

## RESEARCH ARTICLE

# Web-based chlamydia education for university students: A pilot project

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**Abstract**

**Aims:** Chlamydia disproportionately affects individuals aged 15–24 years. A lack of chlamydia knowledge in this high-risk group likely contributes to decreased testing, but interventions to increase chlamydia knowledge in this population are not well-described in the literature. The purpose of this pilot project was to increase chlamydia knowledge in a sample of university students using nurse-developed web-based education.

**Design:** A pre- and post-test design was used to evaluate participant knowledge of chlamydia before and after completing a nurse-developed web-based education intervention designed for university students.

**Methods:** Forty-seven undergraduate students at one U.S. university participated. A focus group and scientific evidence informed the development of the web-based education.

**Results:** Participants had a significant increase in chlamydia knowledge after completing the online educational intervention ( $M = 8.0$ ,  $SD = 0.000$ ) compared to baseline ( $M = 6.5$ ,  $SD = 1.5$ ),  $t(33) = -5.821$ ,  $p < .0001$ . Pilot results provide promising evidence that web-based nurse-developed education designed specifically for university students can increase chlamydia knowledge.

**KEYWORDS**

adolescent health, chlamydia, health education, nurses, sexual health promotion, university students, web-based education, young adults

## 1 | INTRODUCTION AND BACKGROUND

Sexually transmitted infections (STIs) are infections spread predominantly by sexual contact (World Health Organization [WHO], 2021). Some STIs, including chlamydia, can also be transmitted via the maternal-foetal route (WHO, 2021). The WHO estimates that, worldwide, over one million curable STIs are contracted daily, with chlamydia being among the most prevalent (2018). In the United States, chlamydia is the most commonly reported bacterial STI, with the highest rates being among adolescents and young adults (AYA)

aged 15–24 years – a population that includes many university students (Centers for Disease Control and Prevention [CDC], 2021a; Workowski et al., 2021). U.S. chlamydia rates continue to increase each year, with over 1.8 million cases reported in 2021 – an increase of 15% since 2015 (CDC, 2021b). Chlamydia is also among the most costly STIs in the United States (Owusu-Edsei et al., 2013).

Though some individuals with chlamydia may present with symptoms such as vaginal or urethral discharge, chlamydial infections are frequently asymptomatic, undiagnosed and untreated (CDC, 2021a, 2021b). Untreated chlamydial infections can result in serious

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complications, including pelvic inflammatory disease, ectopic pregnancy, chronic pelvic pain and infertility, and an increased risk of HIV transmission or acquisition (CDC, 2021a, 2021b; Workowski et al., 2021). Thus, early detection and treatment of chlamydia are crucial (CDC, 2021a).

Although chlamydia screening has increased in recent years, many at high risk, such as young adults aged 18–24 years who are often university students, are still not being tested (CDC, 2021b). A lack of chlamydia knowledge (Friedman & Bloodgood, 2010), the associated stigma (Booth et al., 2012) and misconceptions regarding risk (Hickey & Cleland, 2013) likely contribute to decreased test-seeking in this population. Even when AYA are aware of chlamydia and know it is a STI, they often lack sufficient knowledge of the disease and its significance (Keizur et al., 2021; Lorimer & Hart, 2010). University-aged individuals may not seek chlamydia testing because of a decreased risk perception regarding the disease and its acquisition (Keizur et al., 2021), including related lack of knowledge and disbelief about STI risk based on their type of sexual behaviour (i.e., only oral intercourse) (Downing-Matibag & Geisinger, 2009). Trust in a sexual partner also contributes to decreased STI risk perception (Masaro et al., 2008). Further, even after AYA are diagnosed with a STI, a discrepancy in perceived versus actual risk may persist (Hickey & Cleland, 2013).

