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**Corresponding author:**

Bambang Purwanto,  
E-mail: [bpaifo@gmail.com](mailto:bpaifo@gmail.com)

**Research article****Vaginal Hygiene, but not Physical Activity Level Associate to the Event of Pathological Leukorrhea among Female Students of Sport Program**

Titania Arfinisa Kirana<sup>1</sup>, Bambang Purwanto<sup>2,\*</sup>, and Wahyul Anis<sup>1</sup>

<sup>1</sup> Midwifery Program Study, Faculty of Medicine University Airlangga 60131, Surabaya, East Java, Indonesia

<sup>2</sup> Department of Medical Physiology and Biochemistry, Faculty of Medicine University Airlangga 60131, Surabaya, East Java, Indonesia

**Abstract** In 2020, more than 70% of vaginal discharge complaints were pathological among Indonesian adolescent girls. Analyzing of the risk factors for pathological vaginal discharge could be the first step in leukorrhea prevention. The level of physical activity and vaginal hygiene behavior were factors potentially associate to the event of pathological leukorrhea. It was uncertain whether the level of physical activity or vaginal hygiene behavior be the risk factor of pathological leukorrhea. This study was aimed to investigate the main risk factor of pathological leukorrhea among female who are active in sports. This study was cross-sectional design among 70 students of Sport Program in Surabaya. The subject was randomly obtained and characterized for the level of physical activity and vaginal hygiene behavior, such as the frequency of panties replacement, panties material, urinary hygiene, vaginal soap/antiseptic, and panty liners utilization. The relationship was determined using Chi-square test. The relationship found between the event of pathological leukorrhea only with urinary hygiene (p-value 0.007). Pathological leukorrhea found mostly among female who wipe vulva from rear to fore after urinary. The level of physical activity and other vaginal hygiene did not associate to pathological leukorrhea event among female in Sports Program. Vaginal hygiene, but not physical activity level associate to the event of pathological leukorrhea among female students.

**Keywords:** Leukorrhea, Vaginal hygiene, Urinary, Physical Activity



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## INTRODUCTION

The problem of vaginal discharge was often overlooked by most female. This problem often neglected, and if it lately handled, it could be fatal (Rachmadianti, 2019). In Indonesia, 70% of the population of adolescent girls experienced leukorrhea problems (Husni and Sukesni, 2020). According to Khan et al (2009), more than one-third of patients who seek treatment at gynecological clinics in Indonesia complained for fluor albus and more than 80% of them are pathological. Pathological leukorrhea is mostly experienced by adolescents due to poor hygiene behavior towards the reproductive organs (Paryono and Nugraheni, 2016).

High humidity facilitated the growth and development of fungus and bacteria related to vaginal discharge (Maimunah et al., 2019). Surabaya's high temperature and humidity increased the growth and development fungus and bacteria related to leukorrhea. Physical active under Surabaya's circumstances increased sweat production, and accumulation especially at inguinal region. This sweat accumulation increased genitalia humidity and so that be an excellent environment for fungus and bacterial growth. Students of Sports Program were individual who susceptible to this circumstance so that potentiate to develop a pathological leukorrhea event. Until now, it was uncertain whether the level of physical activity or vaginal hygiene behavior be the risk factor of pathological leukorrhea. This study was aim to investigate the main risk factor of pathological leukorrhea among female who are active in sports.

## MATERIAL AND METHODS

This study was cross-sectional design among female students of Sports Program in Surabaya. 70 students were randomly obtained from voluntary subjects who registered for joining this study. The subjects were students of Faculty of Sports Science, Surabaya State University, class of 2018 and 2019, aged 19-22 years old with a total of 297 female students. Students with history of genital diseases, during menstruation, and pregnant were excluded. They were characterized for the level of physical activity and vaginal hygiene behavior, such as the frequency of panties replacement, panties material, urinary hygiene, vaginal soap/antiseptic, and panty liners utilization.

The level of physical activity was determined using GPAQ (Global Physical Activity Questionnaire). It resulted the density of physical activity recorded in a Metabolic Equivalent in a week. Then, it grouped in three level of physical activity, i.e.: low, moderate, and high. Low (< 600 MET), moderate (600-3000 MET), high ( $\geq$  3000 MET) (WHO, 2012).

