Deanship of Graduate Studies
Al- Quds University

Prevalence of Vulvovaginal Candidiasis among Pregnant Women Attending an Antenatal Clinic in East Jerusalem

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B.Sc.: Bethlehem University, Palestine

Jerusalem- Palestine

1446 – 2025

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M.Sc.: Thesis

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A Thesis Submitted in Partial Fulfillment of Requirement for the degree of Master of Infection Diseases Prevention and Control/ Faculty of Public Health / Al-Quds University

1446 – 2025

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Thesis Approval

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Jerusalem – Palestine
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Dedication

I dedicate this thesis to my mother and family for their unwavering love and support. Their confidence in my potential intensified my resolve to complete this mission.

I am deeply grateful to my advisor, Dr. Rasmi Abu-Helu, whose guidance, encouragement, and experience were indispensable during this effort. Your commitment to scholarship has motivated me to pursue knowledge with diligence and fervor.

Signature:

Halema Mahmoud Durgham

Date: 8.1.2025

Declaration

I certify that this master's thesis, or any part of it, has not been previously submitted for a higher degree to any other university or institution, and all of the research contained here is my own work, with the exception of any citations.

Signature:

Halema Mahmoud Durgham

Date: 8.1.2025

Acknowledgment

I wish to express my gratitude to the healthcare providers at Red Crescent Society Hospital Jerusalem for their collaboration and support during my data gathering. I would also like to express my gratitude to the academic staff at Al-Quds University, especially my supervisor, Dr. Rasmi Abu-Helu, for their assistance. Finally, I express my profound gratitude to my family, whose unwavering support enabled me to complete my master's degree program.

Halema Durgham

Abstract

Background: *Candida* is the most prevalent opportunistic and pathogenic fungus in humans. Vulvovaginal candidiasis (VVC) is the second most common vaginal infection among women of reproductive age. It impacts 75% of women at least once during their lifetime, with 50% encountering a recurrence. The prevalence of *Candida* spp. rises from 10 to 17% in non-pregnant women to 35% during pregnancy. In Palestine, there is a lack of documented data concerning Candida infections.

Methods: A case-control study evaluated the prevalence of vulvovaginal candidiasis (VVC) among pregnant women at RCSH Jerusalem, identified associated risk factors, and isolated *Candida* species, regardless of clinical manifestations. Between July 2023 and July 2024, there were 240 VVC-pregnant women, comprising 115 cases and 125 controls. Data were analyzed utilizing descriptive and inferential statistics through SPSS.

Results: The study found a higher prevalence of candidiasis in the case group (50.4%). From 115 case samples, 58 pregnant women had *Candida*. Seven species were found in these samples. *C. albicans* (33%), *C. tropicalis* (26%), *C. glabrata* (10%), *C. kefyr* (10%), *C. krusei* (9%), *C. utilis* (7%) and *C. dubliniensis* (5%). The study found significant factors associated with candidiasis, including pregnancy-related factors, clinical history, and behavioral practices. Symptoms include vaginal discharge, itching, burning, and dysuria. Understanding these associations is crucial for prevention and management.

Conclusions: This study highlights the prevalence and risk factors of candidiasis, emphasizing the importance of precise diagnosis and treatment. It suggests that demographic surveys may not be as effective as specialized therapies. Future research should explore complex connections between risk factors and candidiasis.

Keywords: VVC, Pregnant women, Prevalence, *Candida.*

Table of Contents

List of Figures

List of Tables

Abbreviations

NAC Spp	Non-*albicans Candida* species
PH	Potential of Hydrogen
IUD	Intra Uterine Device
HIV	Human Immunodeficiency Virus
C. albicans	*Candida albicans*
HVS	High Vaginal Swab
FRT	Female Reproductive Tract
RCSH	Red Crescent Society Hospital
VVC	Vulvo-Vaginal Candidiasis

Chapter One

Introduction

1.1Background

Candida is the most widespread opportunistic and pathogenic fungus in humans. There are more than 350 species in the genus *Candida*, although only a handful have been related to opportunistic human disease. Several *Candida* species are known to infect humans and cause disease, including *Candida albicans*, *C. glabrata, C. tropicalis, C. krusei, C. parapsilosis, C. dubliniensis, C. guilliermondii, and C. kyfe*. *Candida* species reside on the mucosal surfaces of the human gastrointestinal tract, genitourinary tract, and mouth. It can result in a variety of diseases, ranging from mild infections to life-threatening invasive and hemogenic infections (Tsega & Mekonnen, 2019). *Candida species* often colonize the skin, vagina, and gut. *Candida species* are harmless as human commensals, but they can cause a variety of diseases, including chronic fungal vaginitis (Singh, Toth, & Gasser, 2020).

Candidiasis is an opportunistic infection caused by *Candida* spp. that can affect the oral cavity, vagina, and other organs. Untreated Candida infection carries the risk of causing a systemic infection in which other organs may become involved resulting in sepsis or fungemia (Arya & Naureen, 2022).

Vulvovaginal candidiasis (VVC) is the second most prevalent vaginal infection in women of reproductive age. It affects 75% of women at least once in their lifetime, with 50% experiencing a recurrence (Zeng et al,2018). Cottage cheese-like discharge, swelling, pruritus, irritation, burning sensation, dyspareunia, and dysuria are VVC symptoms (Ghaddar, El Roz, Ghssein, & Ibrahim, 2019).

Hormonal changes (such as those that occur during pregnancy or the luteal phase of a woman's menstrual cycle), usage of antibiotics, and oral contraceptives all put women at increased risk

for vaginal candidiasis. 5% to 10% of healthy women suffer from recurrent vaginal candidiasis. Pregnant ladies have it more than healthy women. Most women with persistent recurrent candidiasis get it during pregnancy (Nelson, Wanjiru, & Margaret, 2013).

The infection has a broad clinical spectrum and can be acute, chronic, superficial, or penetrating (Yadav & Prakash, 2016). Due to high levels of glycogen and a high hormonal load, pregnancy is a predisposing factor for various infections in women, especially in the last trimester. Similarly, the incidence of *Candida spp*. increases from 10 to 17% in non-pregnant women to 35% during pregnancy (Suarez et al., 2018).

Vaginal candidiasis can result in chorioamnionitis and subsequent abortion and preterm birth in pregnant women, congenital infection of the newborn, and pelvic inflammatory disease (PID) leading to infertility in non-pregnant women if left untreated. During a normal pregnancy, VVC could be a risk factor for candidemia in premature neonates (Waikhom, Afeke, & Opintan, 2020).

A correlation has been found between vaginal infections and perinatal morbidity and mortality in newborns, in addition to the negative impact on the reproductive function of the patients.

Candida species are prevalent female genital tract pathogens, and their frequency increases to 43.5% during pregnancy. *Candida* vulvovaginitis affects 30% of pregnant women. Estrogen increases vaginal yeast adhesion and penetration. Hypertrophied glands produce mucus and hormones affect the cervix's texture. Cervical mucus, which is alkaline, temporarily lowers vaginal pH and, along with glycogen, produces an excellent environment for pathogenic *Candida* spp. Estrogens lower IgG and IgA, which helps *Candida* overgrowth and vaginal infections during pregnancy. VVC can cause water abundance, placental insufficiency, premature birth, premature placenta detachment, inflammatory issues in the newborn, and a high chance of clinically manifested infections in the postpartum period, not withstanding the discomfort (Zisova et al,2016).

Clinical management of candidiasis has become increasingly difficult as antifungal resistance among non-*albicans Candida* spp. has increased over the last 20 years (Kim, Jeon, & Kim, 2016). Economic consequences, sexually transmitted infections, and ascending genital tract infections make vulvovaginal candidiasis a global issue (Bitew & Abebaw, 2018).

Fluconazole appeared to be the best drug for the treatment of VVC. Fluconazole, a triazole antifungal drug, is effective in treating VVC due to its broad antifungal spectrum, low hepatotoxicity, and high bioavailability (Qin et al,2018). Oral fluconazole uses during pregnancy significantly increased the risk of spontaneous abortion compared to unexposed and topical azole exposure (Mølgaard-Nielsen et al,2016).

1.2 Problem statement

In light of *Candida*, the second causative agent of vaginitis, the physiological changes that occur during pregnancy, and the effect of untreated vaginal candidiasis in pregnant women on the

newborn, it is crucial to investigate the prevalence of vaginal candidiasis among pregnant women at the antenatal clinic in East Jerusalem. Early diagnosis and appropriate management are essential in order to raise awareness of the issue and generate actionable recommendations for its prevention. Economic consequences, sexually transmitted infections, and ascending genital tract infections make vulvovaginal candidiasis a global issue (Bitew & Abebaw, 2018).

The Palestinian situation is unclear, especially in Jerusalem. The only studies conducted in Gaza involved a population of 423 pregnant women, aged between 16 and 50 years. Researchers found that Candida albicans, among other types of pathogens, accounts for 22 (5.2%) of these STI cases (Lubbad & Al-Hindi, 2007). Elmanama et al. conducted a study in 2020. The study revealed that the isolation rate of Candida spp. among pregnant women was 43% in Gaza. The situation in Jerusalem is unclear, and we must research the prevalence of VVC among pregnant women attending antenatal clinics with clinical manifestations of VVC in East Jerusalem.

1.3 Justification | Rational

According to my knowledge, there have been no previous studies about this issue in Palestine, and this will be the first one. Herein lies the significance of this study: measuring the prevalence and identifying the risk factors associated with VVC in pregnant women.

VVC is the second most common vaginal infection among women of reproductive age. 75% of women will experience it at least once in their lifetime, and 50% will experience a recurrence (Ghaddar, El Roz, Ghssein, & Ibrahim, 2019). The prevalence of Candida spp. increases from 10–17% in non-pregnant women to 35% during pregnancy (Suarez et al., 2018).

Vaginal candidiasis can result in chorioamnionitis and subsequent abortion and preterm birth in pregnant women, congenital infection of the newborn, and pelvic inflammatory disease (PID) leading to infertility in non-pregnant women if left untreated. During a normal pregnancy, VVC could be a risk factor for candidemia in premature neonates (Waikhom, Afeke, & Opintan, 2020).

Clinical management of candidiasis has become increasingly difficult as antifungal resistance among non-albicans Candida spp. has increased over the last 20 years (Kim, Jeon, & Kim, 2016). The development of a health education model (vaginal hygiene) that provides audiovisuals and modules to pregnant women can effectively prevent vaginal candidiasis (Abdullah, Jafar, & Syafar, 2020). The study will give policymakers and hospital managers information that will help them come up with a national plan to treat and prevent VVC.

This study will serve as the basis for policymakers in Palestine to establish a screening program for vulvovaginal candidiasis in pregnant women.

Finally, I'm doing it to satisfy the master's degree requirements.

1.4 Objectives

1.4.1. General objective

The purpose of this study is to determine the prevalence of symptomatic vaginal candidiasis and related risk factors among pregnant women attending prenatal clinics in East Jerusalem.

1.4.2. Specific objectives

- To determine the prevalence of vaginal candidiasis among pregnant women with clinical manifestation. (Case)
- To determine the prevalence of vaginal candidiasis among pregnant women without clinical manifestation. (Control)
- To assess the sociodemographic factors of the affected pregnant women.
- To assess the clinical factors of the affected pregnant women.
- To assess the pregnancy-related factors of the affected pregnant women.
- To assess the behavioral factors of the affected pregnant women.
- To identify the prevalence of *Candida* species.

1.5. Context

1.5.1. Palestine socioeconomic and demographic characteristics in vulvovaginal candidiasis

There is no screening program for vulvovaginal candidiasis in pregnant women in Jerusalem. According to our knowledge, there are no previous studies on the prevalence of vulvovaginal candidiasis among pregnant women in Jerusalem. Only a previous work has been done in Gaza.

