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World Journal of Clinical Pediatrics (*World J Clin Pediatr*, *WJCP*, online ISSN 2219-2808, DOI: 10.5409) is a peer-reviewed open access academic journal that aims to guide clinical practice and improve diagnostic and therapeutic skills of clinicians.

WJCP covers a variety of clinical medical topics, including fetal diseases, inborn, newborn diseases, infant diseases, genetic diseases, diagnostic imaging, endoscopy, and evidence-based medicine and epidemiology. Priority publication will be given to articles concerning diagnosis and treatment of pediatric diseases. The following aspects are covered: Clinical diagnosis, laboratory diagnosis, differential diagnosis, imaging tests, pathological diagnosis, molecular biological diagnosis, immunological diagnosis, genetic diagnosis, functional diagnostics, and physical diagnosis; and comprehensive therapy, drug therapy, surgical therapy, interventional treatment, minimally invasive therapy, and robot-assisted therapy.

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Prospective Study

Screening for asymptomatic chlamydia and gonorrhea in adolescent males in an urban pediatric emergency department

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Abstract

AIM

To determine the prevalence of *Chlamydia trachomatis* (CT) and *Neisseria gonorrhea* (GC) in young men seeking care in the emergency department (ED) for non-sexually transmitted infection (STI) related symptoms.

METHODS

This was a prospective, cross-sectional study in an urban ED. The main outcome was the rate of positive CT and GC on urine nucleic acid amplification testing in males aged 16-21 presenting with non-STI related complaints.

RESULTS

Two hundred and eighty-four patients were enrolled, 271 were included in the final data analysis [age range 16-21, median: 18 (quartiles 16-18, 19-21)]. Overall, 17 (6.3%, 95%CI: 4%-10%) tested positive for CT and 0% (95%CI: 0%-2%) were found to have GC. The proportion of sexually active subjects was 71% (95%CI: 65%-76%) and 2% (95%CI: 0.6%-4%) reported sex with men. Previous STI testing was reported in 46% (95%CI: 43%-54%) and 13% (95%CI: 8%-20%) of those patients previously tested had a history of STI. Of the patients who tested positive for CT in the ED, 88% (95%CI: 64%-98%) were successfully followed up.

CONCLUSION

The prevalence of CT infection found by screening

was 6.3%. Screening and follow-up from the ED was successful. The findings justify routine STI screening in male adolescents presenting to the ED with non-STI related complaints.

Key words: Chlamydia; Gonorrhea; Adolescent; Public health; Emergency department; Pediatric

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Core tip: Chlamydia trachomatis and Neisseria gonorrhea are the most common bacterial sexually transmitted infections (STIs), the sequelae of which are among the most costly of any STI except human immunodeficiency virus infection and acquired immune deficiency syndrome. Disease is often asymptomatic in young males, for whom there is a lack of consensus on screening recommendations and who are screened less often than women. Most studies on emergency department screening focus on young females, or group both asymptomatic and symptomatic patients together. We found 6.3% prevalence of asymptomatic Chlamydia by screening adolescent males who were not seeking screening and would likely not otherwise have been tested.

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INTRODUCTION

Chlamydia trachomatis (CT) and *Neisseria gonorrhea* (GC) are the most common bacterial sexually transmitted infections (STIs) among sexually active adolescents^[1]. The sequelae of untreated disease such as ectopic pregnancy and pelvic inflammatory disease are among the most costly of any STI except human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS)^[2,3]. Risk factors for these diseases include age less than 25, low socioeconomic status, lack of health insurance, African American, high-risk behaviors such as multiple partners, older sex partners for females, alcohol use and lack of condom use^[4-7].

Current CDC recommendations do not include screening asymptomatic adolescent males for STIs, focusing instead on sexually active women, men who have sex with men, drug users and prisoners^[8]. Their rationale for not regularly screening asymptomatic males is that there are little to no reproductive consequences for patients with asymptomatic disease and therefore no substantial secondary prevention is gained. However, many

infectious disease specialists argue that by screening young men the burden of disease among young women (and subsequent reproductive and infectious consequences) can be significantly decreased.

Studies on the prevalence of Chlamydia and Gonorrhea among adolescents largely include males and females, with emergency department (ED) screening studies reporting rates from 4%-14%^[1,2,9,10]. Rates are generally reported as higher in females. The lower rate of both Chlamydia and Gonorrhea reported in males is likely due to lower testing rates^[11]. Males are tested less often than women in part because they are less likely to have symptoms and also because until recently, the only available method of testing was a painful and invasive urethral swab. With the advent of urine RNA amplification tests, there now exists a non-invasive, inexpensive, highly sensitive and specific screening method^[12,13]. While many studies focus on screening females and symptomatic patients in the ED setting, and some focus on screening asymptomatic adult males and females, none that we found focused solely on males seeking care for non-genitourinary (GU) complaints^[14,15].