Vaginal hygiene behavior, such as the frequency of panties replacement, panties material, urinary hygiene, vaginal soap/antiseptic, and panty liners utilization. The frequency of panties replacement was daily behavior of panties replacement number during a day. The panties material was material of panties that used in daily activity. Urinary hygiene was a direction of hand movement to wipe vulva after urinary, i.e.: rear to fore, or fore to rear. Vaginal soap/antiseptic was using vaginal soap/antiseptic habit in daily life. Subject filled in answer of questions asked in questionnaire of GPAQ and vaginal hygiene behavior questionnaire. The questionnaires were valid after preliminary study on 34 subjects. Physical activity level and vaginal hygiene behavior was analyze for relationship with the event of pathological leukorrhea using statistical method. All protocols in this study were approved by the commission of research ethics, Faculty of Medicine Universitas Airlangga as stated in later number 171/EC/KEPK/FKUA/2021.

## RESULTS

The subjects were characterized as female students 19-22 years old of sports program, aged 19-22 years old. The characteristics were seen as follows at table 1. Twenty-three (32.9%) students were experienced pathological leukorrhea, while most (67.1%) female students were experienced physiological leukorrhea.

**Table 1.** Characteristics of Subjects.

Characteristics		N	%
Age	19 years old	2	2.8
	20 years old	22	31.4
	21 years old	37	52.9
	22 years old	9	12.9
Program	Sports Science	24	34.3
	Sports Coaching Education	21	30.0
	Sports and Health Science	25	35.7
Duration of Study	7 semester	33	47.1
	5 semester	37	52.9

**Table 2.** The relationship between the event of pathological leukorrhea with the level of activity and vaginal hygiene behavior among the students sport program in Surabaya.

	Risk Factor	Physiological		Pathological		P-value
		N	%	N	%	
Physical Activity Level	Low	1	25.0	3	75.0	0.141
	Moderate	6	60.0	4	40.0	
	High	40	71.4	16	28.6	
Frequency of panties replacement	≥2 times a day	44	67.7	21	32.3	1.000
	<2 times a day	3	60.0	2	40.0	
Pantie's material	Cotton, T-shirt	44	69.8	19	30.2	0.207
	Nylon, Polyester, etc.	3	42.9	4	57.1	
Urinary hygiene	From fore to rear	28	57.1	21	42.9	0.007
	From rear to fore	19	90.5	2	9.5	
Vaginal soap/antiseptic	No	32	64.0	18	36.0	0.376
	Use	15	75.0	5	25.0	
Panty liners utilization	No	38	67.9	18	32.1	1.000
	Use	9	64.3	5	35.7	

The relationship test among six risk factors of pathological leukorrhea among female students of Sports Program in Surabaya resulted only urinary hygiene behavior as predominant risk factors. The Chi-square test resulted a significant relationship between urinary hygiene behavior with the event of pathological leukorrhea ( $P$ -value 0.007). Other risk factors did not show any relationship with the event of pathological leukorrhea ( $P$ -value > 0.05).

## DISCUSSION

Characteristics of subjects based on age in table 1 the results of the study showed that most (52.9%) female students were 21 years old. The age of subjects in this study were in adolescents if refers to the statement of The Population and Family Planning Agency (BKKBN). BKKBN states that adolescents are in the age range of 10-24 years and are unmarried (Kemenkes RI, 2017). Adolescent were a period that prone to experience pathological vaginal discharge because the majority of them often neglect their reproductive health. This was related to many factors such as knowledge, habit, social economy, and culture.

In this study, we found that 32.9% of subjects experienced with pathological vaginal discharge. Pathological vaginal discharge was excretion of fluid from the vagina except blood either marked by a greenish-yellow, gray or milk-like liquid, sometimes foamy, thick textured, has a pungent odor. There are complaints of pain or itching following the pathological vaginal discharge whenever it excessive. The vaginal discharge became an excellent media for infection to the internal reproductive organs such as the uterus and fallopian tubes and develop as specific inflammation. Other complications can be a urinary tract infection, abnormalities of female reproductive organs, cervical polyps, malignancy (tumors and cancer), and the presence of foreign bodies in the reproductive organs (Sari, 2012).

The event of pathological leukorrhea among physically active individuals was related to some risk factors, consist of vaginal hygiene behavior and the level of physical activity. Both risk factors were explained more at the next section as follows.

### **The relationship between the level of physical activity with the incidence of pathological leukorrhea**

Physical activity was defined as active movement produced by skeletal muscles that required energy expenditure. Physical activity included exercise involved body movement as part of play, work, homework and recreational activities (WHO, 2017). The type of physical activity was divided into three levels, namely light, moderate, and heavy. According to Maulidha (2017) factors that affect physical activity include: lifestyle, disease processes, culture, energy levels, and age. Measurement of the level of physical activity using the GPAQ questionnaire.