1.5.2. Health Care Services

There are five major healthcare providers in Palestine: MoH provides 64% of Palestinian healthcare facilities and the majority of hospital beds. When necessary, it purchases secondary and tertiary care from Palestinian and international providers. United Nations Relief and Works Agency (UNRWA) provides primary and secondary health care services. Non-Governmental Organizations (NGOs): a large sector consisting of missionary hospitals, facilities supported by international organizations, and community health centers. Private sector and contracting out services. In addition, there is the East Jerusalem Hospitals Network, which serves Palestinians but falls under the authority and legal restrictions of the Israeli Ministry of Health (Mimi, 2015).

Jerusalem's Red Crescent Society Hospital is affiliated with the East Jerusalem Hospital Network. Mount Olives is the location of PRCSH Maternity and Obstetrics Hospital, which was established in 1953. The hospital contains forty beds. It is regarded as one of the leading hospitals in Jerusalem for obstetrics and maternity care. The rate of births reached 300 cases per

month, while the rate of surgical operations reached 80 per month. There is also a neonatal intensive care unit at the hospital. The hospital has obtained ISO 9001:2008 certification and Joint Commission International (JCI) accreditation standards. In addition, the hospital operates and manages three outpatient clinics, namely the Herod's Gate Clinic, the Aqabat al-Khaldieh Clinic, and the Kufar Aqab Clinic. The clinic provides immunizations to approximately 2000 children per month and has an obstetrics section where 700 pregnant women receive checkups, ultrasounds, and gynecology services, totaling approximately 1040 per month. Ambulance and Emergency Section that serve Jerusalem and the surrounding areas.

1.6. Operational Definitions

Candida*:* *Candida* is the shortened name used to describe a class of fungi that includes more than 150 species of yeast**.** In healthy individuals, *Candida* exists harmlessly in mucus membranes such as ears, eyes, gastrointestinal tract, mouth, nose, reproductive organs, sinuses, skin, stool, vagina, etc. It is known as "beneficial flora" and has a useful purpose in the body (Agrawal et al., 2014).
Vulvovaginal candidiasis: is inflammatory changes in the vaginal and vulvar epithelium secondary to infection with *Candida* species, most commonly *C. albicans* (Jeanmonod & Jeanmonod, 2022).

Pregnant women: Pregnancy is the term used to describe the period in which a fetus develops inside a woman's womb or uterus. Pregnancy usually lasts about 40 weeks, or just over 9 months, as measured from the last menstrual period to delivery. Healthcare providers refer to three segments of pregnancy, called trimesters (NIH, 2017).

Point prevalence refers to the prevalence measured at a particular point in time. It is the proportion of persons with a particular disease or attribute on a particular date (CDC,2021).

Chapter Tow

Literature Review and Conceptual Framework

2.1 Vaginal Candidiasis

2.1.1 Anatomy of the Female Genital Tract

The female reproductive organs consist of the ovaries, uterine tubes, uterus, vagina, external genitalia, and mammary glands (Tate, 2009).

The vaginal walls and cervix normally function to produce secretions. Normal vaginal secretions and discharge fluctuate from time to time; sometimes clear, almost like water, and at other times mucous and whitish in color, sometimes scanty, and at other times, in greater quantity. These variations are normal. Normal vaginal discharge and secretions can vary from woman to woman. Depending on the stage of a woman's menstrual cycle, menopause, whether she is taking contraceptives or hormone replacement medications, whether she is pregnant or not, and her level of sexual arousal (Berkow et al., 2001).

At the level of histology, the vagina is a fibromuscular structure with three primary layers or tunics called the mucosa, muscle, and adventitia. Stratified squamous epithelium and the lamina propria, an unconnected connective tissue, connect the epithelium to the muscle layers (Barrientos-Durán et al., 2020).

2.1.2 Definition of (VVC)

Vulvovaginal candidiasis (VVC) was first identified by Wilkinson in 1849 **(**Nsenga & Bongmin, 2022). VVC is a common mucosal infection of the lower female reproductive tract (FRT) that is primarily caused by the polymorphic opportunistic fungus *C. albicans.* While *C. albicans* is

responsible for over 90% of VVC cases, other *non-albicans Candida* (NAC) species have also been identified as causative agent. VVC is a disease that primarily affects immunocompetent and otherwise healthy females in the fertile period (Willems et all, 2020). Vulvovaginal candidiasis (VVC) or "Candida vaginitis" infection of the estrogenized vagina and the vestibulum that can spread to the outside of the labia minora, the labia majora, and the intercrural region (Disha &Haque, 2022).

Candida is most associated with invasive vaginal candidiasis. *Candida albicans* is the most prevalent *Candida species* responsible for vaginal candidiasis, accounting for 70-90% of all cases. The remaining *non-albicans Candida* species include *C. glabrata*, which causes 14% of infections in immune-competent women, followed by *C. tropicalis* and *C. parapsilosis*, and infrequently *C. krusei, C. kefyr*, and *C. dubliniensis* (Oyewole et al., 2013).

VVC can be classified as either uncomplicated or complicated based on clinical presentation, microbiology, host factors, and therapeutic response. 10 –20% of women will have complicated VVC, necessitating special diagnostic and therapeutic considerations (CDC, 2021).

2.1.3. Classification of vulvovaginal candidiasis (VVC)

1. **Uncomplicated VVC**

- Sporadic or infrequent VVC
- Mild-to-moderate VVC
- Likely to be *C. albicans*
- Non-immunocompromised women

2. **Complicated VVC**

- Recurrent VVC
- Severe VVC
- Non-*albicans* candidiasis
- Women with diabetes, immunocompromised conditions (e.g., HIV infection), underlying immunodeficiency, or immunosuppressive therapy (e.g., corticosteroids) (CDC,2021).

2.1.4. Clinical Presentation

Some studies concluded that pregnant women were more likely to have symptomatic vaginal infections caused by *Candida* (Aguin & Sobel, 2015).

- Abnormal changes vaginal discharge, odorless vaginal discharge may appear white, clumpy, thick and/or curdy
- Vulvar and/or intravaginal itch, irritation and/or burning
- Superficial dyspareunia (usually at the vaginal introitus)
- External dysuria
- Vulvar and/or vaginal erythema and/or edema
- Vulvar fissures, dryness, cracks in skin, and/or excoriation (BCCDC Clinical Prevention Services,2020)

2.1.5. Predisposing Factors

Multiple risk factors have been linked to the development of VVC. The risk of developing VVC increases from 20% in non-pregnant women to 30% in pregnant women due to physiological changes associated with pregnancy, most notably an increase in estrogen levels. 70% to 75% of women over the age of 18 have at least one attack of *Candida* vaginosis in their lifetime, according to a previous study. Some women were affected only once in their lifetimes, whereas others were affected intermittently with chronic or recurrent VVC. In addition, another estimation revealed that 8–10% of adult women are susceptible to VVC recurrence (Mohamed et al., 2022).

The increased estrogen level during pregnancy causes the production of more glycogen in the vagina, allowing yeast cells to proliferate on the vaginal wall (Yadav & Prakash, 2016).
However, any physiological changes that affect the beneficial bacteria in the vagina would alter the vagina's acidity, increasing its pH to 5.0–6.5 and promoting the growth of pathogenic organisms like *Candida* (Yadav & Prakash, 2016).

Bacterial infections can be treated using antibiotics. Clinicians treat vaginitis with antibiotics. Unfortunately, antibiotics destroy beneficial bacteria that keep vaginal pH acidic. Antibiotics change the vaginal microbiome within hours (Lin et al., 2021).

75% of pregnant women experience vaginal infections due to the use of vaginal douches and poor genital hygiene (vulva hygiene). 10–20% of preterm labor can be attributed to infections due to poor genital hygiene. 50% of preterm labor and premature membrane rupture (PROM) cases, and 36% of neonatal deaths (Abdullah, Jafar, & Syafar, 2020).

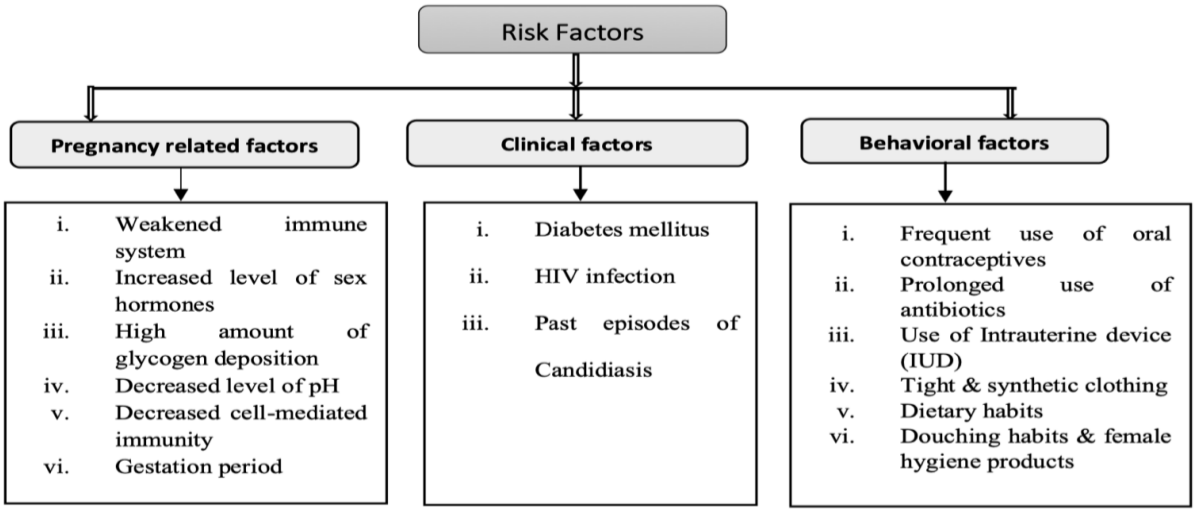

Figure 2.1: Complication of various risk factors associated with VVC during pregnancy (Disha & Haque,2022)

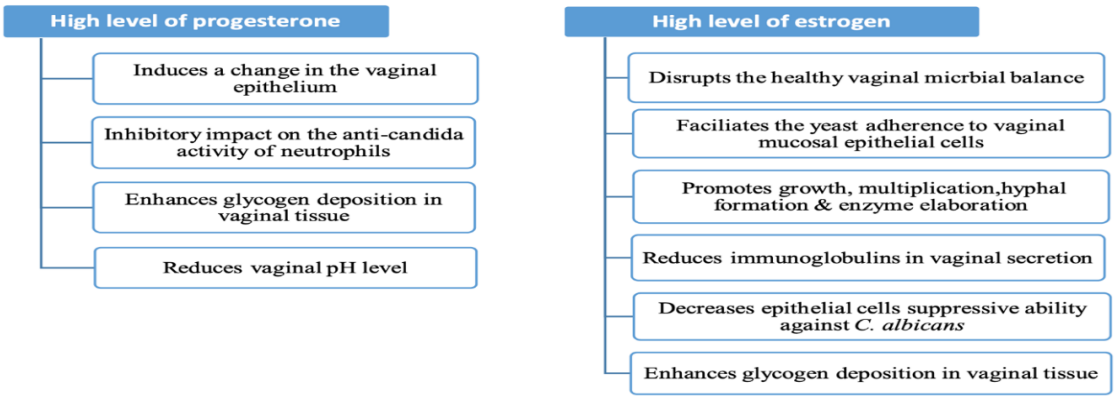

Figure 2.2: The effect of elevated levels of progesterone and estrogen during pregnancy (Disha & Haque,2022)

2.1.6. *Candida*

2.1.6.1. Classification

Fungi are eukaryotic microorganisms that can cause superficial, cutaneous, subcutaneous, or systemic disease. Fungi are heterotrophic, aerobic facultative organisms.

