

## Sodium Bicarbonate: A New Promising Home Strategy for the Treatment of Vaginal Yeast Infection

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### Abstract:

**Background:** Yeast vaginal infections, commonly known as vaginal candidiasis or yeast vaginitis, are a prevalent issue for women. Itching and irritation of the vulva and the area around the vaginal opening are the most typical symptoms. Although vaginal yeast infections typically manifest as sporadic episodes, they can reoccur regularly and result in long-lasting, chronic symptoms. **Aim** of the study was to investigate the effectiveness of sodium bicarbonate as a new promising home strategy for the treatment of vaginal yeast Infection. **Subjects and Methods: Research design:** A quasi-experimental design was conducted. **Setting:** The study was conducted at two Egyptian Maternal and Child Health Centers (MCH). **Subjects:** One hundred-twelve women were recruited for this study. **Tools of data collection:** Four tools were used (1) Arabic structured interviewing questionnaire sheet, (2) Women's knowledge regarding vaginal yeast infection, (3) Clinical manifestation of vaginal yeast infection record, and (4) Evaluation of the effect of sodium bicarbonate among women suffering from vaginal yeast infection. **Results:** the study results revealed that 68.8% of the studied women belonged to the age group of 31 to 40 years. The results of the post-intervention phase showed a highly significant difference ( $p=0.0001$ ) in comparison to the pre-intervention phase in terms of knowledge level and symptoms related to the vaginal yeast infection of the sample under analysis. **Conclusions:** After using baking soda, all symptom of vaginal yeast infection has been subsided. Furthermore, the majority of the studied women became knowledgeable about vaginal infection after implementation of the intervention. **Recommendations:** the effectiveness and efficiency of **sodium bicarbonate** for treating vaginal infections require more research.

**Key words:** Sodium bicarbonate, home remedy, treatment, and vaginal candidiasis.

### Introduction

Vulvovaginal candidiasis (VVC), is a highly common mucosal infection of the lower female reproductive tract that is mostly caused by the polymorphic opportunistic fungus *Candida albicans*. As a typical asymptomatic coloniser of the vaginal canal, *Candida albicans* is a component of the normal human microbiota <sup>(1)</sup>.

Nevertheless, severe mucosal inflammation, mostly due to fungal proliferation in the vagina, can result in symptomatic infection. This is followed by epithelial invasion and the production of virulence effectors. Vaginal burning, discomfort, redness, and itching are typical signs of the illness. Vaginal discharge made up of

immune cells, lost epithelium, and vaginal fluid is frequently present with them <sup>(2)</sup>.

A vaginal yeast infection (VYI) can affect up to 75 out of 100 women at some point in their lives, according to the Institute for Quality and Efficiency in Health Care (IQWiG) in Cologne, Germany<sup>(3)</sup>. By 2022, half of all women will have experienced at least one VVC episode by the time they are 25 years old. Fertile women are more prone to get these illnesses.

In Egypt, 40–45% of women may experience two or more episodes of vaginal yeast infection, and 75% of women will encounter an incident at least once. 10% to 20% of women will experience complex vaginal yeast infections, which need for particular

attention in terms of diagnosis and treatment <sup>(4)</sup>.

There is no one trigger that causes VVC episodes. Both inherent and external factors influence an individual's vulnerability to illness. Immunosuppression, metabolic diseases, age and hormone state, pregnancy, allergies, psychological stress, and genetic predisposition are significant host-specific risk factors. Furthermore, it is necessary to address behavioural risk factors, which include condoms, spermicides, intrauterine devices (IUDs), antibiotics, glucocorticoids, SGLT2 (sodium glucose co-transporter-2) inhibitors, and practises related to sex, hygiene, and clothing <sup>(5)</sup>.