MATERIALS AND METHODS

We performed a prospective, cross-sectional study of adolescent males age 16-21 who presented to either the pediatric ED or the adult fast track area at Kings County Hospital Center, Brooklyn, NY from October 2013 to May of 2015. The State University of New York Downstate institutional review board approved the study protocol.

Enrollment

Only male patients were enrolled by a health care provider or research assistant (to be referred to as "recruiter"). All recruiters were trained in enrollment, informed consent and urine Nucleic Acid Amplification Testing (NAAT) specimen collection.

A recruiter other than the physician primarily responsible for the patient approached subjects during their evaluation and invited them to participate in the study. Patients under 16 or over 21 years of age, those with a chief complaint involving GU symptoms, or Emergency Severity Index score 1-3 (higher acuity) were excluded. While we considered including younger teenagers (age 13 and above) this was not allowed by our institutional review board (IRB) due to concerns that parents of these patients would find the suggestion of sexual activity in this age inappropriate. If a patient agreed to participate, written informed consent was obtained from the subject and their parent or guardian if under 18. In accordance with our IRB's requirements and New York State law, parents were informed of the nature of the study, but not involved in follow up or informed of results. In other words, they consented to allow their son to receive information about test results and follow up for treatment independently. Results were

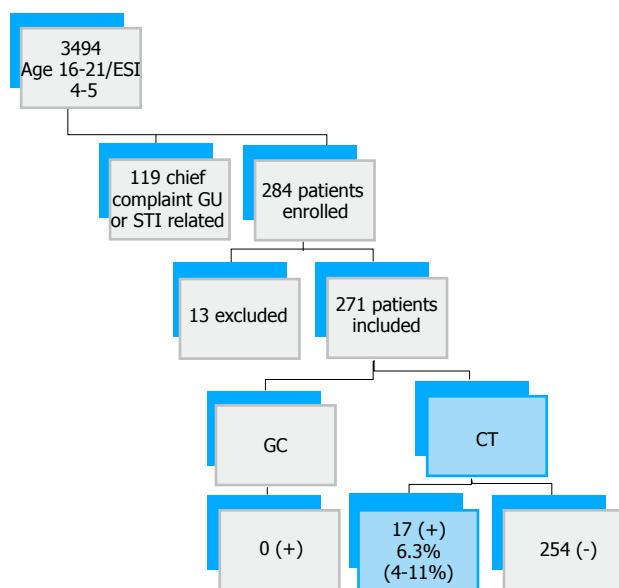


Figure 1 Patient recruitment and results summary. GC: *Neisseria gonorrhea*; CT: *Chlamydia trachomatis*; STI: Sexually transmitted infection; GU: Genitourinary.

part of the permanent medical record, but patients were not billed for the testing.

Data collection

Once enrolled and consented to participate in the study, parents/guardians or others present were asked to leave the room. A verbal survey was administered by the recruiter collecting data on age, race, chief reason for visit, follow up contact information, current GU symptoms, previous sexual activity, previous STI testing results and treatment, and history of primary care visits. All questions were asked in laymen's terms and the answers were recorded in writing by the recruiter. Next, an early stream "dirty catch" specimen was collected and sent for CT and GC testing using urine NAAT testing (gen-probe®). The test is 98.9% sensitive and 97.4% specific for CT in male urine samples. The coefficient of variation is 7.8%^[16].

The ED staff reviewed urine NAAT results as per hospital protocol as soon as results became available (usually within 48-72 h) and patients were contacted at confidential phone numbers provided and treatment arranged if the results were positive. As per hospital protocol, if patients were not contacted successfully by phone after 3 attempts, a telegram was sent to the patient's address, prompting them to contact the ED for test results.

Statistical analysis

Sample size estimate: Based on previous studies and available public health data we anticipated a positive STI rate of 7%. We calculated a sample size goal of 300 to obtain a prevalence of 7% with a 95%CI between 4% and 10%.