Interventions to increase chlamydia knowledge targeted specifically for university-aged individuals may encourage increased testing and are needed (Denison et al., 2018; Keizur et al., 2021; Sagor et al., 2016). AYA, including university students, report insufficient sexual health education and a desire for more and better sexual health education (Denison et al., 2018; Lederer & Sheena, 2020; Normansell et al., 2016). International leaders in AYA health strongly endorse comprehensive sexuality education, with STIs being a key issue (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2018). Sexuality education has many positive effects, including increasing knowledge, but is lacking worldwide (UNESCO, 2018), and high chlamydia rates persist despite current efforts. Considering and incorporating the learning needs and preferences of AYA in the development of educational interventions targeting this population is key to effectively meet their needs and increase their knowledge (Holstrom, 2015; von Rosen et al., 2017). Interventions that normalize chlamydia screening, as well as increase awareness of the commonality of chlamydia, are important in this population (Booth et al., 2012; Denison et al., 2018). The use of simple and understandable language, a clear layout and a credible information source, such as a nurse, are also important for educational interventions targeting AYA (von Rosen et al., 2017).

The Internet is a common source of information for AYA, but accessing accurate and valid sexual health information may be challenging for this group, and inaccurate information may contribute to unhealthy sexual behaviour (von Rosen et al., 2017). Nurses and other trustworthy healthcare professionals should work to find effective ways to disseminate accurate and reliable sexual health information to AYA (von Rosen et al., 2017). Many AYA have access

## Impact

### What problem did the study address?

Reducing the proportion of adolescents and young adults with chlamydial infections is a global health priority, and inadequate chlamydia knowledge in this population likely contributes to decreased chlamydia testing. This pilot project provides preliminary results that web-based education designed specifically for university students can increase their knowledge of chlamydia. Future studies with larger and more diverse samples in a variety of health settings where adolescents and young adults seek care are needed to further evaluate the positive effects of this web-based education approach.

to smartphones or computers, so interventions that use web-based technologies are promising (Lederer & Sheena, 2020; Sagor et al., 2016; Shafii et al., 2014). Use of these technologies can address documented AYA barriers to STI knowledge and testing, including confidentiality and ease of access (Cuffe et al., 2016; Friedman & Bloodgood, 2010; Normansell et al., 2016). The persistent lack of sexual health and chlamydia knowledge among university-aged individuals suggests a need for new and creative strategies to provide sexual health education for this population (Denison et al., 2018; Lederer & Sheena, 2020).

To be effective, sexual health education for AYA should be designed to meet their learning needs and preferences (Holstrom, 2015; von Rosen et al., 2017), but there is a dearth of current web-based interventions in the existing literature that focus specifically on chlamydia and address the learning needs and preferences of AYA. Given the high rates of chlamydia worldwide and significant burden of disease among the university-aged population, new, creative and easily accessible educational interventions designed to meet the learning needs of this group on this topic are paramount (Keizur et al., 2021). The purpose of this pilot project was to extend the literature and increase chlamydia knowledge in a sample of university students using nurse-developed web-based education designed to incorporate and meet the learning needs of this population.

## 1.1 | Design

We used a pre/post-test design and aimed to increase chlamydia knowledge among undergraduate students through web-based education in the fall 2018 semester. The setting was a mid-size, private, co-educational, U.S. university. A convenience sample of students was recruited via flyers and emails. Undergraduate students aged 18–24 years were eligible. Participation was voluntary.

## 1.2 | Ethics

The university's Institutional Review Board approved this project as exempt research.

## 2 | METHODS

A focus group of upperclassmen was used to assess their chlamydia knowledge as freshmen and to gather information regarding their learning preferences. The goal of the focus group was to inform the development of the web-based education, so questions were limited to those regarding chlamydia knowledge and test-seeking behaviour, and learning needs and preferences, rather than actual sexual or testing experiences (See [Appendix S1](#)). The target population for the educational intervention was initially freshmen, as evidence suggests younger college-aged individuals are more likely to engage in risky sexual behaviour and have increased risk for chlamydia and PID (Downing-Matibag & Geisinger, 2009; Habel et al., 2016). An in-person focus group with two upperclassmen assembled on campus and used a semi-structured interview format with open-ended questions. Participants' self-selected pseudonyms and responses were recorded via typed notes. Students unable to participate in the focus group were offered an opportunity to independently complete an anonymous online survey using the same in-person focus group questions. The combined sample of in-person and online focus group participants consisted of two females and one male.