A precise diagnosis is essential for successful therapy; nevertheless, misdiagnosis of this illness is close to 50%, which increases the likelihood of recurrence. A combination of microscopic inspection demonstrating yeasts, hyphae, cultures, or all of these from a vulval or vaginal swab in the presence of consistent clinical signs and symptoms is used to establish the diagnosis of vulvovaginal candidiasis. More precise and sensitive molecular testing have the potential to revolutionise vaginitis diagnosis, resulting in earlier interventions and more accurate diagnoses, as well as lower medical expenses and better patient outcomes <sup>(6)</sup>.

Vulvovaginal candidiasis continues to receive minimal attention in the majority of underdeveloped nations, including Ethiopia. However, because of its links to rising genital tract infections, HIV, and other sexually transmitted illnesses, as well as direct and indirect financial implications, vulvovaginal candidiasis has been recognised as a major worldwide health concern <sup>(7)</sup>.

An internist, nurse practitioner, gynaecologist, or primary care physician typically treats Candida vulvovaginitis. Antifungal medicines are used in the care of the clinically diagnosed disease. The majority of easy cases end in a few days. Patients with more complex cases of candidal vulvovaginitis need more time in treatment. Oral antifungals should not be administered to pregnant patients. An intravaginal therapy period of seven days is appropriate for these patients. It is thought that fluconazole is safe for nursing mothers <sup>(8)</sup>.

One non-pharmacological substance that aids in naturally regulating the vagina's pH levels is baking soda. Since it is alkaline, it aids in the destruction of candida cells, which cause vaginal yeast infections. With its all-natural ingredients, this vaginal wash aids in hastening the healing process <sup>(9)</sup>.

The nurse is crucial in maintaining the health of girls and women who have vaginal yeast infections by helping with early diagnosis and raising awareness of the infection's prevention. Early detection of a vaginal yeast infection aids in women's quick recovery and helps to avoid potential complications. Additionally, the nurse plays a crucial role in helping patients access and utilize primary care services in order to prevent illness by encouraging them to practice good hygiene, wear cotton pants, refrain from douching, and keep a healthy diet <sup>(10)</sup>.

### **Significance of the study**

Despite not being a serious condition, vaginitis can cause people to feel debilitated and distressed. In addition to treating the illness itself, social concerns and sexual dysfunction must be addressed. As per the Clinical Practice Guidelines, topical or oral antifungals are

administered to treat VVC. The most generally prescribed antifungals are azoles, which include fluconazole, clotrimazole, and miconazole. Significantly, the long-term effectiveness of antifungal medications is constrained due to the rise in *Candida* species resistance to these drugs, which leads to the emergence of multidrug resistance. Consequently, in order to properly treat RVVC and stop it from reoccurring, there is an urgent need for complementary or alternative therapy <sup>(11)</sup>.

It is very necessary to concentrate on vaginal infections, conventional treatments, and the efficiency of sodium bicarbonate in the early treatment and reduction of vaginal yeast infections in Egyptian women. Sodium bicarbonate applied early at home may aid in the management and prevention of vaginal yeast infections. Thus, the goal of the current study was to determine whether or not sodium bicarbonate could aid women suffering from vaginal yeast infections by enhancing treatment and facilitating early detection.

### **Aim of the current study:**

The aim of the present study was to investigate the effectiveness of sodium bicarbonate as a new Promising home strategy for the treatment of vaginal yeast Infection.

### **Study Hypotheses:**

Following the implementation of the educational sessions, women's understanding regarding vaginal yeast infection would have improved.

After utilizing baking soda, women with vaginal yeast infections would have recovered.

### **Subjects and Methods:**

#### **Research design:**

The current study used a quasi-experimental design (pre-posttest)

#### **Study setting:**

The study was conducted at MCH centers in Sheba and Elnakkaria in Sharkia Governorate, Egypt. The location was selected based on a number of factors, including its consideration of the principal public MCH and its ability to accommodate large numbers of women from different Zagazig city districts who are seeking improved health care.