Data analysis

The main outcome was the proportion of positive tests

Table 1 Participant characteristics

Characteristic	n (%)
Chief complaint	
Minor trauma	129 (48)
Acute illness	100 (35)
Other	40 (14)
Age	
16-18	208 (73)
19-21	62 (22)
Ethnicity	
Black	230 (81)
Latino	21 (7)
Asian/Indian	5 (2)
White	3 (1)
Other	11 (4)
Sexual activity	202 (71)
Sex with men	5 (2)
Previous STI test	131 (46)
Previous STI	17 (6)
Regular PMD	201 (7)

STI: Sexually transmitted infection.

for either CT or GC. Data are presented as medians with quartiles for continuous variables and as percentages with 95%CI for proportions. Descriptive statistics are used to report additional variables. When applicable, a Fisher exact test was used to report associations. Data analysis was performed using IBM SPSS Statistics for Windows, Version 20.0.

RESULTS

During our study recruitment period a total of 3494 males between age 16 and 21 with ESI levels 4 and 5 presented to the pediatric ED and fast track areas combined. One hundred and nineteen of these patients presented with chief complaints of urinary symptoms, penile discharge, or need for STI testing. We recruited a total of 284 subjects, of whom 13 were not included in the final data analysis due to un-resulted samples (Figure 1). The vast majority of subjects were black (81%), and the majority (73%) were age 16-18 (Table 1 and Figures 2-4). Due to limitations in staffing and inconsistencies with initial data collection, we were unable to collect data on rates of declination for the entire study period of 19 mo. Over a sample period of 5 mo, 61% (95%CI: 51%-69%) of patients approached agreed to participate.

Prevalence

Six point three percent (95%CI: 4%-10%) of patients tested positive for CT and 0% tested positive for GC. Seventy-one percent (95%CI: 65%-76%) of patients reported being sexually active. Forty-six percent (95%CI: 43%-54%) reported previous STI testing and 13% of those reported having had an STI in the past. Of those who tested positive, none denied sexual activity. Of those who tested positive for CT in the ED, 88% (95%CI: 64%-98%) were successfully followed up. As expected, the prevalence of chlamydia was significantly

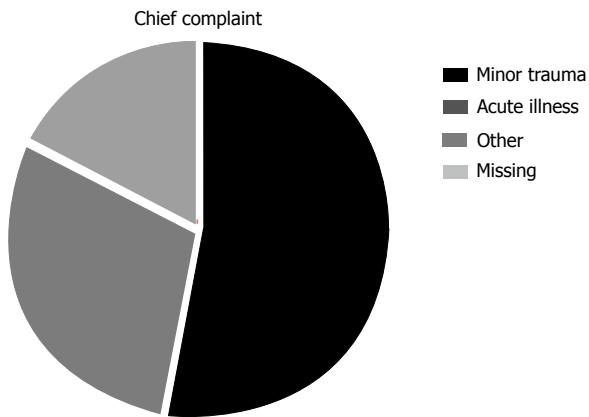


Figure 2 Chief complaint.

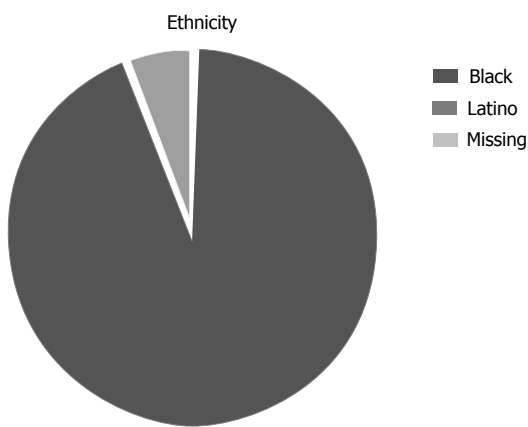


Figure 3 Ethnicity.

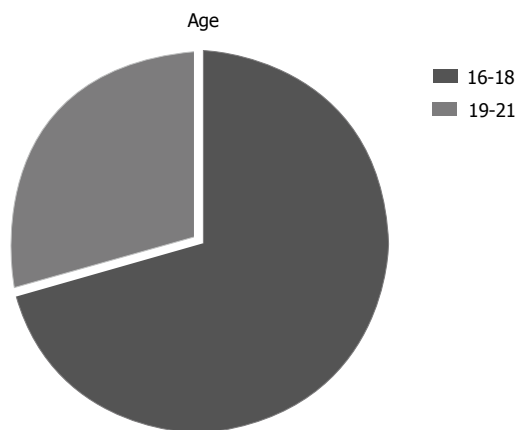


Figure 4 Age.

higher at 9% (95%CI: 5%-14%) in the subgroup of sexually active patients than in the overall group.