Infectious yeast disease is caused by a species of the genus *Candida*, which is classified as a member of the fungal kingdom. *Candida* is classified as a member of the family *Saccharomycetaceae* in the order *Saccharomycetales* (Perez-Nadales et al., 2014) that consists of the yeasts *Saccharomyces cerevisiae*, *C. albicans, C. glabrata, C. parapsilosis, C. tropicalis, C. guilliermondii, C. lusitaniae, C. krusei, C. dubliniensis, C. pelliculosa, C. kefyr, C. norvegensis, and C. haemulonii* (Aittakorpi et al., 2012).

C. albicans (65.3%), *C. glabrata* (11.3%), *C. tropicalis* (7.2%), *C. parapsilosis* (6.0%), and *C. krusei* (2.4%) are the five species most frequently associated with candidiasis (Turner & Butler, 2014).

2.1.6.2. General Characteristics

Candida yeasts are dimorphic fungi with globose, ellipsoidal, cylindroidal, or elongate cells and, infrequently, ogival, triangular, or lunate cells. Reproduction is accomplished through holoblastic budding. The formation of pseudohyphae and septated hyphae is possible (Moris et al., 2008). *Candida* is a 3–30 m-diameter round-to-ovular yeast (Navabi, Mousavi, & Anvari, 2021).

Numerous diploid asexual Candida species undergo a parasexual cycle consisting of mating between diploid cells of the opposite mating type, chromosomal loss, and reversion to the diploid state (Turner & Butler, 2014).

C. albicans grows and produces mycelia in host environments that fluctuate. It is able to do so due to its adaptability to various microecological environments. *C. albicans* is distinguished by the fact that it can exist in three distinct phases: yeast, pseudohyphae and hyphae (Chen et al., 2020). Several distinct shapes and sizes of *C. albicans* have been identified (blastospores, pseudohyphae, and hyphae).

Figure 3 shows that the shape of the blastospore, pseudohyphae, and hyphae can change back and forth during the infection process.

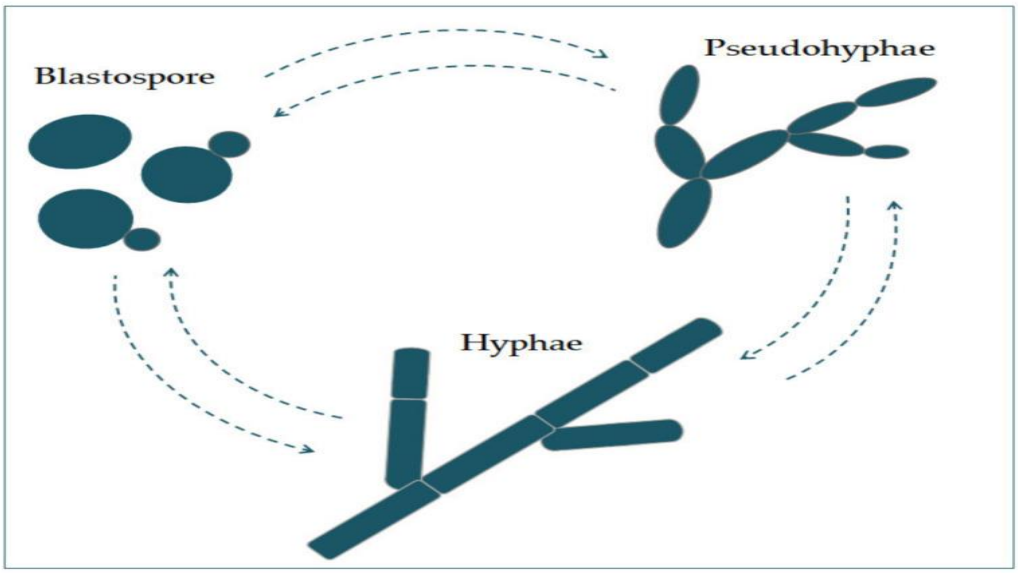

Figure 2.3: Morphological forms of Candida albicans during infection process (Talapko et al.,2021)

2.1.6.3. Habitat

C. albicans is a polymorphic fungus that lives on mucosal surfaces all over the body, including the gastrointestinal tract (for example, the oral cavity and vagina). 50 % of the world's population has this fungus living in their microflora (Richardson & Moyes, 2015).

Candida species are only found in human and warm-blooded animal reservoirs, but they can be isolated from almost any organic material, including dirt, plants, animals, and even the air. (Seyedmousavi et al., 2018). *C. albicans*, a common commensal fungus, colonizes the oropharyngeal cavity, gastrointestinal tract, and healthy skin, affecting 50% of the population and forming part of the microbiota's normal flora (Talapko et al,2021).

2.1.6.4. Virulence Factors

C. albicans' ability to colonize a wide variety of host niches is supported by a vast array of virulence factors and fitness characteristics. Among the virulence factors are the morphological transition between yeast and hyphal forms, the expression of adhesins and invasions on the cell

surface, thigmotropism, the formation of biofilms, phenotypic switching, and the secretion of hydrolytic enzymes and Candidalysin. In addition, fitness characteristics include rapid adaptation to pH fluctuations, metabolic flexibility, potent nutrient acquisition systems, and robust stress response mechanisms (Mayer, Wilson, & Hube, 2013).

Fitness and virulence variables make C. albicans virulent:
Polymorphism helps *C. albicans* adapt to varied growth environments, adhere to biotic and abiotic surfaces, attack cells and tissue, and avoid immune cells.

Invasion and damage: Induced endocytosis and active penetration allow fungi to invade host tissues, while candidalysin in the invasion pocket causes pores to form and damage the host cell.

Adhesion and biofilm formation: The adhesin battery enhances fungal adhesion to biological and abiotic surfaces, which can lead to biofilms on medical devices like catheters.

Genetic and metabolic plasticity: *C. albicans* adapt quickly to varied host habitats because of their metabolic flexibility. Genetic plasticity allows this fungus to rapidly adjust to selective pressures and challenges like antifungal medication exposure.

Stress reactions: *C. albicans* induce robust stress responses after host-imposed stressors, including ROS and RNS, which improve fungal survival after immune attacks.
Cell wall: The sturdy cell wall protects against host-imposed stressors, including osmolarity fluctuations, and maintains cell shape.

Immune evasion: *C. albicans* use cell surface Pathogen-associated molecular patterns (PAMP) exposure regulation and phagocytic escape pathways to avoid innate immune cell death (D'Enfert, 2020).

2.1.7. Pathogenicity

Expressed adhesins allow yeast cells to stick to the surfaces of host cells. Once in contact with host cells, yeast undergo a morphological change into hyphae and develop in a targeted manner through a process called thigmotropism. Induced endocytosis, a process mediated by the production of invasions, is how the host cell takes in the fungus. It has been hypothesized that the second mechanism of invasion, i.e., fungal-driven active penetration into host cells, is facilitated by adhesion, physical pressures, and the production of fungal hydrolases. Yeast cells can adhere to abiotic (such as catheters) or biotic (host cells) surfaces, resulting in the formation of biofilms made up of yeast cells at the bottom and hyphal cells on top. It has been hypothesized that *C. albican*s' antigenicity and biofilm production are affected by its phenotypic plasticity (switching). Several fitness features, in addition to these virulence variables, affect fungal pathogenicity. Metabolic versatility and the uptake of different compounds such as carbon (C) and nitrogen (N) sources; the uptake of essential trace metals, such as iron (Fe), zinc (Zn), copper (Cu), and manganese (Mn); the auto-induction of hyphal formation via the uptake of amino acids; the excretion of ammonia (NH3); and concomitant extracellular alkalinization (Mayer, Wilson, & Hube, 2013).

2.1.8. Immunity

The vaginal microbiota, a community of microorganisms, is primarily found in the squamous epithelium lining the vagina. It's possible that this vaginal microbiome has a role in gynecological health and in women's overall wellness. It is often made up of a wide variety of bacteria (both anaerobic and aerobic), with Lactobacillus species predominating and playing a crucial role in preventing urogenital disorders like yeast infections. (Barrientos-Durán et al., 2020). The acidic environment (pH 3.5–4.5) created by the lactic acid bacteria helps to keep the vagina healthy by preventing the growth of fungi and other pathogens. This defense mechanism, however, is accompanied by others, such as H_2O_2 and bacteriocin. (Mandal & Bhatt, 2020).

During pregnancy, immunologic changes, elevated estrogen levels, and increased vaginal glycogen synthesis all contribute to an overgrowth of pathogens (Aguin & Sobel, 2015). All clinical types of candidiasis (except in severely immunocompromised patients) produce IgG, IgM, and IgA antibodies, but the protective role of humoral immunity is unclear. Patients with mucosal candidiasis have normal or elevated anti-Candida antibodies (Deorukhkar, 2017).

Candida is recognized innately by PAMPs. PAMPs are shared by many Candida species and fungal genera, unlike antigens. Host germ-line-encoded pattern recognition receptors (PRRs) recognize these microbial PAMPs, allowing instant recognition of common fungal components.

The majority of fungal PAMPs are glucans, - and -linked mannans, and phospholipomannans. TLRs, CLRs, and NBDLRs recognize these (NLRs). Dendritic cells, monocytes, macrophages, polymorphonuclear leukocytes (PMNs), T cells, B cells, and epithelial cells express these PRRs on their surfaces, endosomes, or cytoplasms. PAMPs activate PRRs, which activate intracellular signaling pathways like MAPK and NF-B, which increase transcription of host immune defense genes like chemokines, cytokines, inflammatory mediators, and antimicrobial peptides. PRRs are significant mediators between innate and adaptive immune responses (Naglik, 2014).

Vaginal C. albicans infection and adaptive immune responses are uncertain. Th1 cells do not protect against C. albicans in the vaginal environment, and the biological relevance of this "compartmentalization of immunity" is unknown. (Richardson & Moyes, 2015)

2.1.9. Incidence and Prevalence

After bacterial vaginosis, vulvovaginal candidiasis is the second most common infection. Every year, between 5 and 10 million females seek gynecologic advice for vaginitis. 75% of women will experience an episode of vulvovaginal candidiasis at some point in their lives; 50% of these women will experience at least a second episode; and 5%–10% of all women will experience recurrent vulvovaginal candidiasis, which is defined as four episodes of vulvovaginal candidiasis per year (Bitew & Abebaw, 2018). *Candida* species colonization of the vagina occurs in a minimum of 20% of women, rising to 30% during pregnancy (Farr et al., 2021).

The higher incidence of VVC infections was correlated with a rise in gravidity. *C. albicans* consisted of 95.33 % multigravida and 4.66 % primigravida, whereas Candida krusei consisted of 80 % multigravida and 10 % primigravida (Qaddoori, Abdul Samad, & Maslat, 2018).

Uncertain is the extent to which vulvovaginal candidiasis contributes to population-level morbidity (Parolin et al., 2015).

2.1.9.1. Higher prevalence of VVC during pregnancy

Multiple comparative studies between pregnant and non-pregnant women have determined that the prevalence of VVC is greater in pregnant women than in non-pregnant women (shown in Figure 1).

