

# The Correlation between *Candida* sp. Contamination in the Bathroom Water and Candidiasis Incidence

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## Abstract

*Candida* is a fungus which caused candidiasis in women, with a vaginal discharge as the main sign. One of the proposed source of infection is water which is use to clean themself. Little is known regarding the role of water as the source of infection in vaginal candidiasis. The aim of this study are to know how much *Candida* sp. detected on vaginal discharge and contaminated the bathroom water and to prove whether *Candida* sp. contaminated bathroom water can be a source of infection for patients with vaginal candidiasis based on relative risk. This study were conducted in 32 women with candidiasis and 32 water samples from their bathroom. Vaginal discharge were taken by sterile swab and inoculated into Sabouraud Dextrosa Agar. 10 ml bathroom water samples from each water container in their house were taken by sterile syringe and also inoculated into Sabouraud Dextrosa Agar. Twenty-five (78%) vaginal discharge are positive *Candida* sp.. Bathroom water are contaminated with *Candida* sp. as much as 62.5%. Seventeen (53,1%) samples are positive *Candida* sp. both from vaginal discharge and bathroom water. Subject with positive *Candida* sp. from bathroom water, have a risk 2.83 times to suffer Candidiasis than Subject without *Candida* sp.. from bathroom water (*Candida* sp. negative)

**Keywords:** *Candida* sp., Candidiasis, Bathroom water

## 1. INTRODUCTION

Water is a human daily basic need such as for bathing, washing, cooking and drinking. If the water contaminated with mold, such as the fungus *Candida* sp., so the water can be a source of infection for people who use it<sup>3</sup>. Approximately 50% of the water that comes from public places is contaminated with *Candida* sp., and becomes as a source of infection for patients with vaginal candidiasis.<sup>1,2,4</sup>

*Candida* sp. is a genus of fungi that cause Candidiasis. This fungus can infect a variety of human organs, such as the vagina, gastrointestinal tract, skin or other organs<sup>5</sup>. Fourthy percent (40%) Vaginal discharge are caused by Candidiasis, with viscous liquid, milky white and accompanied by severe itching in the pubic<sup>6,7</sup>

There are many study about the water as a source of *Candida* sp. infection , such as water from the swimming pool can caused 51.3% *Candida* sp. infection and water from the public shower can caused 53.3% *Candida* sp.. infection<sup>2,4</sup>.

The aim of this study are to know how much *Candida* sp.. detected on vaginal discharge and contaminated the bathroom water and to prove whether *Candida* sp. contaminated bathroom water can be a source of infection for patients with vaginal candidiasis based on relative risk.

## 2. RESEARCH METHOD

Experimental laboratory research with cross-sectional study, conducted in the laboratory of microbiology Faculty of Medicine, Muhammadiyah University Yogyakarta. Subjects were Candidiasis patients who complaints with viscous liquid, milky white and severe itching in the pubic. The sample vaginal secrete/vaginal swab were taken from Subject. Sample bathroom water (bathtub water and tap water) were taken from Subject house. Both samples vaginal discharge and bathroom water are examined for detection of *Candida* sp. Thirty-two samples are collected from vaginal discharge and 2 sources bathroom water.

**Research Procedure :** 1. Detection of *Candida* sp. from vaginal discharge . Vaginal discharge samples inoculated on SDA + (Sabouraud dektose agar + chloramphenicol 0.05%), and then incubated at room temperature and was observed for fungal growth up to 7 days. 2. Detection of *Candida* sp. from bathroom water samples by taking 10 ml bathroom water samples then transferred into sterile centrifuge tubes .Each water sample centrifuged for 5 minutes ,3000 rpm. Supernatant discarded with a sterile pipette and spared as much as 1 cc as sediment. The precipitate was shaken until homogeneous and were inoculated at 2 media SDA +, then incubated at room temperature and observed for fungal growth up to 7 days.

### 3. RESULTS AND ANALYSIS

#### 1. Characteristics of Subject

Subject are 21-25 years old (40.63%), it is a reproductive age woman which allows *Candida sp.* as normal flora in the vagina grows very fast. Subjects Body Mass Index (BMI) are normal (84.38%). It means no obesity factor that can influenced *Candida* growth faster in the vagina. Most Subject were students (53.57%), place to live are dormitory (28.13%). Dormitory water bathroom are most frequent as source of infection because it is rarely drained and kept clean.

