to Cranberry Extract/Juice and UTI Measurement Methods in Pregnancy. Search phrases were tailored to each database to enhance retrieval accuracy. All retrieved articles were evaluated in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Results: Among the 30 studies reviewed, a daily dose of 500 mg cranberry extract over six months demonstrated promising efficacy as an alternative treatment for UTIs in pregnancy.

Conclusion: Cranberry (*Vaccinium macrocarpon*) extract effectively prevents UTIs by inhibiting bacterial adhesion and exerting antibacterial effects. This review confirms cranberry as a promising, safe alternative for UTI treatment and prevention in pregnancy, suitable for daily consumption.

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Highlights:

1. Cranberry is a promising effective alternative treatment and prevention for UTIs in pregnancy.
2. Cranberry inhibits urinary tract bacteria adhesion and has antibacterial effects.

INTRODUCTION

Due to their pelvic anatomy, women face a higher risk of urinary tract infections (UTIs) than men, as bacteria can readily ascend from the urethra to the bladder and potentially reach the kidneys. The warm, moist vulvar environment, near the rectum, further elevates contamination risk.[1] UTIs are the second most prevalent infection worldwide, frequently presenting as a significant medical complication during pregnancy, often leading to recurrent urinary tract infections (RUTIs).[2-4] The increased UTI incidence in pregnancy stems from anatomical and physiological changes, including ureteral dilation and reduced bladder tone.[5] Symptoms include dysuria, turbid urine, increased urinary frequency, and occasionally hematuria. Recurrent UTI is defined as two or more episodes within six months or three within a year.[6] Un-complicated UTIs, common among women, have a 20–30% recurrence rate, posing a persistent health challenge.[7]

Uncomplicated UTI symptoms, frequently managed in primary care, are typically treated with antibiotics. The high prevalence during pregnancy has driven increased antibiotic prescribing, raising concerns about antimicrobial resistance (AMR).[8] AMR is a critical global health threat, causing 2.8 million illnesses and over 35,000 deaths annually in the US in 2019.[9] Consequently, alternative approaches, such as herbal medicines, are being investigated for UTI prevention and as innovative treatments for RUTI to reduce reliance on antibiotics.

Cranberry (*Vaccinium macrocarpon*) is a widely utilized therapeutic plant, recognized for its efficacy in preventing UTIs in pregnancy.[10,11] The mechanism behind cranberry's UTI-preventive effects is not fully elucidated. Research suggests phenolic compounds and A-type proanthocyanidins (PACs) inhibit uropathogenic bacterial adhesion to the urinary tract epithelium.[10,12,13] These components reduce bacterial attachment to bladder wall cells but do not dislodge adhered bacteria.[14] Cranberries also exhibit antibiofilm, antiproliferative, immunomodulatory, and anti-inflammatory properties, enhancing their primary antiadhesive action.[15-17] By reducing antimicrobial use, cranberry extract mitigates the risk of antibiotic-resistant microorganisms, a significant clinical advantage.[18]

Recent metabolomics studies show that cranberry juice consumption alters the urine metabolome, increasing excretion of exogenous and endogenous metabolites. As cranberries are not metabolized, they are excreted in urine, likely contributing to their antiadhesive properties.[18] This study evaluates cranberry extract's efficacy in treating and preventing UTIs in pregnant women, determines its optimal dosage, and explores its potential to reduce AMR-related complications in clinical practice.

MATERIALS AND METHODS

Literature searching

This was literature review involving a comprehensive literature search conducted using PubMed, Science Direct, ResearchGate, and Google Scholar to identify relevant publications related to this topic. The search strategy employed both MeSH terms and keyword combinations focusing on Cranberry Extract/Juice and Methods of Measurement and Analysis for UTIs during pregnancy. Search terms were tailored specifically to each database to optimize retrieval. All articles published between 2013 and 2024 were retrieved and evaluated. This systematic review adhered to the PRISMA guidelines and was prospectively registered in PROSPERO (CRD42024620931).

Eligibility criteria

The data used in the present study were categorized into two groups: inclusion criteria and exclusion criteria. This review included all experimental studies, cohort studies, longitudinal studies, case reports, social or pilot studies, and observational studies that were published within the past ten years and written in English. The study population consisted of healthy pregnant women, regardless of race, with or without Urinary Tract Infections (UTIs), particularly those exhibiting symptoms of recurrent UTIs. These individuals were selected as subjects for this review. Inclusion also required that studies employ consistent units of measurement, or that any variations be appropriately standardized through accurate calculations. In contrast, exclusion criteria encompassed all review articles, letters to the editor, and conference abstracts. Additionally, studies were excluded if they had irrelevant titles or abstracts, lacked accessible full texts, failed to clearly report units of measurement, or contained otherwise incomplete data.