#### **Study Subjects:**

Studied females complaint from redness in vaginal area were 90% pretreatment by baking soda, which improving to be 70% after treatment (Abd Allah, et al 2022)<sup>(10)</sup>, confidence level is 95% two side, with power of study 95%. Sample size calculated, using Open Epi software, is 112 females. Therefore, agreement to participate in the current study was given by 112 women who attended two Egyptian MCH centers and had a vaginal yeast infection that was confirmed by the doctor through clinical manifestations and vaginal examination (the researcher assisted the physician with vaginal examination) or who were at high risk of developing one and ready to take part in the research.

**Tools of data collection:** four tools for data collection were used

**Tool I: Arabic-language structured interviewing questionnaire** which included three main parts:

**1. The social demographic information** in the study comprised the women's ages, places of residence, employment, educational attainment, and marital status.

**2. Women's reproductive and sexual history:** menarche age, interval between menses, length of menses. Additionally, the obstetric history (number of live births, number of deliveries, number of abortions, interval between pregnancies, and pregnancy complications).

**3. Assessment of vaginal yeast infection risk factors:** Twelve items were assessed, including oral contraceptive pill use, wearing tight pants, using cosmetics, using antibiotics, and vaginal douching.

**Tool II: Knowledge of the participant (pre-posttest):** Six questions were included in the assessment to gauge women's knowledge about vaginal yeast infections, including its definition, causes, symptoms, diagnosis, prevention, and most common home remedies used for treatment of the condition).

**Scoring system:** Every knowledge variable was assigned a weight based on the elements included in each question. The answers to the questions were divided into two categories: (1) correct answers and (2) incorrect answers or answers for which the answer was unknown. Following was the classification of the total knowledge score:

- Satisfactory (≥75% correct answer)
- Unsatisfactory (<75% correct answer)

**Tool III:** Clinical signs and symptoms of (VYI) documentation (pre- and post-test). There were 19 questions in it.

**Tool IV** Assessment of sodium bicarbonate's impact on female patients with vaginal yeast infections (post- test).

**Content Validity and Reliability:**

Before assessing the tools' face and content validity, five experts in obstetrics and gynaecological nursing evaluated them for clarity, relevance, applicability, comprehensiveness, comprehension, and ease of execution.

**Reliability of knowledge score**

Cronbach's Alpha	No. of Items
0.71	6

**Field work:**

The study was conducted through three phases:

**Phase 1 Preparatory phase:**

The following procedures were followed: each participant's oral agreement was gained once the study's goal was stated, and the self-administered questionnaire was first coded.

**Phase 2 Implementing phase**

From May to the end of September 2023, the researchers collected data for five months, three days a week, in the aforementioned location. The researcher gave instructions on how to complete the questionnaire for each woman. After the filling process was defined, it took roughly 30 minutes, and it was disseminated as a pretest. Three women were interviewed and given individual counselling sessions lasting thirty minutes each day. The counselling sessions followed Arabic instructional supportive guidelines, which used various teaching methods for the theoretical portion of the session (group discussions), and media (role plays, laptops). For the application counseling the following procedures were taught to the women

under study on the application of sodium bicarbonate for the treatment of vaginal yeast infections:

a) It is advised that women conduct a sensitivity test, or assess the effects of baking soda on a small patch of skin, ten minutes or more prior to taking a baking soda bath.

b) One method of using sodium bicarbonate was by vaginal irrigation (involves injecting sodium bicarbonate solution at low pressure into the vaginal canal to aid in the vaginal tract's cleansing). Or sitz bath (Sitting in water with sodium bicarbonate up to one's hips). according to women preference.

c) After adding 6–12 g of sodium bicarbonate to one liter of water, It was time to utilise the vaginal irrigation or sitz bath.

d)It is necessary to completely dissolve the mixture.

e) Using sodium bicarbonate required ten to forty minutes, two or three times every day for two weeks. (Felix, 2019)<sup>(12)</sup>.

f) To ensure the women had learned how to use sodium bicarbonate, a return demonstration was conducted at the conclusion of the sessions.