The Chi-square test resulted no relationship between the level of physical activity and the event of pathological leukorrhea among female sports students in Surabaya. Previously, public was believed that higher a female's level of physical activity, the more likely female will experience abnormal vaginal discharge. It confirmed as Wijayanti study (2017) which showed a relationship between physical activity and the event of vaginal discharge among adolescent female students of senior high school at Sleman Yogyakarta.

Our result did not confirm Wijayanti idea that there was not any relationship between level of physical activity with the event of pathological leukorrhea. Pathological leukorrhea among active individual pathogenesis was consist of two mechanisms, creating an excellent media for pathological microorganism and a rapid growth of pathological microorganism. Both were negatively regulated by good vaginal hygiene behavior. Frequency of panties replacement, panties material, and panty liners utilization prevented develop media for microorganism growth. Urinary hygiene and vaginal soap/antiseptic use inhibit rapid microorganism growth (Kairys N and Garg M, 2020).

### **The relationship between the frequency of panties replacement with the event of pathological leukorrhea**

The Chi-square test confirmed that there was not any relationship between the frequency of panties replacement with the event of pathological leukorrhea among female students in Sports Surabaya. Subjects mostly replaced panties more than twice a day so that it prevented an excellent media for microorganism growth. The average period for microorganism growth in a humid environment was ranged 20 minutes until 5 days. The more frequent to replace panties in a day, the lower risk to develop an excellent media for microorganism growth and the lower risk for pathological leukorrhea event. The routine habit of changing underwear at least 2 times a day also plays a major role in keeping the vagina so that it is not moist (Wardani, 2017). The same opinion was also expressed by Mancuso (2015) to avoid humid panties.

Pathological leukorrhea was related to the growth microorganism such as Bacterial vaginosis, *Candida albicans*, *Gardnerella vaginalis*. This study did not investigate the kind of microorganism found in panties and in genitalia. So that further it needs to be confirmed which microorganism related to pathological leukorrhea among female students of Sports Program in Surabaya.

### **The relationship between the pantie's material with the event of pathological leukorrhea**

The panties material in this study was defined as the type of fabric from panties that is often worn by female students. There were two types of materials described in this study. The first was material that easily absorbed sweat or fluids such as cotton, t-shirts, wool,

etc. The second type was a material that was difficult to absorb sweat or fluids such as linen, polyester, etc. The Chi-square test showed that there was no relationship between panties material and the event of pathological leukorrhea ( $P$ -value 0.207) among female sports students in Surabaya. Subject mostly wore the type of panties material that easily absorbed sweat or fluids especially cotton, so that it prevented an excellent media for microorganism growth because genital region was not humid. The absence of a relationship between risk factors and the event of pathological leukorrhea could be because the researchers only collect data through questionnaires and did not directly observe the panties material that was worn by the subjects.

This study confirmed the research conducted by Cahyaningtyas (2019) which stated that there was no relationship between the type of panties material by female students of Islamic boarding school and the event of vaginal discharge. It was supported by Marbun's research (2018) which showed that there is no significant relationship between the panties material and the event of vaginal discharge, evidenced by statistical tests resulted  $p$ -value = 0.153. In addition, this study also confirmed Azizah's research (2015) conducted on female students of SMK Muhammadiyah Kudus with  $P$ -value 0.067.

However, many of the previous studies stated that there was some relationship between panties material and the event of pathological leukorrhea. One of them was the results of research tests conducted by Setyowati (2013) on young female in Islamic boarding schools that resulted the relationship between panties material and the event of vaginal discharge. The CDC (2017) also stated that wearing cotton material for panties could reduce the risk of vaginal yeast infections.

Anyway, wearing panties material that easily absorbs sweat is a good habit because it reduced humidity in the genital region. Humidity in genital region could lead to infection, yeast, and vaginal discharge (Ariyani, 2012). The selection of panties should be made of 100% cotton and in a clean condition, because panties made of nylon or polyester (which due to aesthetic considerations and exploration of sexiness is more widely used) will increase vaginal moisture so that microorganisms were easy to breed (Abrori, 2017).

### **The relationship between urinary hygiene with the event of pathological leukorrhea**

The results of Chi-square test showed that there was a significant relationship between urinary hygiene and the event of pathological leukorrhea in female sports students in Surabaya. In this study, urinary hygiene was defined as a direction of hand movement to wipe vulva after urinary, i.e.: rear to fore, or fore to rear. Urinary hygiene had an effect to rapid growth of pathological microorganism. Microorganisms that cause vaginal discharge were abundant in the anus, so if the direction of cleaning vulva is reversed, it would certainly cause the transfer of fungus and other parasites from the anus to the vagina. With vaginal humidity and an inappropriate pH, it will cause pathological microorganisms to grow rapidly resulting in vaginal discharge (Setyowati, 2013).