Study selection and screening

The screening process was conducted by a team of reviewers. Titles, abstracts, and keywords were carefully assessed. PRISMA guidelines and the Mixed Methods Appraisal Tool (MMAT) were utilized to evaluate the quality of studies included in this systematic review. The MMAT includes five criteria for each methodological category, with items rated as Y (YES = 1), N (NO = 0), or C (Cannot tell = 0). Final

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scores were determined by the number of affirmative responses (see Table 1).

Data extraction

Urinary Tract Infections (UTIs) are identified by clinical signs and symptoms of genitourinary tract infections and the presence of one or more microorganisms in the urine exceeding a defined threshold (102 to 103 colony-forming units/mL)[19,20] Recurrent Urinary Tract Infections (RUTIs) are defined as three positive urine cultures within a 12-month period or two infections within six months.[21] Cranberry Extract, derived from the fruits and leaves of Vaccinium macrocarpon, is a traditional herbal remedy employed for UTI prevention. Numerous studies, including those supported by the National Center for Complementary and Alternative Medicine, have investigated the potential protective effects of cranberry intake on urinary tract health.[22] All studies categorized as experimental, cohort, review, or observational in nature were eligible for inclusion in this systematic review. The target population for this review consisted of women of reproductive age (20–50 years) and older. In addition to the six domains mentioned above, data on study period, country, characteristics of intervention and control groups, outcome measurement tools (e.g., questionnaires), and key findings—such as the intervention's effectiveness on psychological symptoms and any reported adverse events—were extracted from each study.

RESULTS AND DISCUSSION

Overview of literature searching

The PRISMA flowchart of study selection is shown in Figure 1. A total of 743 studies were retrieved from the PubMed, ResearchGate, ScienceDirect, and Google Scholar databases. Following the removal of 805 duplicate records, 358 articles remained for title and abstract screening. Based on the selection criteria, 253 studies were excluded. Subsequently, 105 full-text articles were evaluated, and 59 were excluded due to irrelevant outcomes, the use of active control group designs, or publication in languages other than English or Indonesian. Ultimately, 30 studies were included in the qualitative synthesis.

Table 1. RCT (Randomized Controlled Trial; Y=YES, N=NO, C=Cannot Tell)

Design	Methodological quality criteria / study ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Quantitative RCT	Is randomization appropriately performed?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Are the group comparable at baseline?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Are there complete outcome data?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Are outcome assessors blinded to the intervention provided?	C	C	C	C	Y	Y	C	C	C	C	C	Y	Y	Y	Y
	Did the participants adhere to the assigned intervention?	C	Y	C	C	C	C	C	Y	Y	Y	Y	Y	Y	Y	Y
	Is randomization appropriately performed?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Are the group comparable at baseline?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Are there complete outcome data?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Are outcome assessors blinded to the intervention provided?	C	C	C	C	Y	C	C	C	Y	C	C	Y	Y	Y	Y
	Did the participants adhere to the assigned intervention?	C	Y	Y	Y	C	C	Y	Y	Y	Y	Y	Y	Y	Y	Y