The only patient characteristics with statistically significant associations with positive Chlamydia NAAT were sexual activity and lack of regular primary care (Table 2). All of the patients who tested positive were either Black or Latino, therefore other races were not included in the results table. The proportion of sexually active subjects was significantly higher in the 19-21

Table 2 Results and significant associations with patient characteristics

	Chlamydia positive <i>n</i> = 17, <i>n</i> (%)	Chlamydia negative <i>n</i> = 271, <i>n</i> (%)	<i>P</i> values Fisher's exact test
Chief complaint			0.514
Minor trauma	9 (53)	120 (44)	
Acute illness	5 (29)	90 (35)	
Other	3 (15)	37 (14)	
Age			0.346
16-18	12 (71)	208 (77)	
19-21	5 (29)	57 (21)	
Ethnicity			1.00
Black	16 (94)	230 (85)	
Latino	1 (6)	20 (7)	
Sexual activity	17 (100)	172 (68)	0.008+
Sex with men (y)	0 (0)	5 (2)	1.00
Previous STI	11 (65)	114 (42)	0.467
test (y)			
Previous STI (y)	3 (18)	14 (5)	0.099
Regular PMD (y)	9 (53)	192 (70)	0.044+

STI: Sexually transmitted infection.

Table 3 Differences in rates of sexual activity by age

Sexual activity	<i>n</i> (%)
16-18	148 (71)
19-21	54 (87)

Sixteen percent of difference in sexual activity rates between 16-18 and 19-21 years old age groups (95%CI: 10%-25%), *P* = 0.012.

year age group than the 16-18 year age group (Table 3 and Figure 5).

DISCUSSION

We found a 6.3% prevalence of Chlamydia and 0% prevalence of Gonorrhea in male patients 16-21 years presenting to the ED for non-STI related complaints. Our study confirms that the burden of disease among sexually active male adolescents is high when compared with public health department estimates. The New York City (NYC) public health department estimates a CT rate of 1343 cases per 100000 men (1.34%) between age 15-19 and 1847 per 100000 in men (1.85%) between age 20 and 24. Gonorrhea rates are estimated to be lower at 319 per 100000 (0.3%) in the 15-19 age group and 567 per 100000 (0.6%) in the 20-24 age group. These are less than half the rates reported in females^[8,10,17]. The NYC Department of Health and Mental Hygiene (DOHMH) collects data on all positive tests and relies on reported cases. Additionally, they exclude cases where age or gender information is missing - which could account for the relatively low rates in comparison with our findings.

Our numbers are comparable to studies that focus on targeted screening of undifferentiated symptomatic

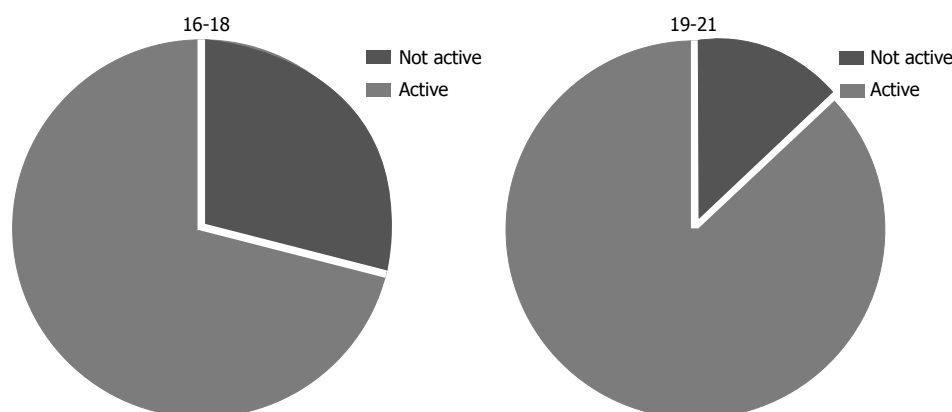


Figure 5 Differences in rates of sexual activity by age.

and asymptomatic male and female ED patients, which cite CT and GC rates in the young adult age group ranging from 4%-14%^[1,2,9,14,18].

These numbers indicate that the prevalence of disease in patients seeking care for reasons entirely unrelated to STI screening is significantly high. A sizeable number of patients with disease are likely being missed by not being screened. None of the patients in our study reported GU symptoms on initial presentation, and likely none would have been screened during their ED visit.

Many adolescents have no centralized primary care^[19]. They commonly seek health care only for non-preventive reasons, often in the ED setting, and males are even less likely to seek regular primary care than females^[20]. The acute care setting is ideal for screening adolescents who do not have regular primary care. Adolescents have been found to be responsive and agreeable to screening for STIs in the ED setting^[2,9,21-25]. However, in the current state there is a lack of consensus on whether the ED should provide routine preventive services^[26].