So far, society taught that the right direction of hand movement while cleaning the female genitals was from fore to rear (from the vagina to the anus). The reverse direction would actually give an opportunity for microorganisms that come from the rest of the dirt that comes out of the anus to enter the urinary tract or vagina (Ariyani, 2012). This study was confirmed the research of Cahyaningtyas (2019) which stated that there is a significant relationship between direction of hand movement after urinating and the event of pathological vaginal discharge. Previous research has also shown that the way of washing the vagina is related to the event of pathological leukorrhea (Abrori, 2017).

### **The relationship between the vaginal soap/antiseptic with the event of pathological leukorrhea**

The Chi-square test resulted no relationship between the vaginal soap/antiseptic and the event of pathological leukorrhea ( $P$ -value 0.376) among female sports students in Surabaya. Vaginal soap/antiseptic could inhibit rapid growth of pathological microorganisms. Vaginal cleaning fluids generally contain many chemical compounds that damaged the skin and the vaginal environment. The use of antiseptics that were widely sold in the market will disrupt the ecosystem in the vagina, especially the pH and the life of good bacteria. If the pH was disturbed, bad bacteria will easily grow rapidly and the vagina will be susceptible to be infected, one of which is marked by vaginal discharge (Triyani et al, 2013).

This study was supported by Ernawati's (2013) research, where it mentioned there was no relationship between the use of vaginal cleansers with the event of vaginosis accompanied by vaginal discharge (Ernawati, 2013). Based on the results of this study, subjects mostly admitted to using their own bath soap as a vaginal soap/antiseptic. There were also two factors that influenced the use of vaginal soap/antiseptics, included knowledge as an internal factor and the environment as an external factor. Most of the vaginal soap/antiseptic ingredients used were commercial ingredients containing acids, antimicrobial bacteriostatic and weak surfactants in various combinations (Pribakti, 2012).

Vaginal soap/antiseptics ingredients were potentially killed the normal flora in the vagina. Normal vaginal flora helped maintain the acidity of the pH in an optimal state (3.5 – 5.5). Changes in the level of acidity in the vagina would cause pathogenic microorganisms to grow easily so that caused vaginal discharge that smells, itch and discomfort. Antiseptics that were used continuously will also killed good bacteria and pathogenic bacteria will more easily enter the vagina. If this is allowed to happen, it can lead to hip inflammation and even cervical cancer (Arumdika, 2018).

### **The relationship between the panty liners utilization with the event of pathological leukorrhea**

Panty liner or panty shield was a thinner type of sanitary napkin that used outside the menstrual period to absorb vaginal fluids, sweat, blood spots, residual menstrual blood and sometimes also used as a urine absorber for incontinence women (Persia, 2015). In the previous evidence, panty liners utilization gave an effect to develop an excellent media for microorganism growth, because panty liners tend to increased humidity of the genital organs. The bottom of the panty liner was made from plastic, so it made the skin unable to breathe freely due to lack of air circulation, this caused the vaginal condition to became more humid and irritated easily (Wati, 2014).

The Chi-square test confirmed that there was not any relationship between the panty liners utilization with the event of pathological leukorrhea among female students of sport program in Surabaya. This study is similar to Marbun's research (2018) with female respondents at the Salsabila Banten Midwifery Academy which showed that the statistical test results obtained there was no significant relationship between the use of pantyliners and the event of vaginal discharge. But this study contrary to research conducted by Persia (2015) which reported that the use of panty liners was one of the predisposing factors for the onset of leukorrhea. Some of the bad effects of using panty liners include: Bacteria easily breed, are exposed to chemicals, cause vaginal discharge, and trigger allergies.

## **CONCLUSION**

Based on the results and discussion, the researchers draw conclusions that urinary hygiene was the only risk factor significantly associate with the event of pathological leukorrhea. The level of physical activity, the frequency of panties replacement, panties material, urinary hygiene, vaginal soap/antiseptic, and panty liners utilization did not associate with the event of pathological leukorrhea.

In addition, there were some absent factors need to be observed in the future, such as the humidity of genital region, culture test of vaginal swab and the immune response. However, the application of vaginal hygiene is very important for all women to avoid pathological leukorrhea which can be dangerous and even fatal if not treated immediately.

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## AUTHOR CONTRIBUTIONS

Titania Arfinisa Kirana designed and conducted all of the research, performed the statistical analysis and data visualization and wrote the manuscript. Bambang Purwanto and Wahyul Anis helped to give suggestion or feedback on research and correct the manuscript writing. All authors have read and approved of the final manuscript.

## CONFLICT OF INTEREST

The authors declare that they hold no competing interests.

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