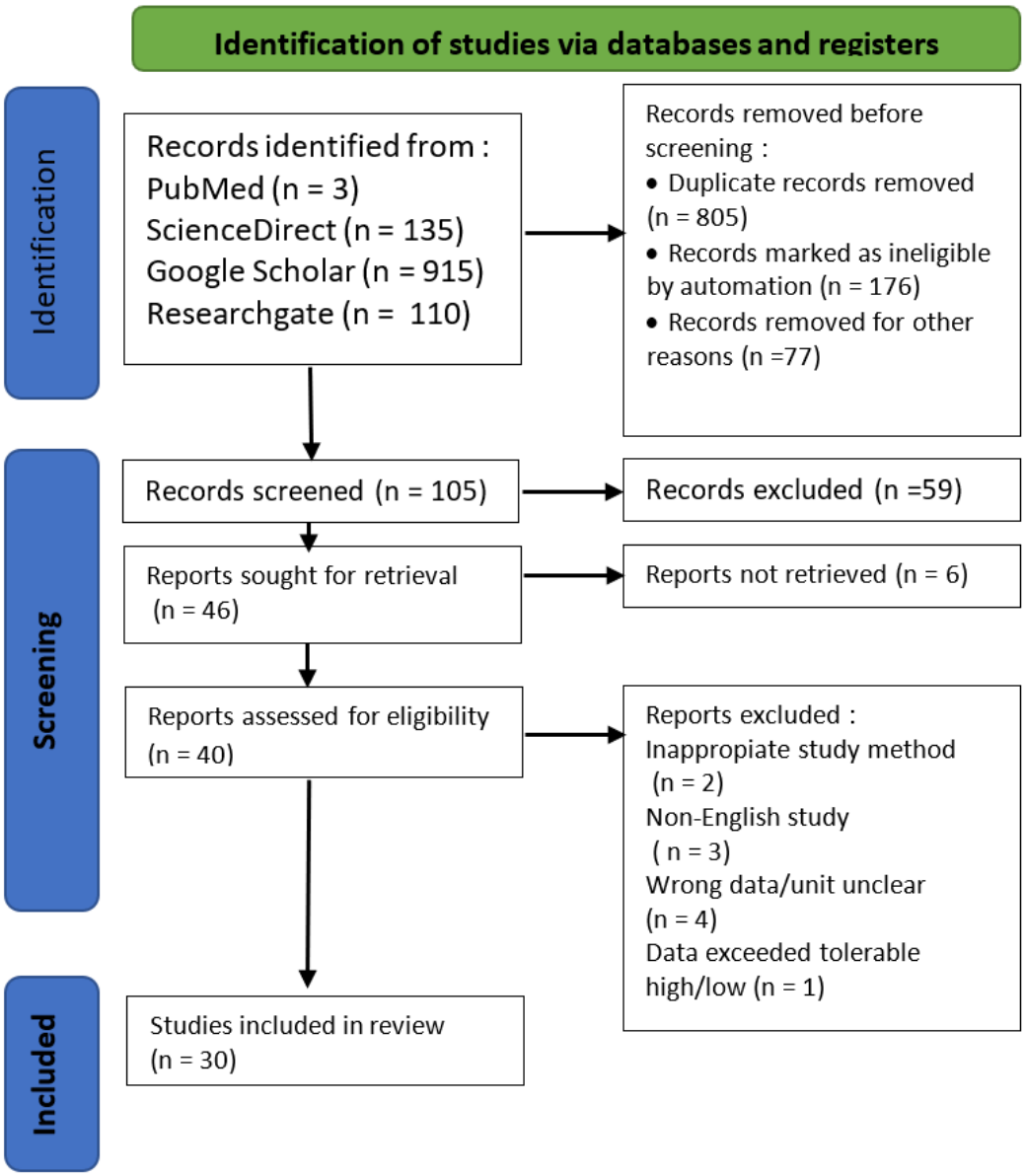

Figure 1. PRISMA Flowchart of The Literature Selection

Study characteristics

The characteristics of the 30 studies included in the current qualitative analysis are presented in Table 2. This review includes a total of 30 studies involving participants evaluated for the use of Cranberry Extract in the treatment of Urinary Tract Infections (UTIs) during pregnancy. Most of these studies were conducted in the USA (10), followed by the UK (3), Spain (2), China (2), the Netherlands (2), Germany (2), and one study each from Canada, Switzerland, Norway, Italy, Mexico, Australia, Iraq, Poland, and Finland. These 30 studies, included in the present systematic review, provide an analytical evaluation of the preventive application of Cranberry (*Vaccinium macrocarpon*) extract in the management of UTIs during pregnancy.