G) it's critical to understand any possible side effects. Although they are uncommon, some people may have adverse responses (skin irritation, itching, or redness) after having a baking soda bath. To protect women, women have been advised to stop using baking soda immediately if they develop any of these symptoms.

### **Phase 3 Evaluation phase:**

Using the same pre-questionnaire sheet form, post-counselling questionnaires were distributed and subsequently gathered.

Following the post-test, ladies were scheduled for a follow-up session to assess the impact of their therapy; they were instructed to return to the center after a week to gauge any progress

### **Pilot study:**

An initial analysis of 10% of the instances (11) was done with the intention of determining how straightforward and applicable the study was. No adjustments were required in light of the pilot study's findings. The pilot sample has been included in the study.

### **Administrative and Ethical considerations:**

Before beginning the study, formal approval from the Zagazig University Faculty of Nursing's Scientific Research Ethical Committee was obtained (00#66).The confidentiality and anonymity of the subjects were maintained. Prior to each woman agreeing to take part, the researchers delivered a brief introduction and explanation of the purpose and nature of the study. After giving their spoken informed consent, women were then able to enroll at will. Women were also told that the data collected would be used exclusively for research purposes and would remain confidential achieved in improving their condition.

### **Statistical Analysis**

2015 IBM Corp. was used for data collection, tabulation, and statistical analysis. Version 23.0 of IBM SPSS Statistics for Windows. NY / Armonk: IBM Corp. The format for qualitative data was number & (%).The paired categorical variable comparison was performed using the McNemar test. When appropriate, the Fisher Exact test or the Chi square test were used to compare the percentage of categorical variables. Every test was

two-sided; a p-value of less than 0.05 was regarded as statistically significant, while a p-value greater than 0.05 was regarded as statistically insignificant.

### Results:

**Table (1):** displays the examined sample's socio-demographic features. It was determined that 68.8% of the study sample belonged to the 31–40 age range. In terms of residence, 82.1 % them were rural residents. Moreover, 96.4 percent of them were married. Also, 48.2% of the studied women had secondary education and 33.0% of them have completed their university degree.

**Table (2):** demonstrates how risk factors for vaginal yeast infection are assessed. The findings showed that the women in the study had a high risk of developing vaginal candida because they washed their pants in cold water (88.4%), suffered from stress and psychological issues (87.5%), wore tights and synthetic fibre pants(82.1%) , slept in insufficient amounts (66.1%)used odor-causing cosmetics, and frequently took antibiotics.,

**Table (3)** shows that, when comparing the post-intervention phase findings to the pre-intervention phase results, there was a highly significant difference ( $p=0.0001$ ) favouring the post-intervention phase regarding the degree of knowledge of the examined sample.

**Table (4)** demonstrates that, with regard to vaginal symptoms connected to the examined sample's vaginal yeast infection, there was a highly statistically significant difference between the post-intervention phase's results and the pre-intervention phase's, favouring the post-intervention phase ( $p=0.0001$ ).

**Table (5)** shows that there was a highly statistical significant difference between improvement level of vaginitis in study group and their knowledge level post intervention.

### Discussion

A fungal infection that produces vaginal discharge, discomfort, and intense itching is the cause of vaginal yeast infections. A yeast infection, according to Foxman and Muraglia <sup>(13)</sup>, is brought on by an overgrowth of fungi that normally flourish in the vagina. By reestablishing the ideal equilibrium of the vagina's naturally occurring bacteria and yeast, sodium bicarbonate may be utilised to cure vaginal yeast infections <sup>(14)</sup>.

Regarding the individual characteristics of the study sample, the results revealed that more than half of the participants were in the age range of 31 to 40. Approximately one-third of them had only completed high school. Moreover, about one fourth of them were graduates of college. More than two thirds of them reported living in rural areas. In addition, a great deal of them were married.

This outcome aligns with the study by **Said et al** <sup>(15)</sup>, who evaluated educational intervention guidelines about knowledge and self-care techniques for vulvovaginal infections in women while doing research in Egypt. According to their findings, less than 25% of the women in the study had earned a college degree, more than half of the women were over thirty, and more than half of the women lived in rural areas.

