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Neisseria gonorrhoeae Cases at AMC Muhammadiyah Hospital Indonesia: The Importance of Screening and Health Service Improvement to Prevent its Transmission and Complications

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Abstract

BACKGROUND: Gonorrhoeae is a type of sexually transmitted disease (STD) caused by the Neisseria gonorrhoeae (NG) bacteria. It is a commonly reported bacterial STD with rising cases in men and women in Indonesia. Gonorrhoeae is commonly asymptomatic. Therefore, the disease is often left undiagnosed, untreated, and causes further complications.

AIM: This study aims to describe the incidence and distribution of gonorrhoeae in AMC Muhammadiyah Hospital, Yogyakarta, Indonesia. The importance of screening and health service improvement toward preventing transmission and complications are also discussed.

METHODS: It is a descriptive observational study and aims to identify the percentage of NG in patients with clinical symptoms of STDs. The non-randomized sampling technique was used with 710 respondents. The inclusion criteria were women aged 15-44 years with STD symptoms who underwent vaginal smear examinations for NG, Bacterial Vaginosis (BV), yeast cells-pseudohyphae Candida sp, and were willing to be respondents. The exclusion criteria were women with STDs and HIV. Microscopic characteristics of NG were examined by Gram staining the vaginal swab samples from the respondents.

RESULTS: It was found that 623 (87.7%) out of 710 respondents had NG with clinical symptoms of leukorrhea and itchiness. The vaginal smear results also found bacterial vaginosis and candidiasis.

CONCLUSIONS: Screening and health facilities providing STI-related services are essential to prevent the transmission of gonorrhoeae and reduce the high incidence and severity of gonorrhoeae in reproductive health.

Introduction

Sexually transmitted diseases (STDs) have been among the most common infectious diseases and the leading cause of poor pregnancy outcomes in Indonesia for two decades (1990–2019) [1]. The most common types of reported STD cases in females per 100,000 adults include genital ulcer disease (9.8) and syphilis (4.2, 3.2, and 3.3 for adult females, pregnant women, and female workers, respectively) [2], [3].

Gonorrhoeae is a commonly reported bacterial STD that has recently risen in many countries [4], including Indonesia [5]. Based on data from the Asri Medical Centre (AMC) Muhammadiyah Hospital, the rate of infected patients by *Neisseria gonorrhoeae* (NG) has increased by 47% in the past 4 years, from 148 patients in 2017, and increasing every year to 155, 232, and 314 patients in 2018, 2019, and 2020, respectively. It indicates an increasing trend of NG cases every year in AMC Muhammadiyah Hospital, which does not support the WHO's target of reducing the incidence of gonorrhoeae globally by 90% by 2030 [6].

In relation to that, Yogyakarta is one of the three major cities in Indonesia (besides Jakarta and Bali), with a high prevalence of asymptomatic urogenital gonorrhoeae (23.9%) [5]. The incubation period, that is, the period between exposure to the bacteria until the symptoms of gonorrhoeae develop, varies and may be difficult to determine as it is usually asymptomatic [7], [8]. Women are more likely to be asymptomatic than men as more than 50% of women infected with NG have asymptomatic gonococcal infections [9], [10]. The absence of symptoms, such as vaginal or urethral discharge, genital ulcer, and abdominal pain [8], results in undiagnosed and untreated infections [7], which could further lead to serious complications such as

ectopic pregnancy, epididymitis, and infertility [11]. Given the largely asymptomatic nature of the infection, close observation through screening and re-testing for patients with a history of gonorrhoeae is recommended for high-risk populations to reduce transmission and prevent complications [11]. Moreover, a continuous effort through improving health services that provide STD examinations is also vital for gonorrhoeae prevention and treatment [8].

Based on the background, this study aims to describe the incidence and distribution of gonorrhoeae in AMC Muhammadiyah Hospital, Yogyakarta, Indonesia. It also aims to highlight the importance of improving screening and health services to reduce the incidence and severity of gonorrhoeae.

Methods

This study is a descriptive observational study. As much as, 710 of 721 patients with gonorrhoeae were nonrandomly collated through a total sampling design – 11 patients were excluded due to incomplete data. The inclusion criteria of the respondents were: women with STD symptoms; aged between 15 and 44 years old; women who underwent vaginal smear examinations for NG, Bacterial Vaginosis (BV), and yeast cells-pseudohyphae Candida sp; and women who were willing to be the study's respondents. The exclusion criteria were women with STDs and HIV. Microscopic characteristics of NG were intracellular diplococci negative grams. These characteristics were determined by gram staining vaginal swab samples taken at the Sexually Transmitted Disease Clinic at AMC Muhammadiyah Hospital, Yogyakarta, Indonesia, from April 1, 2019, to June 1, 2021. At the same time, the examination of samples and slide observations was conducted at the AMC Clinical Laboratory. AMC Muhammadiyah Hospital is one of the numerous reproductive health services in Yogyakarta, Indonesia, and is equipped to conduct reproductive examinations, screening checks, and counseling for STDs.