Table 2. Characteristics of included study

Countries	Authors	Years	Study designs
Spain	Llano, Dolores Gonzales et al	2020	Observational Study
Canada	Babar, Asma et al	2018	Double Blind Randomized Controlled Study
USA	Zhuxuan, Fu et al	2017	Cohort Study
UK	Gbinigie, Oghenekome et al	2019	Randomized Clinical Study
USA	Hudson, Rachel E et al	2021	Cohort Study
USA	Bolgarina, Zoryana et al	2023	Clinical Trial and Observational Study
Switzerland	Gbinigie, Oghenekome et al	2020	Cohort Study
USA	Wing, Deborah A et al	2014	Clinical Trial and Observational Study
China	Wang, Chih-Hung et al	2013	Randomized Control Study
Norway	Heitmann, Kristine et al	2013	Cohort Study
Germany	Jeitler, Michael et al	2022	Prospective, Uncontrolled Exploratory Study
Italy	Ledda, A et al	2017	Clinical Study
Germany	Vostalova, Jitka et al	2015	Randomized Double Blind and Placebo Controlled Study
USA	Wing, Deborah A et al	2013	Pilot Study
USA	Stapleton, Ann E. et al	2013	Randomized Controlled Study
Netherland	Beerepoot, Marielle A.J et al	2013	Randomized Double-Blind Non-Inferiority Study
Spain	Perez-Lopez, Faustino R et al	2013	Observational Study
USA	Koradia, Parshottam et al	2019	Controlled Pilot Study
Mexico	Monroy-Torres, Rebeca et al	2018	Observational Actual Evidence Study
Australia	Konesan, Jenane et al	2022	Cohort Study
UK	Maki, Kevin C et al	2016	Double-blind Randomized Placebo-controlled Study
USA	Liska, DeAnn J et al	2016	Cohort Study
Iraq	Al Gaoale, Zubaidah Ibrahim Younus et al	2022	Observational Study
Poland	Wawrysiuk, Sara et al	2019	Cohort Study
UK	Griffiths, Peter	2013	Observational Social Study
USA	Efros, Mitchell et al	2013	Clinical Study
Netherland	van Wietmarschen, Herman et al	2022	Observational Study
USA	Gupta, K et al	2013	Clinical Study
Finland	Kontiokari, Tero et al	2013	Randomized Study
China	Xia, Jia-yue et al	2021	Sequential Analysis Study

Table 3 contains detailed descriptions of the 30 primary articles selected for the systematic review on Cranberry Extract in Urinary Tract Infections (UTIs) during pregnancy, comprising a total sample size of 3,657 women in healthy reproductive age, pregnant, or breastfeeding.

UTIs represent the second most common infectious condition globally, affecting approximately 150 million individuals. This infection is highly prevalent during pregnancy, with frequent recurrence attributed to anatomical and physiological changes associated with gestation.[2,23] The prevalence of UTIs is higher in women due to shorter urethral anatomy, which facilitates bacterial colonization and ascending infection to the bladder and kidneys.[1] During pregnancy, UTIs are often associated with complications affecting both the mother and fetus. Studies have reported a higher incidence of preterm birth among women experiencing recurrent UTIs.[3] Recurrent UTIs (r-UTIs) are defined as two episodes within six months or three within twelve months.[24] This condition often necessitates extended or higher-dose antibiotic therapy. Some women may present with asymptomatic UTIs, posing challenges for timely diagnosis and effective treatment. Standard treatment for UTIs primarily involves antimicrobial or antibiotic therapy. However, growing concerns have emerged due to increasing antibiotic resistance associated with recurrent infections.[8,9] This situation has led to a growing interest in alternative therapies, such as herbal medicine, for their protective effects. Beyond resistance, additional concerns regarding antibiotic use in pregnancy include risks of miscarriage and increased incidence of sick leave, as also reported in the literature.[13]

Table 3. PICO table summary of primary articles sources with sample size (n = 3657 women)