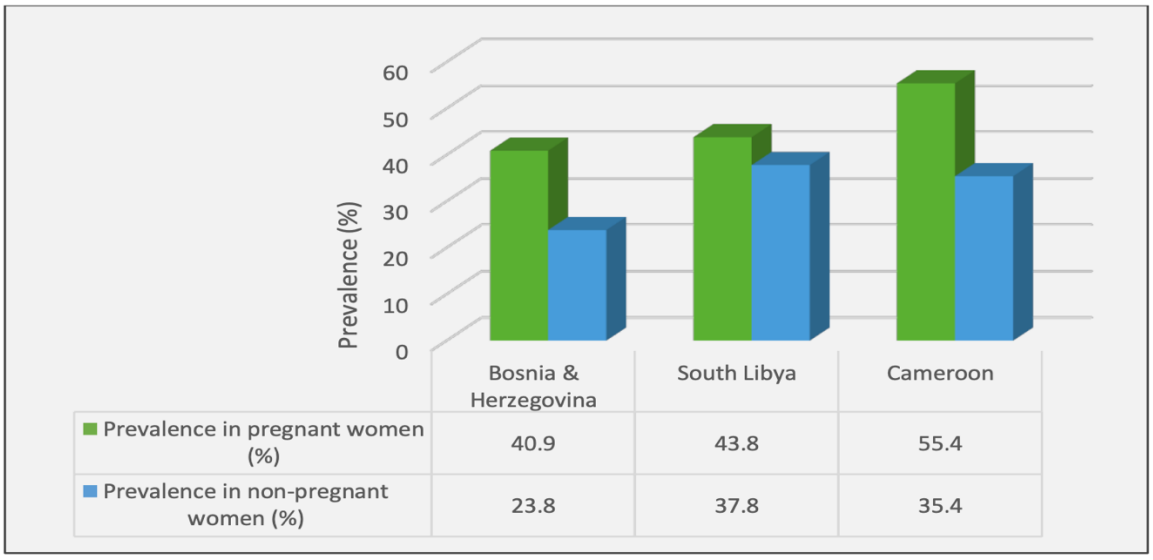

Figure 2.4: Difference in prevalence of VVC between pregnant & non-pregnant women (Disha & Haque,2022)

Figure 4 shows comparable outcomes in South Libya (43.8%) and Cameroon (55.4%). Candida spp. was recovered from 299 (7.9%) non-pregnant women and 277 (29.1%) of pregnant women in a study testing the prevalence of VVC in 3,791 non-pregnant and 952 pregnant women with signs and symptoms of vaginitis. Thus, these results demonstrate that the prevalence of VVC is higher during pregnancy (Disha & Haque, 2022).

The incidence also differs greatly among regions. Whereas *C. glabrata* is most prevalent in Asia and the EU, C. tropicalis is nearly three times as widespread in Africa and the Middle East. It is in the Americas where C. parapsilosis is most common (Turner & Butler, 2014).

2.1.10. The diagnosis of VVC and identification of *Candida species*

Clinicians typically provide additional diagnoses. Microscopic inspection of discharge is also beneficial.50–80% of microscopies show mycelia. The whiff test, which adds 10% potassium hydroxide to vaginal discharge, distinguishes VVC from bacterial vaginitis. This reaction gives bacterial vaginosis an amine-like smell while yeasts are tested negative. A fungus culture should

confirm the diagnosis. VVC is unlikely in a woman with no fungal elements under microscopy and no typical clinical signs. Empirical treatment should not be started except in positive cultures (Dovnik, 2015).

2.1.11. Background Studies

In India (2019), a study was conducted to study the prevalence of vaginal candidiasis among pregnant patients. 45.18% of the 135 collected samples were positive for candidal fungus species. 20- to 25-year-olds had the highest number of positive candidiasis cases. Multigravida (60%) were affected more frequently than primigravida (40%) and in the third trimester (67.41%). In 2022, 60.8% of pregnant women in North-West Nigeria tested positive for candidiasis, indicating a high prevalence rate of VVC.

In 2019, researchers conducted a study in Lebanon to determine the prevalence of VVC among pregnant women. The study found that out of 221 high vaginal swabs, 44.8% were positive for *Candida*, with *C. albicans* infections being the most common at 43.4%. 56.6% of VVC cases were caused by *NAC* strains, with *C. glabrata* being the most common strain.

In Iraq (2018), researchers surveyed a group of 120 expecting mothers to investigate the epidemiological factors associated with vaginal candidiasis in pregnant women. Vaginal candidiasis affected about 29% of the participants in the study. Antibiotic use, oral contraceptive use, and the presence of diabetes mellitus were all significantly associated with the development of the disease.

A 2020 Yemen study revealed a 51.6% prevalence of vulvovaginal candidiasis in pregnant women, with *C. albicans* accounting for 39.5% and *NCA* at 12.1%. Risk factors included age, first trimester, multiple parities, low socioeconomic status, and illiteracy.

Table 2.1: The prevalence of VVC during pregnancy in different regions of the world.

City, country	No. of studied patients	Prevalence (%)	Citations
India	135	45.18	(Sutaria, Cholera, and Donga, 2019)
North- West Nigeria	288	60.8	(Disha, and Haque,2022)
Lebanon	221	57.7	(Ghaddar et al., 2019)
Iraq	120	29	(Alsharifi, 2018)
Yemen	190	51.6	(Al-Rukeimi et al., 2020)
Gaza	100	43	(Elmanama et al.,2020)
Turkey	372	37.4	(Guzel et al., 2011)
Malaysia	1163	17.2	(Masri et al., 2015)
Saudi Arabia	1207	70.2	(Al-Aali, 2013)
Argentina	210	24.8	(Disha, and Haque,2022)
Mato Grosso, Brazil	404	44.8	(Disha, and Haque,2022)

2.1.12. Treatment

Short-course topical formulations (single doses and regimens of 1–3 days) are effective for treating VVC without complications. 80%–90% of patients who complete azole therapy experience symptom relief and negative cultures as a result of treatment with azoles.
Vulvovaginal Candidiasis Treatment Recommendations:

Clotrimazole, 1% cream 5 g intravaginally daily for 7–14 days

Clotrimazole 2% cream, 5 g intravaginally daily for 3 days

Miconazole 2% cream, 5 g intravaginally daily for 7 days

Miconazole 4% cream, 5 g intravaginally daily for 3 days

Miconazole 100 mg vaginal suppository, one suppository daily for 7 days

Miconazole 200 mg vaginal suppository, one suppository for 3 days

Miconazole 1,200 mg vaginal suppository, one suppository for one day

Tioconazole 6.5% ointment, 5 g intravaginally in a single application

Prescription intravaginal agents

Butoconazole 2% cream (a single dose bioadhesive product) delivers 5 g intravaginally in a single application.

Terconazole 0.4% cream (5 g intravaginally daily for 7 days)

Terconazole 0.8% cream (5 g intravaginally daily for 3 days)

Terconazole 80 mg vaginal suppository, one suppository daily for 3 days

Oral Agent

Fluconazole 150 mg orally in a single dose (CDC,2021)

Women with untreated asymptomatic candidiasis had a higher spontaneous preterm birth rate than those without candidiasis (6.25 % versus 2.89 %) (Disha & Haque, 2022).

The frequent use of antifungal compounds in prevention and treatment may have changed fungal infection epidemiology. Abuse or improper use of antifungal drugs is the most likely cause of reduced susceptibility or resistance in fungi (Czechowicz, Nowicka, & Gościniak, 2022).

Pregnant women should only apply topical azole treatments for seven days. According to epidemiological studies, a single 150-mg dose of fluconazole may be associated with

spontaneous abortion and congenital abnormalities; therefore, it should not be administered (CDC, 2021).

2.1.12. Prevention and Control

Women are unlikely to seek advice for "white discharge" because the condition is associated with shame and guilt, which discourages them from seeking help. Women typically complain of vaginal discharge when they perceive it to be abnormal or when it causes itching or discomfort (Kamath et al., 2014).

The development of a health education model (vaginal hygiene) that provides audiovisuals and modules to pregnant women can effectively prevent vaginal candidiasis (Abdullah, Jafar, & Syafar, 2020).

Avoid wearing tight synthetics: *Candida* infections may become more prevalent as temperatures and humidity rise. Candida infection may result from local hypersensitivity to perfumed products. Replace vaginal soaps with moisturizers derived from water. These may reduce the symptoms of dermatitis. Soap also irritates (Ramsay et al., 2009).

Chapter Three

Methodology

3.1. Introduction

We conducted this survey in the antenatal clinics of RCSH in East Jerusalem. The main objective was to gather information and data regarding *Candida* infection.

3.2. Ethical issue

This study was undertaken by the Department of Microbiology at RCSH. Before commencement, the project received approval from the Research Ethics Committee of Al-Quds University to ensure adherence to ethical norms. The hospitals participating in the study were apprised of their goals and objectives and were mandated to complete a consent form before involvement.

3.3. Study design

Case-control study of all symptomatic VVC-pregnant women attending antenatal clinics at the RCSH Jerusalem as cases, and all asymptomatic VVC-pregnant women as control.

3.4. Study setting

The research was conducted at the antenatal clinics of the Red Crescent Society Hospital—Jerusalem (RCSHJ), established in 1953 and integrated into the East Jerusalem Hospital network. The hospital primarily provides specialist medical services in obstetrics, gynecology, and neonatal care.

3.5. Study outcome

The main objective was to assess the prevalence of vulvovaginal candidiasis (VVC) in pregnant women, regardless of the presence of clinical symptoms, and to identify associated

risk factors among those attending prenatal clinics in East Jerusalem. The secondary outcome involved the isolation and identification of *Candida* species.

3.6. Study population and duration

From July 2023 to July 2024, symptomatic and non-symptomatic VVC-pregnant women visited the antenatal clinics at RCSH Jerusalem.

3.6.1. Inclusion criteria

- Pregnant women reported symptoms of abnormal vaginal discharge, itching, and genital burning or burning during urination.
- Pregnant women without signs and symptoms of VVC.

3.6.2. Exclusion Criteria

- Non-pregnant women.

3.7. Sampling

3.7.1. Sample Type

Non- probability sampling (Purposive Sample).

3.7.2. Sample Size

The sample size for the case-control study was calculated utilizing the online software tool Epitool (AUVEST, n.d.). The target sample consisted of approximately 240 participants, comprising 115 cases and 125 controls.

3.8. Study variables

VVC was the dependent variable. The independent variables included sociodemographic, clinical, behavioral, and pregnancy-related factors.

3.9. Data collection

Attending physicians utilized standardized questionnaires to gather information including sociodemographic data, behavioral details, signs and symptoms of VVC, age, marital status, pregnancy status, educational level, history of antibiotic treatment, clinical signs and symptoms, and a preliminary diagnosis. The process commenced upon the patient's provision of informed consent.

3.10. Experimental work

3.10.1. Specimen

All pregnant women with signs and symptoms of VVC had high vaginal swabs (HVS) collection for case samples.
All pregnant women exhibiting no signs or symptoms of VVC had high vaginal swab (HVS) collection for control samples.

3.10.2. Method of collection

Specimens were collected by sterile cotton-tipped swabs by the gynecologist.

3.10.3. Macroscopic examination

Each specimen's odor, consistency, and color were observed and recorded.

3.10.4 Culture and identification of *Candida* species

In accordance with the manufacturer's guidelines, chromogenic media was prepared, and the organism was inoculated prior to a 48-hour incubation period at 37 °C. Subsequently, we monitored the growth of Candida spp. by noting the color change of the colonies, attributable to the interaction between the chromogenic substrate and the enzymes produced by different Candida spp. This reaction facilitated the identification of organisms at the species level through their color and colony characteristics.

The ability of CHROM agar *Candida* to differentiate *Candida* yeast based on color and morphology will be demonstrated. The product identifies Candida albicans by colonies that are light to medium green and wet; *C. tropicalis* by colonies that are steel blue and wet; *C. glabrata* by colonies that are dark pink and wet; Candida krusei by colonies that are light pink and dry; and other *Candida* spp. by white colonies (Babić & Hukić, 2010).

This study involved the identification of *Candida* spp. conducted by the antenatal clinics of RCSHJ through the implementation of the following steps: Initially, we cultured clinical samples utilizing blood agar and incubated at 37°C for 48 hours. The identifying process started with the germ tube test. We subcultured the colonies once the germ tube test identified Candida. We used HiCromeTM **Differential Agar for subsequent analysis.**

HiCromeTM Candida Differential Agar is a selective and differential medium that facilitates the rapid separation of yeast from mixed cultures. This method enables differentiation among Candida species based on their coloration and colony morphology. Results are obtained within 48 hours, facilitating the rapid and presumptive identification of common yeasts in the Mycology and Clinical Microbiology Laboratory. Peptone special and yeast extract supply nitrogenous and carbonaceous compounds, along with other essential nutrients for growth. The

medium is adequately buffered with phosphate. Chloramphenicol inhibits the associated bacterial flora (HiMedia,2023).