Furthermore, the tools and materials used in this research included a microscope (Leica DM500), glass objects (Slides), disposable vaginal speculums (One-Med Vagion), swab specimen collection tubes (AM-Med), sterile NaCl 0.9% (Merck, 99%), Gentian Violet (STReagensia), Lugol (ST-Reagentia), Ethanol 96% (Merck, 95%), Fuchsin (ST-Reagentia), and oil immersion (Agritech). The vaginal swab samples were collected by a sterile cotton swab. The swab samples were then spread on individual glass slides. The smears were then air-dried before staining. The Gram staining process was as follows: (1) The slide with the vaginal smear was covered with crystal violet solution and left to stand for 30 s; (2) the stain was then washed off gently with flowing water for 5 s, and the excess water was shaken off (gently dripping tap water could also be done); (3) the slide was then covered with Gram's iodine solution for 1 min and then washed with water as in step 2, and the excess water was shaken off; and (4) the slide was the decolorized by tilting the slide slightly and slowly dropping decolorizing solution above the smear on the slide, allowing it to run down across the smear. This step was conducted until the purple color ceased to flow away from the smear. The slide was later washed with water as in step 4 for 5 s, and the excess water was shaken off; (5) the slide was then covered with the counterstain for 30 s; and (6) washed with water as in step 2, and the excess water was shaken off. The slide was then allowed to air dry. The smears would then be ready to examine under oil immersion (1000×). To determine the intracellular diplococci negative gram bacteria as NG, negative and positive coccobacilli bacteria with clue cells as bacterial *vaginosis* bacteria suspect, and yeast cells and pseudohyphae as *Candida* spp. were used.

Furthermore, ethical approval was obtained from the University of Muhammadiyah Yogyakarta, Health Research Ethics Committee Number.165/EC-KEPK FKIK UMY/VII/2019. This study also obtained ethical approval from AMC Muhammadiyah Hospital Number.218/AII-1/AMC/IV/2019.

Results

The examination results can be seen in the tables and Figures 1 and 2.

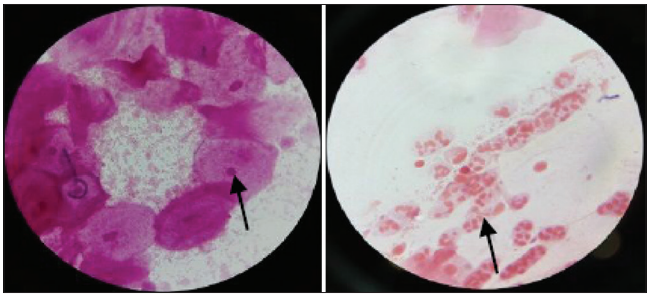

Figure 1: Neisseria gonorrhoeae appears as intracellular diplococcus (×1000)

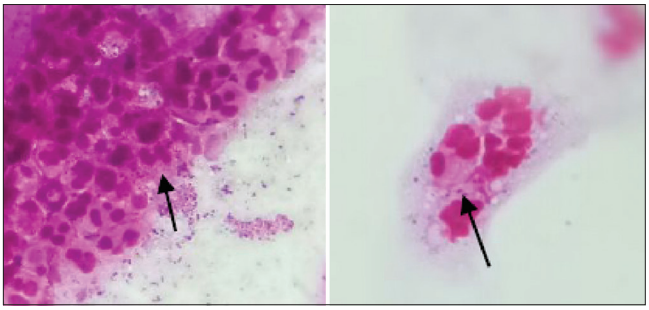

Figure 2: Neisseria gonorrhoeae appears as intracellular and extracellular diplococcus (×1000)

Table 1 shows that 606 of 710 patients (85.4%) were identified as positive with NG. The results also showed that the rate of gonorrhoeae cases was high among adolescents aged 20–24 years.

Table 1: Test results for gonorrhoeae status and age of patients

Variable	Total cases (n = 710)	n (%)
Gonorrhoeae		
Positive	623	87.7
Negative	87	12.3
Total	710	100.0
Age group		
15–19	1	0.1
20–24	606	85.4
25–29	80	11.3
30–34	19	2.7
35–39	2	0.3
40–44	2	0.3
Total	710	100.0

Table 2 exhibits the data of signs and symptoms experienced by patients with positive results of gonorrhoeae (n = 623). As much as, 97.9% (n = 610) and 67.6% (n = 421) of patients reported experiencing leukorrhea and itchiness, respectively. Meanwhile, most patients reported having no genital pain (82.3% or n = 513). Moreover, the microscopic examination of the vaginal smear gram stain found that most patients acquired bacterial vaginosis (76.1%), while 48.3% had candidiasis.