Author (Year)	Country	Sample	P	I	C	O
Llano, Dolores Gonzales et al (2020)	Spain	170 women	100 pregnancy women (50 primiparous and 50 nulliparous) and 70 healthy women in reproductive ages with or without recurrent or uncomplicated UTIs for 3 – 6 months	Cranberry extract from small dosage to high dosage	Placebo	Protective effect of cranberry extract for UTIs
Babar, Asma et al (2018)	Canada	148 women; ages ≥ 18 years old, with ≥ 2 symptoms of UTIs in 6 months or ≥ 3 symptoms of UTIs in 12 months	Divided into 2 groups (74 women for each group)	2x18,5 mg PACs per day for 6 months	2x1 mg PACs per day for 6 months	New standardized of High Doses of cranberry extract for Prevention of r-UTI
Zhuxuan, Fu et al (2017)	USA	154 women; ages ≥ 18 years old with history of UTI in pregnancy	Divided into 2 groups (77 women for each group)	Cranberry juice and extract	Placebo	Effect of cranberry for UTIs in women
Gbinigie, Oghenekome et al (2019)	UK	45 women; ages ≥ 18 years old consulting in primary care for pregnancy and problems of acute UTIs; get antibiotic for prescription	20 women with problem of UTIs who got the early prescription of first line antibiotics; 25 women with UTIs who got delayed or never get antibiotics	Cranberry extract combines with primary line antibiotics	Antibiotics	Effect of cranberry for acute UTIs and how much it can reduce antibiotics use for treatment of UTIs
Hudson, Rachel E et al (2021)	USA	100 women with symptoms of UTIs in pregnancy	25 women as control group get conventional treatment for UTIs; 75 women in intervention group divided into 2 groups; 35 women with standard dosage of cranberry and 40 women with high dosage of cranberry extract	Standard dosage of cranberry extract and high dosage of cranberry extract	Conventional Treatment for UTIs	Examine the complementary and dosage of cranberry for better treatment
Bolgarina, Zoryana et al (2023)	USA	200 women; with symptoms of UTIs or RUTIs in pregnancy	Divided into 2 groups	Cranberry supplement	Placebo	Evaluate the effectiveness of cranberry supplement for UTIs in pregnancy women
Gbinigie, Oghenekome et al (2020)	Switzerland	140 women; ages ≥18 years old, outpatient in primary care with symptoms of UTIs	Divided into 2 groups	Cranberry extracts	Placebo	Efficacy of cranberry extract for acute UTIs in pregnancy
Wing, Deborah A et al (2014)	USA	49 pregnant women with gestational ages between 12 to16 weeks	Divided into 2 groups	Cranberry capsules	Placebo	Preventive effect of cranberry for UTIs in pregnancy
Wang, Chih-Hung et al (2013)	China	414 women; ages ≥18 years old with UTIs symptoms in pregnancy	Divided into 2 groups (consist of 207 each group), then divided into 2 smaller groups each; 1 group for r-UTIs during pregnancy and 1 group without r-UTIs symptoms	Cranberry juice and extract for 3 until 6 months prior to the symptoms	Placebo	Analyze the effect of cranberry extract for treatment in UTIs of pregnant women
Heitmann, Kristine et al (2013)	Norway	300 women; gestational age between 12 to 16 weeks	Divided into 2 groups base on primiparous and nulliparous	Cranberry extract	Placebo	Pregnancy UTIs symptoms and condition after consume cranberry extract
Jeitler, Michael et al (2022)	Germany	23 women; ages ≥18 years old reported with chronic recurrent UTIs problem in pregnancy	Divided into 2 groups	Cranberry supplement within 6 months consumption	Cranberry supplement for 1 – 3 months consumption	UTIs outcome with different duration of cranberry supplement consumption
Ledda, A et al (2017)	Italy	36 women; ages ≥18 years old suffering with r-UTI in pregnancy	Divides into 2 groups consist of 17 women as control (get the standard management for UTIs) and 19 women as intervention who obtained oral cranberry supplementation	Oral cranberry supplementation contain of 120 mg cranberry extract, standardized to 36 mg proanthocyanidins for 60 days	Standard management and medication	Effectiveness of prevention of UTIs in pregnancy