Differentiation of *Candida* species according to the color of the colony as HiCrome™ Candida Differential Agar Base strep of color as mentioned in the **Table 2** below.

Table 3.1: Differentiation of Candida HiCrome™ Candida Differential Agar Base (HiMedia,2023).

Organism	Colour of colony
Candida albicans	Light Green
Candida glabrata	Cream to White
Teunomyces kruseii	Purple, Fuzzy
Candida tropicalis	Blue to Purple
Candida Kefyr	Cream to white with a slight purple center
Candida Utilis	Pale pink to pinkish purple
Candida dubliniensis	Pale Green

3.11. Validity and Reliability

Validity: We reviewed the questionnaire with a panel of survey methodology and gynecologist experts in the field, considering their comments.

The microbiology work with swabs conducted at RCSH Jerusalem has achieved International Organisation for Standardisation (ISO) 9001:2008 certification, Joint Commission International (JCI) accreditation, and rigorous Quality Control (CAP) accreditation.

Reliability: To assess the instrument's internal consistency, a pilot study with 10 questionnaires was performed. This sample was excluded from the original study.

3.12. Data Analysis

The data was entered into SPSS software version 27, and after the data code, data cleaning descriptive and inferential statistics were performed. Descriptive statistic includes frequency, percentages and inferential statistic include chi-square (X^2) tests and p-values to assess statistical significance.

3.13. Ethical considerations

The Department of Microbiology at Red Crescent Society Hospital conducted this study. The hospital was briefed on its aims and objectives and mandated to complete a consent form

before participation.
- The Research Ethical Committee at Al-Quds University approved the study before its initiation to ensure adherence to ethical standards.
- Informed consent was obtained from all patients.
- Participants were informed regarding the infection, the research objectives, and the study's benefits in their native language.
- All collected data is securely stored and utilized solely for the study's purpose; it will not be disclosed to third parties.

Chapter Four

Results

4.1. Introduction

This chapter presents the findings of the study based on the analysis of the collected data. The results are organized and presented concerning the research objectives and hypotheses. Key demographic variables of the participants are first described to provide context to the sample characteristics. Following this, the main findings from the data analysis are discussed, including descriptive statistics and inferential statistics.

4.2. The prevalence of candidiasis among participants

In a study of 240 participants, results indicated that 58 (24.2%) of the participants tested positive for candidiasis, while 182 (75.8%) tested negative. These findings suggest that candidiasis affects nearly one-quarter of the study population. In more detail, all control group 125 (100%) tested negative. In contrast, 58 (50.4%) of the case group tested positive, and 57 (49.6%) tested negative. These findings demonstrate a higher prevalence of candidiasis in the case group compared to the control group.

4.3. Factors associated with candidiasis in Case and Control groups

A study was conducted to examine the factors associated with candidiasis in 240 participants, comprising both symptomatic (case group) and asymptomatic (control group) individuals. The results are summarized in Table 1, which outlines demographic variables and their associations with candidiasis, using chi-square (X^2) tests and p-values to assess statistical significance.

Age: Age distribution across the case and control groups showed no statistically significant difference ($X^2 = 0.353$, $p = 0.950$). Most participants in both groups were between 20-29 years old (63.3%), followed by those aged 30-39 years (25.4%). Body Mass Index (BMI): While there was a noticeable difference in BMI categories, especially with a higher percentage of underweight individuals in the symptomatic group (9.6% vs. 3.2% in the control group), this

difference was not statistically significant ($X^2 = 4.965$, $p = 0.174$). The majority of participants fell within the normal weight category (70.8%). Level of Education: Education levels were similarly distributed between groups, with no statistically significant difference observed ($X^2 = 4.067$, $p = 0.131$). Most participants had secondary education (54.2%), followed by those with college or university education (33.3%). Place of Residence: There was no significant difference in place of residence between the case and control groups ($X^2 = 2.045$, $p = 0.360$). Most participants resided in cities (75.4%). Occupation: The majority of participants in both groups were housewives (86.3%). There was no statistically significant difference in occupation between the case and control groups ($X^2 = 1.673$, $p = 0.433$).

In conclusion, none of the demographic variables, including age, BMI, level of education, place of residence, or occupation, showed statistically significant associations with candidiasis in this case-control study.

Table 4.1: Factors associated with candidiasis in case-control groups in terms of demographic variables (n=240)

Demographic variables		**Control (Asymptomatic)**		**Case (Symptomatic)**		**Total**		**X^2**	**P-value**
		n	**%**	**N**	**%**	**n**	**%**		
Age	16-20 years old	10	8.0%	8	7.0%	18	7.5%	.353	.950
	20-29 years old	77	61.6%	75	65.2%	152	63.3%		
	30-39 years old	33	26.4%	28	24.3%	61	25.4%		
	40 - 49 years old	5	4.0%	4	3.5%	9	3.8%		
Body Mass Index (BMI)	<18.5 (Underweight)	4	3.2%	11	9.6%	15	6.3%	4.965	.174
	18.5-24.9 (Normal weight)	94	75.2%	76	66.1%	170	70.8%		
	25-29.9 (Overweight)	25	20.0%	25	21.7%	50	20.8%		
	30-34.9 (Obese)	2	1.6%	3	2.6%	5	2.1%		
	>34.9 (Extreme obese)	-	-	-	-	-	-		
Level of education	Primary education	12	9.6%	18	15.7%	30	12.5%	4.067	.131
	Secondary education	75	60.0%	55	47.8%	130	54.2%		
	Collage/University	38	30.4%	42	36.5%	80	33.3%		
Place of residence	City	99	79.2%	82	71.3%	181	75.4%	2.045	.360
	Camp	14	11.2%	17	14.8%	31	12.9%		
	Village	12	9.6%	16	13.9%	28	11.7%		
Occupation	Governmental	2	1.6%	4	3.5%	6	2.5%	1.673	.433
	Private	12	9.6%	15	13.0%	27	11.3%		
	Housewife	111	88.8%	96	83.5%	207	86.3%		

4.4. Factors associated with candidiasis in Case and Control groups in terms of pregnancy related factors

The distribution of participants across different pregnancy trimesters showed a highly significant association with candidiasis ($X^2 = 45.539$, $p < .001$). A majority of symptomatic participants were in their third trimester (71.3%), compared to only 32.0% in the control group. Conversely, a significantly higher proportion of asymptomatic participants were in their first trimester (27.2%) compared to symptomatic participants (2.6%). The logistic regression analysis shows a significant relationship between pregnancy trimester and the risk of developing candidiasis. Women in later trimesters are more than four times as likely to develop candidiasis compared to those in earlier stages of pregnancy (**Exp(B) = 4.12, p < .001**). The confidence interval for this effect is relatively narrow (**95% CI: 2.639–6.423**), indicating the result is both statistically significant and reliable. The analysis highlights that as pregnancy progresses, the likelihood of candidiasis increases substantially.

Furthermore, the number of pregnancies a woman has had (gravidity) was also significantly associated with candidiasis ($X^2 = 4.110$, $p = .049$). A higher proportion of symptomatic participants were multigravida (62.6%) compared to the control group (49.6%). The logistic regression analysis shows that higher gravidity (number of pregnancies) is significantly associated with an increased risk of developing candidiasis. For each additional pregnancy, the odds of having candidiasis increase by **70.1%** (**Exp(B) = 1.701, p = 0.043**). The confidence interval for this effect ranges from **1.016 to 2.849**, indicating a reliable association. This finding suggests that women with more pregnancies are more likely to develop candidiasis.

In conclusion, both pregnancy trimester and gravidity were significantly associated with candidiasis in this case-control study. Participants in their third trimester and those with multiple pregnancies were more likely to be symptomatic.

Table 4.2: Factors associated with candidiasis in case-control groups in terms of pregnancy related factor (n=240)

Pregnancy related factor		Control (Asymptomatic)		Case (Symptomatic)		Total		X^2	P-value
		n	%	n	%	n	%		
Trimester in pregnancy	First	34	27.2%	3	2.6%	37	15.4%	45.539	<.001*
	Second	51	40.8%	30	26.1%	81	33.8%		
	Third	40	32.0%	82	71.3%	122	50.8%		
Gravidity	Primigravida	63	50.4%	43	37.4%	106	44.2%	4.110	.049*
	Multigravida	62	49.6%	72	62.6%	134	55.8%		

**Significant value at p=<0.05*

4.5. Factors associated with candidiasis in Case and Control groups in terms of clinical related factors

Gestational Diabetes Mellitus (GDM) was found to be significantly associated with candidiasis ($X^2 = 4.094$, $p = .049$). A higher proportion of symptomatic participants had GDM (16.5%) compared to asymptomatic participants (8.0%). The logistic regression analysis shows that

having Gestational Diabetes Mellitus (GDM) is significantly associated with a reduced risk of developing candidiasis. Women with GDM are 56.1% less likely to develop candidiasis (**Exp(B) = 0.439, p = 0.047**). The confidence interval for this effect ranges from **0.195 to 0.990**, indicating a reliable association. This finding suggests that women with GDM are less likely to develop candidiasis compared to those without GDM.

Furthermore, a history of candidiasis was strongly associated with current symptomatic candidiasis ($X^2 = 15.483$, $p < .001$). Among symptomatic participants, 15.7% reported past episodes of candidiasis, compared to only 1.6% of the control group. The logistic regression analysis shows that having a past episode of candidiasis is significantly associated with a reduced likelihood of developing current candidiasis. Women with a history of candidiasis are 91.2% less likely to develop candidiasis again **(Exp(B) = 0.088, p = 0.001).** The confidence interval for this effect ranges from **0.020 to 0.387**, indicating a reliable association. This finding suggests that a history of candidiasis is a strong protective factor against developing candidiasis in the current instance. In conclusion, the presence of GDM and a history of previous candidiasis were significantly associated with current candidiasis in this case-control study, while diabetes mellitus itself did not show a statistically significant association.

Table 4.3: Factors associated with candidiasis in case-control groups in terms of clinical related factor (n=240)

Clinical factors		**Control (Asymptomatic)**		**Case (Symptomatic)**		**Total**		**X^2**	**P-value**
		n	**%**	**n**	**%**	**n**	**%**		
DM	Yes	1	0.8%	4	3.5%	5	2.1%	2.106	.197
	No	124	99.2%	111	96.5%	235	97.9%		
GDM	Yes	10	8.0%	19	16.5%	29	12.1%	4.094	.049*
	No	115	92.0%	96	83.5%	211	87.9%		
Past Episodes of Candidiasis	Yes	2	1.6%	18	15.7%	20	8.3%	15.483	<.001*
	No	123	98.4%	97	84.3%	220	91.7%		

**Significant value at p=<0.05*

4.6. Factors associated with candidiasis in Case and Control groups in terms of behavioral related factors

Prolonged use of antibiotics was significantly associated with candidiasis ($X^2 = 12.531$, $p < .001$). None of the participants in the control group reported prolonged antibiotic use, while 9.6% of the symptomatic group did.

Moreover, a significant association was found between douching and the use of female hygiene products with candidiasis ($X^2 = 19.103$, $p < .001$). A much higher percentage of symptomatic participants (34.8%) engaged in these practices compared to the control group (11.2%). The logistic regression analysis shows that the use of female hygiene products is significantly associated with a reduced likelihood of developing candidiasis. Women who use female hygiene products are 76.4% less likely to develop candidiasis (**Exp(B) = 0.236, p < .001**). The confidence interval for this effect ranges from **0.120 to 0.465**, indicating a reliable and strong

association. This finding suggests that the use of female hygiene products plays a protective role against candidiasis.