Table 2: Signs and symptoms of positive gonorrhoea patients

Variable	Total cases (N = 623)	n (%)
Leukorrhea		
Positive	610	97.9
Negative	13	2.1
Total	623	100.0
Painful intercourse		
Yes	110	17.7
No	513	82.3
Total	623	100.0
Itchiness around vagina		
Yes	421	67.6
No	202	32.4
Total	623	100.0
Bacterial vaginosis (BV)		
Yes	474	76.1
No	149	23.9
Total	623	100.0
Candidiasis		
Yes	301	48.3
No	322	51.7
Total	623	100.0

The microscopic Gram stain of vaginal discharge swab showed intracellulare diplococci negative gram, epithel cell <10/LP, PMN cell <10/LP.

The microscopic Gram stain of vaginal discharge swab showed intracellulare diplococci negative gram, epithel cell <10/LP, PMN cell <10/LP, magnification 10 × 100.

Discussion

Sexually transmitted disease (STD) is a variety of clinical syndromes and infections caused by bacteria, viruses, or parasites commonly acquired and transmitted through unprotected sexual activity [12]. Gonorrhoeae is a curable STD caused by infection with the *Neisseria gonorrhoeae* (NG) bacterium [8]. The disease is diagnosed by finding the intracellular Gram-negative bacterium diplococcus [13] presented in the endocervical mucus through microbiological examination. This diplococcus bacterium indicates that a pathogen infection has occurred, as it is not a member of the normal vaginal flora [14]. NG infection mainly attacks the urogenital tract in men and women but can also be from oro-genital and ano-genital sexual contact as the bacterium can also infect both the mucous membranes of the reproductive tract and other mucosal surfaces of the mouth, throat, eyes, rectum [15] and can spread to the joints (although it is rare) [9].

According to the results, this study found that the adolescent group dominates the positive cases. Patients that tested positive with gonorrhea have prominent clinical symptoms of leukorrhea and itchiness. The vaginal smear results also found bacterial vaginosis and candidiasis. Meanwhile, patients that tested negative with gonorrhoeae had more complaints of painful intercourse and the incidence of candidiasis, which is also one of the main causes of STDs in Indonesia [15]. The diagnosis of gonorrhoeae can be made on the basis of history, physical examination, and laboratory examination. Laboratory diagnostics include microscopic examination using Gram staining of sampling from endocervical swabs in women. A positive result will appear in Gram-negative diplococci. Positive staining in women has a sensitivity of 30–50% and a specificity of 90-99% [15], [16], [17].

Gonorrhoeae often occurs in the reproductive age group between 20 and 24 years due to the intense sexual activity of this age group [16], [18]. It is in line with the CDC's (2018) findings as they reported that the highest gonorrhoeae case rates are among adolescents (aged 20-24 years), at 713.0 per 100,000 population [16]. It may be due to their inadequate sex education knowledge and inappropriate sexual and social behaviors that may place adolescents at risk for contracting STDs [18]. Other possible reasons for why adolescents have a higher risk for contracting STDs include the fact that the body of young women is biologically more prone to STDs, hesitation to talk with health professionals about their sex life, having multiple sex partners, and lack of access to STD screening or tests due to lack of recommendations or parental consent [19], [20]. These reasons can lead to missing important infection screening steps. For example, a cross-sectional analysis study conducted by Drinkard (2017) showed that the case positivity rate for NG increased from 0.7% (urogenital-only screening) to 3.3% (risk-prompted extragenital screening) after the participants (male college students) self-reported their risky sexual behavior – 63.2% of NG infections would have been missed if only urogenital screening had been conducted [17]. Therefore, for STD prevention, comprehensive screening [11] in combination with standardized laboratory examinations is vital [21].

Furthermore, unresolved gonorrhoeae can lead to high transmission [14], [15] and can be a leading indirect cause of maternal mortality [1]. In men, gonorrhoeae generally causes acute urethritis, while in women; it causes cervicitis [11], which is commonly asymptomatic at the initial infection stage [4], [5]. Most STDs are well known to be asymptomatic [6], although symptoms such as excessive purulent discharge, dysuria, genital and perianal ulcers, regional lymphadenopathy, skin rash, or pain with defecation or during intercourse may occur [4], [12]. In this study, almost all patients have experienced leukorrhea and have admitted to experiencing itchiness around the vagina. Moreover, this study's microscopic examination of vaginal smear Gram stains showed that most patients had acquired bacterial vaginosis.