One of the challenges to stopping spread of CT is that infections are often asymptomatic in both males and females^[8,27,28]. Some studies report as many as 90% of infections in males being asymptomatic^[5,21]. Routine screening of all patients is therefore a crucial step in decreasing the burden of disease. The CDC currently recommends annual screening for all females, and biannual screening if high risk^[17]. Concise recommendations for males focus mostly on those who are incarcerated and those who have sex with men^[17]. We believe these recommendations are insufficient and lead to missed screening opportunities, contributing to spread of an easily treatable disease.

In addition to being feasible, screening efforts in the ED setting have been shown to be cost effective and to decrease the burden of disease^[29,30]. Opt-out screening in the ED setting using non-rapid technology in the setting of HIV has been shown to be feasible and effective^[31]. Given its success, we view opt-out screening as a potential model for how screening for other STIs such as CT and GC may be implemented.

There are several limitations to our study. Firstly, our sample size is relatively small due to lack of around the clock patient recruitment staff and relatively inconsistent recruitment efforts and training. Early in the study, the training of the enrollers was not as rigorous, and this likely lead to incomplete data collection (missing variables on several patients in Tables 1 and 2). We also did not collect comprehensive data on patients who declined. Over a 5 mo period, when data was collected on enrollment, we found that 39% of patients approached declined screening. We can only speculate that the IRB's requirement for parental consent contributed since it is higher than other similar studies on STD screening. We presume that younger patients may have not wanted to participate with their parents' knowledge and likewise some of these declinations could have been due to parental refusal to consent. Conversely, there could have been a selection bias; patients who agreed to participate could have been more likely to engage in risk-taking behavior or had unreported symptoms causing them to choose testing. Our patient population and thus our study sample was largely black and urban, which while consistent with studies of similar microorganisms in similar populations may not be generalizable to rural and more diverse populations in which other STIs we did not test for may be more prevalent^[1,2,9,14,18]. Lastly, the study was not powered to assess demographic and behavioral factors associated with having an STI, nor was it powered to assess feasibility, both of which are important ideas for future studies.

To our knowledge, our study is one of the only to date that focuses on targeting asymptomatic males for screening. Although the general prevalence was 6.3%, if the study were translated into an opt-out model for asymptomatic males, it would likely be closer to the 9% found in sexually active patients.

In conclusion, our results support the need for increased STI screening efforts in the acute care setting, particularly among asymptomatic sexually active young men. Increased screening and effective treatment has been shown to reduce both risk-taking behaviors^[32,33] and sequelae of disease^[2,34]. Young men

are well established as a vulnerable population who are likely to miss screening opportunities^[35]. Further studies should focus on expanded screening efforts including implementation of opt-out policies. Additionally, more comprehensive and demographic data on declination rates could help develop a targeted screening approach to maximize acceptance rates. Future studies should assess disease reduction as a result of new and improved screening interventions.

COMMENTS

Background

Chlamydia and Gonorrhea are the most common bacterial sexually transmitted infections. The sequelae of untreated disease include abscesses, chronic pelvic inflammation and infertility. Testing and treatment is inexpensive and easy. While screening practices in young women are well established, there is a paucity of concise screening recommendations in young men, in whom infection is often asymptomatic. The study investigates the prevalence of disease in asymptomatic young men being seen in the emergency department (ED) who would otherwise not have been screened.

Research frontiers

Adolescents are a generally healthy population and typically do not have regular primary care where most screening occurs. Particularly in poor communities, the ED is often the only place they are seen and evaluated by physicians and thus is an ideal setting for addressing public health issues.

Innovations and breakthroughs

Screening adolescents for sexually transmitted infections (STIs) in the ED setting has been well studied, however to our knowledge this is the only study focusing solely on young men who are both asymptomatic and presenting for low acuity issues, who might not otherwise have been screened.

Applications

Opt-out testing has been shown to be effective at achieving early diagnosis and treatment of HIV in sexually active adolescents and adults. By showing a significant burden of disease in asymptomatic patients who are not regularly screened in any other setting, they support the use of opt-out testing in the context of bacterial STIs as well as human immunodeficiency virus which could potentially significantly reduce spread of disease.

Terminology

The authors use the word screening to describe testing for a disease as a matter of routine rather than in response to symptomatology. The authors use the term adolescent to describe patients aged 16-21.

Peer-review

This is a very interesting paper.

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