Vostalova, Jitka et al (2015)	Germany	182 women; history of pregnancywith 2 or more UTIs episodes in the last year	Divided into 2 groups; 89 received the cranberry extract and 93 as control received the placebo	Daily 500 mg cranberry extract for 6 months	Placebo	Efficacy of high dosage of proanthocyanidins as the key of successful treatment and prevention of UTIs in pregnancy
Wing, Deborah A et al (2013)	USA	28 pregnant women and 15 non-pregnant women in reproductive age	Both category divided into 2 and randomly made into 2 large groups, consisted of 24 intervention groups (14 pregnant women and 10 non-pregnant) and the rest as the control group	Low calorie cranberry juice (consist of 100% cranberry) 240 ml two times daily	Placebo	Antimicrobial effect of cranberry juice cocktail daily
Stapleton, Ann E. et al (2013)	USA	176 women; ages between 18 to 45 years old which history of clinical diagnosed UTIs in pregnancy	Divided into 2 groups of 120 women in intervention group and 56 women in control group. The intervention group divided into 2 groups obtaining different intervention	Group 1A : received 4 oz of cranberry juice Group 2A : received 8 oz of cranberry juice	Placebo	The preventive effect of cranberry juice for recurrent UTIs and Urinary *Eschericia colli* Infection in women
Beerepoot, Marielle A.J et al (2013)	Netherland	221 women; ages between 18 to 45 with history of UTIs symptoms in pregnancy or breastfeeding (at least 3 symptomatic UTIs) that have been receiving antibiotics treatment	Divided into 3 groups; consisted of 2 intervention groups and 1 placebo	Group (1) : obtained *Trimetrophim-sulfamethoxazole* (TMP) with placebo Group (2) : TMP and 500 mg capsule of cranberry, 1 capsule, twice, daily	Placebo	Analyze the preventive effect between antibiotics and cranberry for UTIs problem in women
Perez-Lopez, Faustino R et al (2013)	Spain	20 women; ages ≥18 years old with history of UTIs in pregnancy	Divided into 2 groups	Cranberry extract	Placebo	The effect of cranberry for prevent the case of recurrent UTIs
Koradia, Parshottam et al (2019)	USA	115 women; which 90 enrolled and 81 subjects completed the study; ages 18 to 55 years old which have history of UTIs in pregnancy	Divided into 2 groups for 26 weeks treatment	180 days (full treatment) of cranberry capsule	90 days cranberry capsule	Evaluate the duration of probiotic and cranberry capsule for recurrent UTIs in women
Monroy-Torres, Rebeca et al (2018)	Mexico	150 pregnant women (early pregnancy or first semester) with the history of UTIs, but not in active UTIs problem	Divided into 2 groups, each consisted of 75 women	Cranberry juice daily for 6 months	Placebo	The efficacy of cranberry juice for prevention of r-UTIs in pregnant women
Konesan, Jenane et al (2022)	Australia	172 women; ages between middle 20 to 50s years old with history of UTIs in pregnancy	Divided into 2 groupss	Cranberry extract	Placebo	The effect of cranberry for UTIs in women
Maki, Kevin C et al (2016)	UK	373 women; ages 20 – 70 years old with history of UTIs in pregnancy and BMI < 40, that have been treated in health care professional	Divided into 2 groups; 185 women in intervention group and 188 women in control group	240 mL of cranberry beverages/day	240 ml placebo beverages/day	Evaluate the effect of cranberry beverages for UTIs problem
Liska, DeAnn J et al (2016)	USA	90 women; ages 18 – 45 years old with history of recurrent UTIs in pregnancy and breastfeeding	Divided into 2 groups; 50 women in intervention group and 40 women in control group	Cranberry extract	Placebo	The effect in cranberry extract consumption for UTIs problem
Al Gaoale, Zubaidah Ibrahim Younus et al (2022)	Iraq	24 pregnant women with uncomplicated UTIs problem	Divided into 2 groups	Cranberry (combination) supplement	Placebo	Therapeutic effect of cranberry for anti-relapse uncomplicated UTIs in women
Wawrysiuk, Sara et al (2019)	Poland	30 women; ages ≥18 years old with history of UTIs in pregnancy or r-UTI	Divided into 2 groups	Cranberry extract	Placebo	Evaluate the preventive and treatment effect of cranberry in UTIs

Griffiths, Peter (2013)	UK	20 women; ages ≥18 years old outpatient in primary health care with history of UTIs in pregnancy	Divided into 2 groups	Cranberry juice for 7 days	Cranberry juice for ≥14 days (standardized)	Role of cranberry for treatment and prevention of UTIs
Efros, Mitchell et al (2013)	USA	28 women; ages ≥18 years old with history of UTIs in pregnancy and breastfeeding in minimum 6 months	Divided into 5 groups	Oral cranberry extract at : Group (1) 15 mL, (2) 30 mL, (3) 45 mL, (4) 60 mL and (5) 75 mL for 12 weeks	-	The recommend dose of cranberry extract to get the preventive effect of recurrent UTIs problem
van Wietmarschen, Herman et al (2022)	Netherland	40 women; ages ≥18 years old with history of UTIs in pregnancy	Divided into 2 groups	Cranberry extract	Placebo	The preventive effect of cranberry extract for recurrent UTIs
Gupta, K et al (2013)	USA	20 women; ages ≥18 years old with history of specific UTIs in pregnancy (*E. coli)* infection	Divided into 2 groups	Cranberry supplement (consist of 9 mg proanthocyanidin per gm)	Placebo	The effect of cranberry extract in inhibit adherence of P-Fimbriated *Eschericia coli* in UTIs problem
Kontiokari, Tero et al (2013)	Finland	150 women; have the history of pregnancy UTIs caused by *Eschericia coli* bacteria in Oulu University Hospital	Divided into 3 groups, consisted 2 intervention groups and 1 control group	Group 1A : 50 women received 50 mL of cranberry juice concentrate a day for 6 months Group 2A : 50 women received 100 mL *Lactobacillus* GG drink 5 days a week for one year	Placebo	Evaluate better option for prevention of recurrent UTIs caused by *E.coli*
Xia, Jia-yue et al (2021)	China	24 women; reproductive age, with history of UTIs in pregnancy that have been treated by antibiotics	Divided into 2 groups	Cranberry extract	Primary Line of Antibiotics	Evaluate the effect of cranberry as the adjuvant therapy of UTIs problem in women