Given that the nature of the infection is usually asymptomatic, early detection in high-risk groups is essential to prevent the transmission and severity of the disease [11]. Kirkclady (2019) reported that most of the symptoms had only been detected when screening, particularly for rectal, pharyngeal, and cervical infections [4]. Pillay (2021) defined screening as a systematic test that is offered to detect infections in asymptomatic patients who are not purposively seeking care for symptoms [11]. To reduce transmission, screening should target individuals who are at increased risk of infection, that is, commercial sex workers (CSW), homosexuals, transgender persons, and bisexual individuals [5], especially among those who do not use condoms [16]. It is conducted as screening the general population is considered ineffective because it may increase false positives and lead to psychosocial harm such as anxiety and stigmatization [11].

The prevalence of gonorrhoeae cervicitis among individuals with high-risk sexual behavior is very high, especially in sex workers. Given that Yogyakarta is considered the center of tourism in central Indonesia, it has also been found to have many sex workers [5] from other regions [22]. Sex workers can be a transmission source to the public through their consumers [23]. According to data from the National Commission for Child Protection, there are around 300,000 female commercial sex workers (CSWs) throughout Indonesia, of which around 70,000 are children under the age of 18 [24]. This large number of female sex workers is at risk for acquiring STDs [5] and could lead to a higher prevalence of gonorrhoeae in the population, resulting in additional asymptomatic cases and contributing to further disease transmission [3].

Another group that needs to be screened is pregnant women, as the effect of NG can be fatal for mothers and babies. Ryan (2021) mentioned that 22.8% of maternal deaths in Indonesia were due to indirect causes, with one of the leading causes being infectious and parasitic diseases [1]. Screening may also be beneficial if performed on women who complain of their vaginal discharge as they are more likely to confuse symptoms of STDs. Moreover, they cannot also differentiate symptoms from normal discharge [25], even though complaints of profuse vaginal discharge, especially with discharging pus, may be a symptom of NG infection [4].

Screening should also be associated with follow-up treatment and partner notification, as well as possible retesting for reinfection and counseling on future STI prevention [11]. However, people seeking screening have faced many problems, including limited resources, poor service quality, stigmatization, and interrupted sexual partner follow-up [8]. In many low-income and middle-income countries (LMIC), including Indonesia, screening for asymptomatic infections is mostly unavailable in primary health services [26]. Women generally seek treatment when complications have occurred and after they were diagnosed during an antenatal examination or family planning examination [16], [27]. The WHO (2014) mentioned that LMICs should rely on syndromic management to identify high-risk groups and recognize symptoms to guide treatment [8]. It is recommended for LMICs due to its simplicity, rapid measurement (same-day treatment), and inexpensive and available diagnostic tests [8].

Screening can also focus more on opportunistic screening at visits to health services or other health care sites, including school-based health centers, STI clinics, pharmacies [11] or public health centers [28]. Moreover, as many Indonesians live in remote and very remote areas that have limited geographical access to health services [29], screening can also be focused on remote societies through outreach programs in non-health community settings such as schools, sex venues, ambulances [11] or CFHC programs (a program that focuses on reproductive health-related problems for families and communities supervised by a local community health service) [28]. The other barrier to seeking screening is stigmatization, as many people perceive it is embarrassing to contract an STD since it is often associated with deviant sexual behavior [30]. Moreover, the need to inform recent and current partners is also another barrier and has become one of the most fear-inducing consequences of being diagnosed with STDs [30].

In this case, a holistic approach is needed to encourage people to go for screening to suppress the spread of STDs, including targeting individual, structural, and social levels [30]. The individual level involves personal beliefs about STDs [30]. This level can be influenced by educating the public on specific information related to STDs and testing procedures. People can also be actively engaged in the learning process through peer group sessions [28]. Therefore, health-care providers occupy an important position in delivering reliable information and as counselors regarding STD topics [28]. In this case, policymakers need to provide free access to health services that offer comprehensive information and free STI tests. It

has been proven to improve knowledge [28], reduce screening barriers, and further influence healthcare-seeking behaviors [30].

Conclusion

Most patients who conducted a gonorrhoeae test in the AMC Muhammadiyah Hospital Indonesia were identified as positive for *Neisseria gonorrhoeae*. As gonorrhoeae is usually asymptomatic, early detection in high-risk groups, particularly in low-income and middle-income countries, must be conducted. Furthermore, health care providers and policymakers need to provide easy and free access to screening services. It is also recommended that AMC Muhammadiyah Hospital conduct ongoing examinations, treatment stages, and counseling about STDs prevention.

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