#### 2. Charactersitics of Environmental

The environmental characteristic is 50% humid, this condition induces *Candida sp.* growth easier, especially in places that contain water such as bathrooms. The source of Subject bathroom water comes from wells (93.75%) and tap (6.25%). Bathtub condition are clean (71.88%) and dirty (28, 13%). Bathroom water are drained once a week (35, 48%). Subject use the bathroom water as much as 6-10 times a day (46.88%). The bathroom is shared by boarders as much as 56.25%. This condition influence bathroom water contamination by microorganisme such as *Candida sp.*.

#### 3. Characteristic of Subject Personal hygiene

Personal hygiene is prediposisi factors of *Candida* infection in the vagina such as cleans genital after urination. Subject clean up genital after urination as much as 90.66%. Replace underpants 2 times a day (65.63%) and replace underpants more than 2 times a day as much as 18.75%. Subject rarely wore tight pants as much as 43.76%, while always using tight pants as much as 9.38%. Clean underwear showed personal hygiene, because of dirty underwear can cause growth of *Candida* in the vagina . Tight underwear makes the circumstances surrounding the vagina becomes moist and stimulate the growth of *Candida sp.* in the vagina.

Thirty two (32) vaginal discharge samples and 64 bathroom water samples (32 waterbath and 32 watertap/wells) were examined to detect *Candida sp.*.

Twenty-five (25) vaginal discharge samples are positive *Candida sp.* (78%) and 7 vaginal discharge samples are negative *Candida sp.* (22%) as in table 1

**Table 1. Detection of *Candida sp.* from Vaginal secrete Respenden**

Test Method	<i>Candida sp.</i> Identification		Amount
	Positive	Negative	
Microscopy & Culture	25	7	32

In Table 2 showed that water from Cistern more detectable *Candida sp.* as many as 16 (50%), while the water from the water faucet is detected *Candida sp.* many as 10 (31%).

**Table 2. Detection of *Candida sp.* in the Bathroom water from Subject**

Origin of the water	Culture of		Amount
	<i>Candida</i> (+)	<i>Candida</i> (-)	
Cistern	16	16	32
Water Faucet	10	22	32
Amount	26	38	64

The microscopic and colony characteristic of *Candida sp.* detected from vaginal discharge samples and bathroom water samples are showed at table 3

**Table 3. Microscopy and Colony Characteristic of *Candida sp.* from Vaginal discharge and bathroom water samples**

Characteristics of <i>Candida</i>	<i>Candida sp.</i> from Vaginal discharge	<i>Candida sp.</i> from bathroom water
shape	yeast cell colonies, round or oval	yeast cell colonies, round or oval
size	4-6 $\mu$ m	4-6 $\mu$ m
color	white	white
odor	like Yeast	like Yeast
Budding	available	available
Pseudohyphae	available	available

The result of *Candida sp.* detection from vaginal discharge samples and bathroom water samples showed in Table 3. Seventeen (17) samples are positive *Candida sp.* both from vaginal discharge and bathroom water; whereas 3 samples are positive *Candida sp.* only from bathroom and 8 samples are positive *Candida sp.*

only from vaginal discharge. In the other 4 samples are negative *Candida sp.* from both vaginal discharge or bathroom water.

**Table 4. The result of *Candida sp.* detection from vaginal discharge samples and bathroom water samples**

Samples	Vaginal discharge		Amount
	<i>Candida sp.</i> (+)	<i>Candida sp.</i> (-)	
Bathroom water			
<i>Candida sp.</i> (+)	17	3	20
<i>Candida sp.</i> (-)	8	4	12
Amount	25	7	32

ODD ratio value =  $(17 \times 4) / (8 \times 3) = 2.83$

It means that the Subject with positive *Candida sp.* from bathroom water, have a risk of 2.83 times to suffer Candidiasis than Subject without *Candida sp.* from bathroom water (*Candida sp.* negative)

There is a significant correlation between *Candida sp.* contamination in bathroom water with incidence Candidiasis, with r value 0.46 (lambda correlation test,  $p < 0.05$ ). It has strength correlation which if the many amount of *Candida sp.* contamination at bathroom water will increase incidence of candidiasis

There is a significant correlation between the intensity use of the bathroom with incidence of Candidiasis, with r value 0.13 (lambda correlation test,  $p < 0.05$ ). It means more the intensity using the bathroom will increase the incidence of Candidiasis but it has weak correlation.

#### 4. CONCLUSION

Twenty-two samples (78%) vaginal discharge showed positive *Candida sp.* Bathroom water are contaminated with *Candida sp.* as much as 62.5%. Seventeen (53,1%) samples are positive *Candida sp.* both from vaginal discharge and bathroom water. Subject with positive *Candida sp.* from bathroom water, have a risk 2.83 times to suffer Candidiasis than subject without *Candida sp.* from bathroom water (*Candida sp.* negative)

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