Nevertheless, the results of the present investigation were at odds with those of (Abd-Allah et al. <sup>(10)</sup>. The latter examined the impact of sodium bicarbonate on VYI in teenage nursing students at Banha University in Egypt. Less than half of the sample, according to their findings, was

between the ages of 21 and 22. Less than two thirds of those who lived there did so in rural areas. Furthermore, the majority of them were single. This disparity results from a change in sample makeup (in the current study, the focus is on students rather than women).

According to the study findings, the most frequent risks that exacerbate (VYI) in the sample under investigation are experiencing psychological issues and stress," "pants with industrial fibres," and "not sleeping enough hours." "Wearing tight pants," "taking antibiotics frequently," and " not using hot water to wash knickers or leaving it outside in the sun " are among the other risk factors that account for more than two-thirds, one-third, and one-quarter , respectively. Additionally, a small percentage of the women regularly used vaginal douches, and nearly one-quarter of the women took oral contraceptive tablets.

Singh and Singh's <sup>(16)</sup> study, which looked at the risk factors for vaginal infections in women within the reproductive age range, has corroborated the existing findings in this regard. According to the study, most participants said that wearing tight clothing increased the risk of vaginal infections, although only a small percentage said they had taken antibiotics.

This result also agrees with the study of Abd El Razek and Al-Zaru <sup>(14)</sup>, which looked at how well sodium bicarbonate worked to treat VYI in Jordanian women and manage them early. According to their research, wearing tight pants was linked to 94% of risk variables for VYI, while pants with a high percentage of industrial fibres were linked to 85% of risk factors, and vaginal douches account for half of the risk variables.

Based on the knowledge of vaginal yeast infection in the studied sample, the results of the current study showed a highly significant difference ( $p=0.0001$ ) between the pre- and post-intervention phase results, favouring the post-intervention phase.

Similar findings were reported by Malfasari et al. <sup>(17)</sup>, who discovered a statistically significant difference ( $p$ -value  $\leq 0.001$ ) between the participants' weak pretest and good posttest knowledge of VVC. To determine the proportion of female college students knew about VVC and how the educational programme affected their understanding, a study on the subject was carried out in Egypt.

The current study reveals that there was improvement in all symptoms following the application of sodium bicarbonate, with a difference that is extremely statistically significant observed between the pre and post application regarding all symptoms ( $p$ -value = 0.0001).

These results were consistent with those of Abd-Allah et al. <sup>(10)</sup>. They clarified that after applying sodium bicarbonate, both vaginal and urinary symptoms got better, with a significant difference in statistical significance seen for all symptoms between the prior and post-application periods ( $p$ -value  $\leq 0.001$ ).

Furthermore, this result was in line with the findings of Zehong Tao and Aihua Ye <sup>(18)</sup>, who examined the clinical impact of prescribing a sodium bicarbonate sitz bath along with a vaginal nystatin suppository for patients with fungal vaginitis. Their findings made it clear that treating fungal vaginitis with a combination of a vaginal sitz bath using 5% sodium bicarbonate solution and vaginal nystatin suppository is beneficial. The combination results in a reduced

infection recurrence rate and a pH environment that is favourable for vaginal health. This similarity highlights the significance of extending the findings of this study to other contexts in order to reinforce the use of baking soda in conjunction with medicine to treat vaginal yeast infections.

### **Conclusion**

The current study concluded that after using baking soda, all symptom of a vaginal yeast infection has been subsided. Furthermore, the majority of the studied women became knowledgeable about vaginal infection after implementation of the intervention.

### **Recommendations**

The results of the study suggest that a routine evaluation of the risk factors for vaginal yeast infections should be part of the care provided to women at MCH centers. Nurses should take on the role of educators when it comes to delivering health education on vaginal yeast infections, covering terminology, risk factors, signs and symptoms, medication, and particularly non-pharmacological therapy. Healthcare professionals should think about the benefits of sodium bicarbonate as a treatment for vaginal infections in addition to standard medication. Further research is needed to determine the efficacy and efficiency of herbal therapies for treating vaginal infections.