In addition, high intake of sugar and artificial sweeteners was strongly associated with candidiasis ($X^2 = 34.475$, $p < .001$). Nearly half of the symptomatic participants (49.6%) reported high sugar consumption, compared to only 14.4% in the control group as well as a significant association was also found between high intake of dairy milk products and candidiasis ($X^2 = 20.154$, $p < .001$). The logistic regression analysis shows that high sugar intake is significantly associated with a reduced likelihood of developing candidiasis. participants with high sugar intake have 17.1% of the odds of developing candidiasis compared to those without high sugar intake. **(Exp(B) = 0.171, p < .001).** The confidence interval for this effect ranges from **0.092 to 0.318**, indicating a strong and reliable association. This finding suggests that high sugar intake may have a protective effect against candidiasis when considering other factors in the model. Furthermore, the logistic regression analysis shows that high milk intake is significantly associated with a reduced likelihood of developing candidiasis. Participants with high milk intake have 30.2% of the odds of developing candidiasis compared to those without high milk intake (**Exp(B) = 0.302, p < .001**). The confidence interval for this effect ranges from **0.178 to 0.514**, indicating a strong and reliable association. This finding suggests that high milk intake may play a protective role against candidiasis when considering other factors in the model.

A higher percentage of symptomatic participants (61.7%) reported high dairy consumption, compared to 32.8% of the control group. However, there was no significant association between the frequent use of oral contraceptives and candidiasis ($X^2 = 0.823$, $p = .474$). The percentage of participants using oral contraceptives was similar between the case group (9.6%) and control group (6.4%). And the use of intrauterine devices was not significantly associated with candidiasis ($X^2 = 2.551$, $p = .126$). The percentage of IUD use was similar between the symptomatic (16.5%) and control (9.6%) groups.

Table 4.4: Factors associated with candidiasis in case-control groups in terms of behavioral related factor (n=240)

Behavioral factors		Control (Asymptomatic)		Case (Symptomatic)		Total		X^2	P-value
		N	%	n	%	n	%		
Prolonged use of antibiotics	Yes	0	0.0%	11	9.6%	11	4.6%	12.531	<.001*
	No	125	100.0%	104	90.4%	229	95.4%		
Douching habits & female hygiene products	Yes	14	11.2%	40	34.8%	54	22.5%	19.103	<.001*
	No	111	88.8%	75	65.2%	186	77.5%		
Frequent use of oral Contraceptive	Yes	8	6.4%	11	9.6%	19	7.9%	.823	.474
	No	117	93.6%	104	90.4%	221	92.1%		
High Sugar & Artificial Sweeteners	Yes	18	14.4%	57	49.6%	75	31.3%	34.475	<.001*
	No	107	85.6%	58	50.4%	165	68.8%		
High Dairy milk products. intake	Yes	41	32.8%	71	61.7%	112	46.7%	20.154	<.001*
	No	84	67.2%	44	38.3%	128	53.3%		
Use of Intrauterine Device	Yes	12	9.6%	19	16.5%	31	12.9%	2.551	.126
	No	113	90.4%	96	83.5%	209	87.1%		

**Significant value at p=<0.05*

4.7. Factors associated with candidiasis in Case and Control groups in terms of candidiasis status

The results revealed a highly significant association between candidiasis status and symptoms of candidiasis ($X^2 = 83.134$, $p < 0.001$). Among symptomatic participants, 50.4% tested positive for candidiasis, compared to 0% of the control group. Conversely, 100% of the control group tested negative, while 49.6% of the symptomatic group had negative test results.

In conclusion, there was a strong and significant association between positive candidiasis status and the presence of symptoms, indicating that individuals who tested positive for candidiasis were much more likely to be symptomatic than those who tested negative.

Table 4.5: Factors associated with candidiasis in case-control groups in terms of candidacies status (n=240)

Group		Control (Asymptomatic)		Case (Symptomatic)		Total		X^2	P-value
		n	%	n	%	n	%		
Candidacies status	Positive	0	0.0%	58	50.4%	58	24.2%	83.134	<.001*
	Negative	125	100.0%	57	49.6%	182	75.8%		

**Significant value at p=<0.05*

4.8. Factors associated with candidiasis in Case and Control groups in terms of each sign and symptoms

In a case-control study investigating factors associated with candidiasis among 240 participants, several signs and symptoms were significantly more prevalent in the symptomatic group (cases) than in the asymptomatic group (controls). White vaginal discharge was present in 89.6% of the cases compared to none in the controls ($X^2 = 196.128$, $p < 0.001$). Thick vaginal discharge was also significantly associated with candidiasis, with 38.3% of cases exhibiting this symptom ($X^2 = 58.563$, $p < .001$). Additionally, vulvar and/or intravaginal itch was reported in 58.3% of the cases and was absent in the controls ($X^2 = 101.030$, $p < 0.001$). Other symptoms such as vulvar and/or intravaginal irritation, burning, erythema, edema, superficial dyspareunia, external dysuria, dryness, and cracks in the skin were also significantly associated with candidiasis (all $p < 0.05$). These findings highlight specific clinical features that are strongly linked to the presence of candidiasis.

Table 4.6: Factors associated with candidiasis in case-control groups in terms of each signs and symptoms (n=240)

Signs and symptoms		Control (Asymptomatic)		Case (Symptomatic)		Total		X^2	P-value
		N	%	n	%	n	%		
White vaginal discharge	Yes	0	0.0%	103	89.6%	103	42.9%	196.128	<.001*
	No	125	100.0%	12	10.4%	137	57.1%		
Clumpy vaginal discharge	Yes	0	0.0%	1	0.9%	1	0.4%	1.092	.479
	No	125	100.0%	114	99.1%	239	99.6%		
Thick vaginal discharge	Yes	0	0.0%	44	38.3%	44	18.3%	58.563	<.001*
	No	125	100.0%	71	61.7%	196	81.7%		
Vulvar and/or intravaginal Itch	Yes	0	0.0%	67	58.3%	67	27.9%	101.030	<.001*
	No	125	100.0%	48	41.7%	173	72.1%		
Vulvar and/or intravaginal Irritation	Yes	0	0.0%	35	30.4%	35	14.6%	44.539	<.001*
	No	125	100.0%	80	69.6%	205	85.4%		
Vulvar and/or intravaginal burning	Yes	0	0.0%	15	13.0%	15	6.3%	17.391	<.001*
	No	125	100.0%	100	87.0%	225	93.8%		
Vulvar and/or vaginal Erythema	Yes	0	0.0%	26	22.6%	26	10.8%	31.694	<.001*
	No	125	100.0%	89	77.4%	214	89.2%		
Vulvar and/or vaginal Edema	Yes	0	0.0%	13	11.3%	13	5.4%	14.940	<.001*
	No	125	100.0%	102	88.7%	227	94.6%		
Superficial dyspareunia	Yes	0	0.0%	44	38.3%	44	18.3%	58.560	<.001*
	No	125	100.0%	71	61.7%	196	81.7%		
External dysuria	Yes	0	0.0%	39	33.9%	39	16.3%	50.616	<.001*
	No	125	100.0%	76	66.1%	201	83.8%		
Dryness	Yes	0	0.0%	5	4.3%	5	2.1%	5.550	.024*
	No	125	100.0%	110	95.7%	235	97.9%		
Cracks in skin	Yes	0	0.0%	17	14.8%	17	7.1%	19.887	<.001*
	No	125	100.0%	98	85.2%	223	92.9%		

4.9. *Candida* spp. distribution

Fifty-eight pregnant women tested positive for Candida strains from 115 case samples. We found seven different species among these samples. The most common species was C. albicans, accounting for 33%, followed by *C. tropicalis* (26%), *C. glabrata* (10%), *C. kefyr* (10%), *C. krusei* (9%), *C. utilis* (7%) and *C. dubliniensis* (5%). As seen in Figure (4.1).

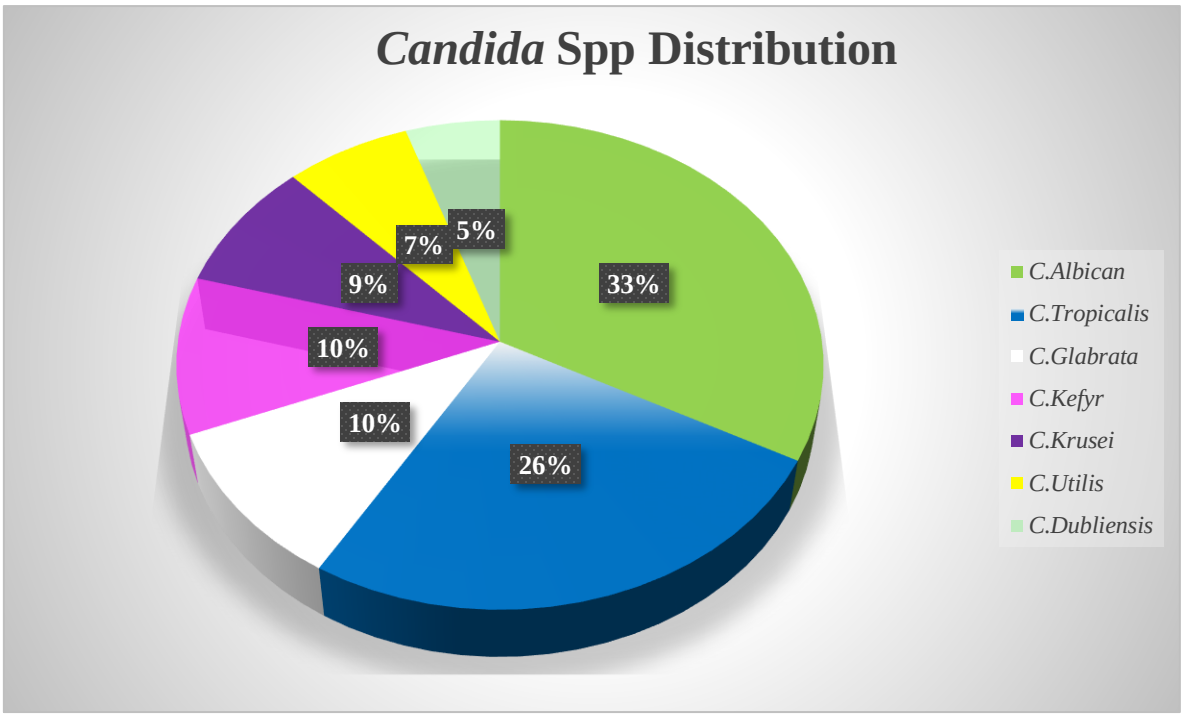

Figure 4.1: *Candida* species distribution

4.10. Conclusion

The study identified several significant factors associated with candidiasis across demographic, pregnancy-related, clinical, and behavioral categories, as well as specific signs and symptoms.

Demographic factors such as age, BMI, and place of residence did not show a statistically significant association with candidiasis. However, pregnancy-related factors, including being in the third trimester and multigravidity, were significantly associated with symptomatic candidiasis. Clinical factors like a history of gestational diabetes mellitus (GDM) and past episodes of candidiasis were also significantly linked to the condition. Behavioral factors, including high intake of sugar and dairy products, and douching habits, were strongly associated with symptomatic candidiasis. Among signs and symptoms, white and thick vaginal discharge, vulvar/vaginal itching, irritation, burning, erythema, edema, superficial dyspareunia, and external dysuria were highly prevalent among symptomatic individuals. These findings suggest that pregnancy status, clinical history, certain behavioral practices, and specific symptoms are key contributors to the risk and manifestation of candidiasis. Understanding these associations is crucial for better prevention, early diagnosis, and management of candidiasis

Chapter Five

Discussion

5.1 Introduction

The results of the current study regarding the prevalence and risk factors of candidiasis in the participants are thoroughly discussed in this chapter. This chapter's objectives include interpreting the study's findings in light of previous research, emphasizing the findings' importance, and investigating their implications for future research and medical practice. This chapter's organization adheres to the particular research goals and is broken up into subsections that discuss the prevalence of candidiasis, demographic, clinical, and behavioral aspects, along with other pertinent data.

This chapter attempts to confirm or refute accepted knowledge regarding candidiasis by contrasting the results with those of earlier studies. Additionally, it will discuss the surprising results of this study that demand more research. The chapter will also discuss the study's possible shortcomings and make suggestions for future lines of inquiry and advancements in clinical practice.