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Herbal therapies for UTI prevention include cranberry (*Vaccinium macrocarpon*). Cranberry contains polyphenols, flavonoids, and phenolic acids, which have been shown to contribute to the prevention of UTIs[5,6] Early research proposed that cranberry functions by increasing urinary acidity, while later studies suggest its mechanism involves the inhibition of bacterial adhesion to the urinary tract epithelium[25,26] Cranberry consump-tion has been associated with a reduction in UTI incidence among women[5] While several studies support its efficacy in alleviating symptoms and preventing UTIs, some have yielded inconsistent results. Findings from both in vivo and in vitro research strongly support the recommendation of cranberry as a preventive agent for UTIs.[5] In the present review, this claim is supported by over 20 included studies. Some studies demonstrate that cranberry extract, whether in juice or capsule form, may be utilized as either an adjunct to antibiotic therapy or as a standalone treatment.[27-29] Both modalities appear to offer beneficial effects in reducing recurrent UTIs.[9] However, challenges remain, including limited knowledge of the products, lack of standardization, unclear dosing regimens, and concerns regarding toxicity and side effects.[6,10]

One study included in this review found that daily administration of 500 mg cranberry containing 2.8 mg of proanthocyanidins (PACs) for six months reduced the recurrence of UTIs.[18] Another study reported that cranberry exhibited antibacterial activity against *Escherichia coli*, with a reduction in bacterial colonies observed after single or double doses of cranberry intake.[19] Although cranberry tolerability remains a concern, several studies have shown a statistically significant reduction in recurrent UTIs in women following cranberry consumption.[30-32] Some findings also suggest that daily cranberry intake for 6 to 12 months is safe for pregnant women and children.[33,34] Additional studies confirm the high efficacy of cranberry in preventing UTIs during pregnancy, particularly due to its feasibility for daily use.[35,36]

Despite the positive effects reported in several studies, two of the reviewed articles noted no significant difference in the protective effects of cranberry. Moreover, due to the long duration of some studies, a substantial number of participants were lost to follow-up, leaving the evidence base inconclusive.[4-7] The incidence of symptomatic UTIs during the studies showed little variation between the cranberry, antibiotic, and placebo groups.[7,8] Limitations of this review include a lack of robust studies published after 2018, insufficient evidence to form definitive clinical guidelines, and continued absence of product standardization as of 2022. Nonetheless, this review highlights the promising potential of cranberry as an effective alternative treatment and preventive option for UTIs during pregnancy, underscoring the therapeutic role of herbal medicine in infection management.

Strength and limitation

A key strength of this review is the finding that cranberry presents a promising and effective alternative therapy for the treatment and prevention of UTIs in pregnancy. The main limitation lies in the lack of stronger studies and more comprehensive sources available for inclusion.

CONCLUSION

This systematic review demonstrates that UTIs remain a prevalent health issue among women, particularly during pregnancy. At present, this infectious disease may be managed and prevented through alternative therapies alongside conventional treatments. Cranberry (*Vaccinium macrocarpon*) extract is frequently used for its prophylactic effects against UTIs. According to this review, daily supplementation of 500 mg cranberry extract over a six-month period offers an effective alternative for UTI management in pregnancy, with no adverse effects reported. The mechanism of cranberry involves the inhibition of bacterial adherence to the urinary tract epithelium and the exertion of antibiotic-like effects. These findings support the conclusion that cranberry is a promising and effective alternative therapy for both treatment and prevention of UTIs during pregnancy, suitable for regular consumption.

DISCLOSURES

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Conflict of interest

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Author contribution

All of the authors prepared, collected, analyzed, wrote, and approved this work.

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