**Table (1): Frequency and Percentage Distribution of the women According to Personal Characteristics (N.112).**

Item		N	%
<b>Age per years</b>	21-30	35	31.3
	31-40	77	68.8
<b>Education</b>	Read and write	14	12.5
	Primary school	7	6.3
	Secondary school	54	48.2
	University	37	33.0
<b>Occupation</b>	Working	85	75.9
	House wife	27	24.1
<b>Residence</b>	Urban	20	17.9
	Rural	92	82.1
<b>Marital status</b>	Married	108	96.4
	Separated	4	3.6
<b>Medical history</b>	No	90	80.4
	Hypertension	4	3.6
	hypertension and diabetes	11	9.8
	Others	7	6.3
<b>Contraceptive use</b>	No	19	17.0
	Yes	93	83.0
<b>Contraceptive method</b>	no method	19	17.0
	Oral contraceptives pills	32	28.6
	Intrauterine Device	51	45.5
	Injections	3	2.7
	subdermal implantation	7	6.3

**Table (2): Frequency and Percentage Distribution of risk factors of vaginitis (N.112).**

Items	N	%
<b>Vaginal douching regularly</b>	22	19.6
<b>Use odor cosmetics product for hygiene</b>	19	17.0
<b>Underwear With industrial fibers</b>	92	82.1
<b>Wearing Tight Underwear</b>	43	38.4
<b>Taking antibiotic frequently</b>	27	24.1
<b>Using oral contraceptive pills</b>	25	22.3
<b>Experiencing psychological issues and stress</b>	98	87.5
<b>During menstruation, not changing the pad frequently</b>	32	28.6
<b>Not sleeping enough hours</b>	74	66.1
<b>Not using hot water to wash knickers or leaving it outside in the sun</b>	99	88.4

**Table (3): Knowledge level regard vaginitis at pre& post phase**

Items	Knowledge level				p-value
	pre		Post		
	No.	%	No.	%	
<b>Satisfactory</b>	11	9.8	89	79.5	0.0001
<b>Unsatisfactory</b>	101	90.2	23	20.5	

McNemar test,  $p < 0.05$  = significant

**Table (4): Improvement of vaginitis symptoms after using bicarbonate sodium rinse**

Items	Symptoms				p-value
	pre		Post		
	No.	%	No.	%	
<b>Excessive vaginal discharge</b>	12	10.7	5	4.5	0.118
<b>secretion have an odor</b>	68	60.7	23	20.5	0.0001
<b>Watery secretion</b>	10	8.9	7	6.3	0.55
<b>White cheesy secretion</b>	112	100.0	17	15.2	0.0001
<b>Vaginal redness</b>	94	83.9	11	9.8	0.0001
<b>Itching in the external genitalia</b>	97	86.6	13	11.6	0.0001
<b>Lower abdominal pain</b>	59	52.7	19	17.0	0.0001
<b>Dyspareunia</b>	90	80.4	21	18.8	0.0001
<b>Low backache</b>	83	74.1	18	16.1	0.0001
<b>Chronic pelvic pain</b>	50	44.6	19	17.0	0.0001
<b>Burning sensation</b>	86	76.8	20	17.9	0.0001

McNemar test,  $p < 0.05$  = significant  $p > 0.05$  = no-significant

**Table (5): Relation between improvement level of vaginitis in study group and their knowledge level post intervention (n=112).**

Items	Improvement				p-value
	Complete improvement		Partial improvement		
	n.96		n.16		
	No.	%	No.	%	
<b>Knowledge level</b>					
<b>Satisfactory</b>	82	85.4	7	43.8	0.001*
<b>Unsatisfactory</b>	14	14.6	9	56.2	

f=Fisher exact test  $p < 0.05$  = significant

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