5.2 The prevalence of candidiasis among participants

According to the current study, 75.8% of subjects had negative candidiasis tests, whereas 24.2% had positive ones. These findings are consistent with the prevalence percentages found in a number of studies. The prevalence rate found in this study is in line with Sobel's (2007) estimate that 20–25% of women may get candidiasis during their reproductive years. However, compared to certain other research, the distribution of candidiasis in the case and control groups in this study is different. A higher link between symptomatic people and a diagnosis of candidiasis may be shown by the fact that 50.4% of participants in the case group tested positive for the disease, whereas none of the participants in the control group did. The overall prevalence of vulvovaginal candidiasis in pregnant women from 8 nations was 29.2%, contrary to earlier study (Mohamed et al. 2022).

This result is in contrast to studies that found a prevalence of candidiasis in people who did not exhibit any symptoms (Fidel, 2007). These discrepancies could result from changes in sample makeup, geographic location, or diagnostic techniques. Compared to studies that just employ self-reported symptoms, the current study used laboratory-confirmed diagnoses, which may

produce more accurate results. Furthermore, the validity of diagnosing candidiasis in this population based on symptoms is supported by the fact that there were no positive cases in the control group.

The idea that candidiasis is frequently underdiagnosed in asymptomatic people is supported by the increased prevalence seen in the symptomatic group (Sobel, 2016). This emphasizes how crucial precise diagnostic instruments are to determining the actual prevalence of candidiasis across different demographics.

C. albicans predominated in most cases, exceeding other *NAC* species. Brazil exhibited the highest prevalence of *C. albicans* among samples from pregnant women, at 92.3%. Tunisia and India reported frequencies of 76.61% and 69.23% of *C. albicans*, respectively. Regions such as Turkey, Northwest Ethiopia, and Lebanon have identified a notable incidence of C. albicans.

The proportions of albicans were 58%, 56.25%, and 43.4%, respectively. We identified *C. glabrata* and *C. tropicalis* as the most abundant species among other *NAC* species linked with VVC, corroborating the data in Table 9. The study found that *C. albicans* dominated in most cases, with the highest prevalence at 33%, followed by *C. tropicalis* at 26%. The most frequently detected *non-albican Candida* species were *C. glabrata*, *C. kefyr*, and *C. krusei*. Turner & Butler's (2014) research revealed that the prevalence of *C. albicans* is three times higher in Africa and the Middle East than that of *C. tropicalis*.

Table 5.1: The distribution of different species of Candida isolated from pregnant women around the world (Disha & Haque,2022).

country, Citation	C. albicans (%)	C. glabrata (%)	C. krusei (%)	C. tropicalis (%)	C. lypolytica (%)	C. kefyr (%)	C. fmata (%)	C. parapsillosis (%)	C. dublinies sis (%)	C. utilis
Turkey	58	19	2.9	13.2		24	1.5	0.5	0.5	
Lebanon	43.4	44.5	12.1							
Brazil	92.3	22	3.3	1.1				1.1		
Yemen	39.5	47			3.2		2.1		0.52	
India	69.23	23.07		7.69						
Saudi Arabia	70.2	16.5		3.3	2.6	0.6				
Tunisia	76.61	17.18	1.54	1.4		0.56				
Northwest, Ethiopia	56.25	17.7	21.96	1						
In our study	33	10	9	26		10			5	7

5.3 Factors associated with candidiasis in Case-Control groups

According to this study, there was no significant correlation between candidiasis and any of the demographic factors, such as age, BMI, education level, residence, or occupation. This result contrasts with several studies that found BMI and age to be risk factors. Higher BMI may raise the chance of getting candidiasis, according to studies by Achkar and Fries (2010). This is

probably because of alterations in the immune system or more skin folds that encourage the growth of fungi.

Given that most participants in this study were in the same age range and had comparable BMI distributions, the lack of correlation between demographic characteristics and candidiasis may be explained by the sample's homogeneity. The lack of a significant correlation with occupation, residence, or educational attainment is also in line with studies that indicate these variables may not directly impact the risk of candidiasis (Sobel, 2007). Nonetheless, some research has linked a higher prevalence of candidiasis to a lower socioeconomic position, which was not the case here (Mugo et al., 2014).

The premise that clinical and behavioral factors, rather than basic demographic traits, have a greater influence on candidiasis is supported by the study's absence of significant data addressing demographic factors. Targeted therapies that concentrate on clinical and lifestyle risk factors may benefit from this.

The majority of pregnant women with VVC symptoms were positive and fell within the age range of 20 to 29 years. There were 39 positive samples from this age group, accounting for 76.24% of the total prevalence, in line with Elmanama et al. (2020). The study revealed that the isolation rate of Candida spp. among pregnant women was 43%. The highest rate occurred in the 18-to-28 age group, exhibiting a prevalence of 46.4%.

5.4 Factors associated with candidiasis in Case-Control groups in terms of pregnancy-related factors

Participants in their third trimester had a greater than four-fold increased risk of developing candidiasis in comparison to those in their early stages of pregnancy, indicating a clear correlation between the two conditions. This result is in line with research that found that hormonal changes, especially an increase in estrogen, which encourage fungus growth, make late pregnancy a risk factor for candidiasis (Sobel, 2016).

Additionally, prior evidence supports the link between candidiasis and gravidity in this study. It has been demonstrated that having several pregnancies increases the risk of getting candidiasis since each pregnancy may impair immune function and change the vaginal microbiome (Roy & Ray, 2024). This supports the study's conclusion that women who were multigravida had a noticeably increased risk of developing candidiasis.

Nonetheless, some research has found no discernible variations in the frequency of candidiasis with gravidity or with pregnancy trimesters (Achkar & Fries, 2010). The disparity can result from variations in the research populations' geographic distribution or sample sizes. It's possible that the new study's emphasis on later-stage pregnant women offered more thorough insights into the dangers associated with each trimester.

5.5 Factors associated with candidiasis in Case-Control groups in terms of clinical related factors

In contrast with earlier studies that found diabetes to be a risk factor for candidiasis, this study found a substantial connection between GDM and candidiasis (Achkar & Fries, 2010). This study found that women with GDM had a lower risk of developing candidiasis, which goes against the widely held belief that fungal infections are more common in people with diabetes due to glucose intolerance and immune suppression.

The fact that women with GDM in this demographic may be getting better care and surveillance, which could lower their risk of infections like candidiasis, could be one reason for this surprising discovery. Since this protective link defies a large body of current knowledge, more investigation is warranted to determine the processes underlying it (Sobel, 2007).

According to Sobel (2016), a history of candidiasis increases the risk of recurrence because of residual fungal spores or compromised local immunity. This study's findings support the strong correlation between a history of candidiasis and current symptomatic candidiasis. This emphasizes how crucial it is to keep an eye out for early indications of recurrence in people with a history of candidiasis.

5.6 Factors associated with candidiasis in Case-Control groups in terms of behavioral related factors

This study found that the usage of female hygiene products, excessive sugar intake, and prolonged antibiotic use were all strongly linked to candidiasis, which is in line with previous research. As noted by Fidel (2007), antibiotics upset the equilibrium of vaginal flora, resulting in an overabundance of Candida species. The results of this study highlight how crucial it is to prescribe antibiotics with caution in order to reduce the risk of candidiasis.

Research indicates that high-sugar diets may increase fungal growth by changing blood sugar levels and fostering an environment that is more conducive to Candida growth, which is consistent with the link between high sugar intake and candidiasis risk (Roy & Ray,2024). The study's conclusion, however, that a high sugar intake was linked to a lower risk of candidiasis, defies some of the literature and could be an outlier because of sample characteristics or dietary practices.

Similarly, it is unexpected that feminine hygiene products had a protective impact in this study given that prior research has frequently connected them to a higher risk of candidiasis (Achkar & Fries, 2010). This disparity can result from variations in the study population's usage habits or product categories.

5.7 Factors associated with candidiasis in Case-Control groups in terms of candidiasis status

In line with previous research showing that symptomatic people are more likely to test positive for candidiasis, this study found a highly significant correlation between the presence of

symptoms and candidiasis status (Sobel, 2007). The idea that candidiasis is mostly symptomatic and that diagnostic accuracy is high when symptoms are present is further supported by the control group's lack of positive test results.

Nevertheless, this investigation did not find any asymptomatic cases of candidiasis, which have been described in other studies (Fidel, 2007). The discrepancies might result from the strict diagnostic standards used in this investigation, which might have omitted patients that were borderline or subclinical.

The obvious difference in candidiasis status between participants with and without symptoms emphasizes how crucial symptom identification and laboratory confirmation are to a precise diagnosis and course of treatment.

5.8 Factors associated with candidiasis in Case-Control groups in terms of each sign and symptom

The clinical characteristics of candidiasis reported in the literature are in line with the substantial correlation found in this study between certain symptoms, such as thick and white vaginal discharge, and the disease (Sobel, 2016). Further supporting the results of earlier research, vulvar itching, burning, and irritation—all of which are characteristic signs of candidiasis—were considerably more common among those who had symptoms (Roy & ray, 2011).

Furthermore, this study found that symptoms including external dysuria, erythema, and superficial dyspareunia were substantially linked to candidiasis. This is consistent with clinical research by Fidel (2007) that found similar symptoms to be suggestive of Candida infections. The claim that these clinical indications are accurate markers of candidiasis is reinforced by the fact that the control group did not exhibit these symptoms.

This study's findings about symptoms and indicators are generally in line with the body of knowledge already available on candidiasis, which supports the diagnostic standards applied in clinical settings to recognize this illness. This cross-study consistency demonstrates how reliable a symptom-based diagnosis of candidiasis is.

In conclusion, the study's findings provide light on the prevalence of candidiasis and its contributing causes, while also pointing out areas in which they concur with or deviate from previous research. Participants' prevalence of candidiasis, particularly in the case group, was in line with earlier studies, reinforcing the link between the diagnosis of candidiasis and symptomatic presentation. Nonetheless, variations in clinical and demographic characteristics, such as the lack of a substantial correlation between BMI and candidiasis, imply that factors unique to a certain area or community may affect the risk of developing candidiasis.

Important variables linked to candidiasis, such as sugar intake, antibiotic use, gravidity, and pregnancy trimester, were mostly consistent with previous research. Unexpected findings, however, such the beneficial correlation found between the use of feminine hygiene products and gestational diabetes mellitus (GDM), point to the necessity of more investigation into the underlying processes of these associations. The significance of symptom detection for precise

and prompt treatment is highlighted by the substantial correlation between candidiasis symptoms and a positive diagnosis.

Overall, this study contributes to the expanding corpus of knowledge on candidiasis and offers useful insights for medical professionals regarding the significance of taking behavioral and clinical factors into account when diagnosing and treating the disease. Although the findings largely corroborate previous studies, a few outliers highlight the need for more research to fully comprehend the nuances of candidiasis risk in various communities.

5.9. Conclusion

In conclusion, this study offers important new information about the risk factors and prevalence of candidiasis in participants. The results show that candidiasis is quite common, especially in those who exhibit symptoms, underscoring the significance of a precise diagnosis and efficient treatment. Although the study supports earlier research on the relationship between candidiasis and specific clinical characteristics, including pregnancy status and symptomatology, it also offers surprising results that call for more research, such as the protective associations between the use of feminine hygiene products and gestational diabetes mellitus (GDM).

General demographic surveys may not be as effective in lowering risk as specialized clinical and behavioral therapies, as seen by the lack of substantial correlations between demographic parameters and candidiasis. The study highlights how important is monitoring symptoms manifestation and laboratory confirmation is when diagnosing candidiasis, especially in high-risk groups.

Overall, this study adds to the expanding corpus of information on candidiasis and provides vital information for medical professionals creating specialized preventative and therapeutic plans. To improve our knowledge of this prevalent yet frequently misdiagnosed illness, future research should examine the complex connections between recognized risk factors and candidiasis. As the epidemiology of candidiasis develops further, research will be essential to guide clinical care best practices and enhance the health of those afflicted.

Preventive strategies for VVC may involve enhancing education to elevate women's understanding of reproductive health, especially among pregnant individuals. Furthermore, suggested techniques encompass advocating for regular condom utilization as a contraceptive approach and discouraging frequent vaginal douching.

5.10. Limitations of the Study

This study faced several limitations:

- The results may not be as broadly applicable if the sample size is insufficient to accurately reflect the larger population. The prevalence of candidiasis in certain demographic groups may be overestimated or underestimated as a result of smaller sample sizes.

- Bias may be introduced when self-reported behaviors, such eating and hygiene habits, are relied upon. The data gathered may contain errors as a result of participants' inaccurate recollection or disclosure of their actions.
- Participants with borderline or subclinical infections might have been excluded from the study due to its stringent diagnostic criteria for candidiasis. As a result, the actual prevalence of candidiasis may be underestimated.

5.11. Future Studies

Future research should focus on the following areas to expand understanding of candidiasis:

- Longitudinal research could shed light on the causal links between known risk factors and the progression of candidiasis across time. This would make it easier to assess whether behavioral or health-related changes raise risk.
- A more varied sample population, representing a range of ages, races, and socioeconomic backgrounds, should be the goal of future research. This would improve the findings' generalizability and more accurately depict the candidiasis epidemiology.
- A deeper understanding of women's experiences with candidiasis, including the effects on their quality of life and the sociocultural elements impacting their attitudes and actions related to the illness, may be possible through the use of qualitative research methods.
- Future studies should examine the efficacy of focused interventions such as dietary changes, proper hygiene practices, and educational programs on antibiotic use that are meant to lower the risk of candidiasis.
- Examining the biological processes that underlie the association between known risk factors (such as consumption of sugar and use of personal hygiene products) and candidiasis may help to explain how these factors affect the infection's incidence and recurrence.

5.12. Recommendations

Based on the findings of this study, the following recommendations are proposed:

- Accurate diagnosis procedures for candidiasis should be implemented by healthcare providers, especially for those who exhibit symptoms. Diagnostic accuracy can be increased by combining symptom ratings with test confirmation of diagnoses.
- More knowledge and instruction are required on the risk factors for candidiasis, such as the possible negative effects of antibiotics and proper hygiene. Women of reproductive age should be the focus of health education programs to educate them about preventive measures.
- Given their effects on vaginal flora, medical providers should use caution when prescribing antibiotics. The risk of candidiasis may be reduced by creating recommendations that encourage the prudent use of antibiotics.

- In order to prevent candidiasis, it may be helpful to promote lifestyle changes including cutting back on sugar intake and encouraging good cleanliness habits. Health care providers should assist patients in forming healthy habits by offering resources and assistance.
- It is important to stress routine screening and symptom monitoring for women with a history of recurrent candidiasis. Recurrence can be avoided, and general health outcomes can be enhanced with early intervention.

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الموافقة المستنيرة على المشاركة في دراسة بحثية

Informed consent to participate in research

عزيزي/ عزيزتي المشارك/ة:

أنا الباحثة حليمة محمود ضرغام طالبة ماجستير الوقاية وضبط الأمراض المعدية في جامعة القدس- كلية الصحة العامة أقوم بإجراء هذا البحث كمتطلب رئيسي من متطلبات الحصول على شهادة الماجستير. ان الهدف الرئيسي لهذا البحث معرفة نسبة الاصابة بالإلهاب الفطري المهبلي.

يطلب من حضرتك بموجب هذا النموذج المشاركة في دراسة بحثيةٌ، اقوم بعمل هذا البحث بغية الاجابة على اسئلة مهمة في البحث العلمي، الأمر الذي قد يساعد على تغيير او تحسين الطريقة التي نتبعها في الاجراءا التشخيصية والعلاجية في المستقبل.

يجوز لحضرتك عدم المشاركة في الدراسة، كما يجوز لك الانسحاب من الدراسة في اي وقت كان، لن يودي قرارك عدم المشاركة في الدراسة، او قرارك الانسحاب منها في وقت لاحق، الى اي تدبير جزائي أو الى فقدان الامتيازات المستحقة لك، ولن يكون لقرارك هذا اي تأثير على علاقتك بالباحثين أو بمن يستخدمهم.

قبل موافقتك على المشاركة بالدراسة، من حقك ان تعرف المعلومات التالية لمساعدتك في اتخاذ قرار المشاركة أو عدمه:

لا يوجد مخاطر مرتبطة بهذه الدراسة، حيث أن الأمر يتطلب إستخدام جزء من عينتك بعد جمعها للفحص المطلوب للمركز الصحي ومن ثم عمل نفس الفحص في طريقة مختلفة.

في حال كان لديك اسئلة حول الدراسة أو حول اصابة متعلقة بالدراسة، بامكانك سؤال:

لمزيد من المعلومات عن الحقوق التي تتمتع بها بصفتك مشارك بدراسة بحثية، او لمناقشة أي مشاكل او شكاوى أو مخاوف حول الدراسة البحثية، أو للحصول على معلومات او للمساهمة بآراءك يرجى الاتصال بمكتب البحث العلمي في جامعة القدس

موافقة المشارك

بموجب توقيعك على هذا النموذج، تؤكد على ما يلي:

لقد تم وصف الدراسة البحثية لك شفهيا وقمت بقراءة المعلومات المدرجة أعلاه، وبعد وصف الدراسة البحثية لك واي معلومات اضافية قدمها الشخص الراغب بالحصول على الموافقة، عرضت هذه المعلومات عليك بلغة تفضلها وتفهمها جيدا.

سيتم اخذ مسحة لعنق الرحم من حضرتك، لن يكون هناك اضرار عليك بسببها، سيتم أخذ المسحة حسب الطرق العالمية للتحكم بالعدوى ولن يتم ذكر اسم حضرتك في البحث، وسيكون اسمك فقط لدى الباحث وسيتم الحفاظ عليه بكل سرية.

أوافق على المشاركة بهذه الدراسة البحثية، سوف أحصل على نسخة موقعة من هذا النموذج لبيان الموافقة المستنيرة للاحتفاظ بها في سجلاتي، أوافق على المشاركة بهذه الدراسة

اسم المشارك: _____

توقيع المشارك: _____ التاريخ: _____

اسم الباحث: _____

توقيع الباحث: _____ التاريخ: _____

Data Collection Sheet

Demographic Data

Age: □ < 20 □ (20-29) □ (30-39) □ > 45

Weight: …….

High:……...

Education level: □ Primary □ Secondary □ Collage / University

Marital Status: □ Married □ Divorce □ Single

Residence: □ City □ Camp □Village

Occupation: □ Governmental Employee □ Private Employee. □ Housewife

Pregnancy Related Factors

Trimester in pregnancy: □ First Trimester □ Second Trimester □Third Trimester

Gravidity: □ Primigravida □ Multigravida

Clinical Factors

Diabetes mellitus: □ Yes. □ No

Gestational Diabetes: □ Yes. □ No

Past Episodes of Candidiasis: □ Yes. □ No

Behavioral Factors

Prolonged use of Antibiotics: □ Yes: ……. □ No

Douching habits & female hygiene products: □ Yes. □ No

Frequent use of oral Contraceptive: □ Yes. □ No

Dietary Habits: High Sugar & Artificial Sweeteners □ Yes. □ No
High Dairy milk products. intake. □ Yes. □ No

Use of Intrauterine Device: □ Yes. □ No

Sign and symptom

Asymptomatic: □ Yes □ No

Sing and symptom:

- vaginal discharge: □ White □ Clumpy □ Thick □ Curdy
- Vulvar and/or intravaginal: □ Itch □ Irritation □ Burning
- Vulvar and/or vaginal: □ Erythema □ Edema
- □Superficial dyspareunia
- □External dysuria
- □ Vulvar fissures □ Dryness □ Cracks in skin

HVS Result: ……

جامعة القدس

القدس

كلية الصحة العامة

Al-Quds University

Jerusalem

School of Public Health

التاريخ: 31/1/2023

عزيزتي الطالبة حليمة درغام المحترمة

برنامج ماجستير الوقاية وضبط الامراض المعدية

الموضوع: موافقة لجنة اخلاقيات البحث العلمي

قامت اللجنة الفرعية لأخلاقيات البحث التابعة لكلية الصحة العامة بمراجعة مشروع الرسالة بعنوان:

"

"

المقدم من (مشرف البحث/د. رسمي ابو حلو).

يعتبر مشروعك مستوفيًا لمتطلبات أخلاقيات البحث في جامعة القدس.

نتمنى لكم كل التوفيق في تسيير المشروع.

ملاحظة: في حالة الحاجة الى موافقة من اللجنة المركزية في الجامعة، تستطيع التقدم باستخدام هذه الموافقة على الرابط.

رئيسة اللجنة الفرعية لاخلاقيات البحث

كلية الصحة العامة

د. نهى الشريف

نسخة/ أعضاء لجنة البحث

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عنوان الرسالة : انتشار داء المبيضات المهبلية بين النساء الحوامل اللاتي يراجعن عيادات ما قبل الولادة في شرق القدس

الطالبة : حليمة محمود عطا ضرغام
المشرف : د. رسمي فايز مسلم أبو حلو

ملخص

خلفية: المبيضات هي الفطر الانتهازي والممرض الأكثر انتشارًا في البشر. التهاب المهبل الفطري هو ثاني أكثر أنواع العدوى المهبلية شيوعًا بين النساء في سن الإنجاب. يؤثر على 75% من النساء مرة واحدة على الأقل خلال حياتهن، مع 50% منهن يواجهن تكرارًا. تزداد نسبة انتشار فطر المبيضات من 10 إلى 17% لدى النساء غير الحوامل إلى 35% خلال فترة الحمل. في فلسطين، هناك نقص في البيانات الموثقة المتعلقة بعدوى المبيضات.

الطرق: تم تقييم انتشار داء المبيضات الفرجية المهبلية بين النساء الحوامل في مستشفى جمعية الهلال الأحمر القدس من خلال دراسة حالة - ضابطة، وتحديد عوامل الخطر المرتبطة، وعزل أنواع المبيضات، بغض النظر عن الأعراض السريرية. بين يوليو 2023 ويوليو 2024، كان هناك 240 امرأة حامل مصابة بعدوى المبيضات الفرجية المهبلية، تتكون من 115 حالة و125 ضابطة. تم تحليل البيانات باستخدام الإحصاءات الوصفية والاستدلالية من خلال برنامج.SPSS

النتائج: وجدت الدراسة انتشارًا أعلى لعدوى المبيضات في مجموعة الحالات (50.4%). من بين 115 عينة حالة، كانت 58 امرأة حامل مصابة بالفطريات. تم العثور على سبع أنواع في هذه العينات .C . albicans (33%)، C. tropicalis (26%)، C. glabrata (10%)، C. kefyr (10%)، C. krusei (9%)، C. utilis (7%)و .C. dubliniensis (5%)وجدت الدراسة عوامل مهمة مرتبطة بعدوى المبيضات، بما في ذلك العوامل المرتبطة بالحمل، والتاريخ الطبي، والممارسات السلوكية. تشمل الأعراض إفرازات مهبلية، حكة، حرقان، وعسر البول. فهم هذه الارتباطات أمر بالغ الأهمية للوقاية والإدارة.

الاستنتاجات: تسلط هذه الدراسة الضوء على انتشار وعوامل خطر داء المبيضات، مؤكدة على أهمية التشخيص الدقيق والعلاج. يقترح أن الاستطلاعات الديموغرافية قد لا تكون فعالة مثل العلاجات المتخصصة. يجب على الأبحاث المستقبلية استكشاف الروابط المعقدة بين عوامل الخطر والقلاع.

الكلمات المفتاحية: التهاب المهبل الفطري المبيضات، النساء الحوامل، انتشار المبيضات.