Focus group findings were discussed until all investigators reached consensus. The major themes that emerged from the focus group were the need for all students to receive chlamydia education (not just freshmen), a belief that participation would be higher with web-based education, and a lack of chlamydia knowledge among students. These findings were integrated into the educational intervention. Additionally, the educational intervention integrated CDC guidelines (2016), National Chlamydia Coalition information (2018) and studies of STI knowledge or testing in AYA (Sagor et al., 2016). The intervention included evidence-based information about chlamydia prevalence, risk, transmission, symptoms, complications, testing and treatment. Clinical experts established the content validity of the intervention and pre/post assessments.

The 20 minute web-based intervention consisted of: (a) evidence-based pre/post-intervention knowledge assessments (each 10 questions) that evaluated learning objectives and explored perceptions of testing barriers and facilitators (Booth, 2012; Sagor et al., 2016), and (b) replayable video education that included chlamydia disease information, testing resources and case scenarios. Pre- and post-session assessments evaluated the learning objectives and were adapted from those used by Sagor et al. (2016) and presented in a "Yes, No, Not Sure" format, where the correct answer was scored as 1, and the incorrect answer (including "Not Sure") was scored as 0. Two questions explored student perceptions of barriers and facilitators to chlamydia testing (Booth et al., 2012). The intervention and assessments were delivered online and easily accessed by participants

through an anonymous hyperlink or QR code on a smart device or computer. Focus group participants received a snack and intervention participants could enter a \$25 gift card raffle upon intervention completion.

## 2.1 | Data analysis

SPSS, version 25.0, was used for quantitative data analysis. Analysis included descriptive and inferential statistics. A  $p$ -value of  $<.05$  was considered statistically significant. A formal power analysis was not performed for this project as it was a pilot project. Overall change from in chlamydia knowledge before and after the intervention was evaluated with a paired  $t$ -test for continuous scores. A McNemar's test was planned to evaluate knowledge changes for individual items that were dichotomous.

## 3 | RESULTS

The sample size included 44 students ( $N = 44$ ). Ten (22.7%) completed only the pre-intervention assessment and were excluded from knowledge change analyses; 34 (77.2%) completed the pre- and post-intervention assessments. The mean age of participants was 20 years, and the majority identified as female.

Participants who completed the pre- and post-intervention assessments ( $n = 34$ ) had a significant post-intervention increase in chlamydia knowledge ( $M = 8.0$ ) compared to baseline ( $M = 6.5$ ),  $t(33) = -5.821$ ,  $p <.0001$ ). At baseline, participants had the least knowledge regarding chlamydia disease commonality, testing and treatment processes, presentation in men and potential complications (Table 1). The planned McNemar's test was not conducted as all participants ( $n = 34$ ) scored 100% on all items on the post-intervention assessment.

Most participants reported they would seek chlamydia testing if they were sexually active pre- ( $n = 34$ , 88.2%) and post-intervention ( $n = 34$ , 97.1%). Participant-identified facilitators for chlamydia testing included inexpensive or free testing, easy access and increased knowledge regarding STIs and testing recommendations.

## 4 | DISCUSSION

Similar to other studies that evaluated the feasibility, acceptance and/or effectiveness of computer-based education to increase chlamydia and/or sexual health knowledge among AYA (Sagor et al., 2016; Shafii et al., 2014), this pilot project provides evidence that web-based education for university students is a feasible and acceptable strategy for increasing chlamydia knowledge in this high-risk population. Further, our evidenced-based approach to involve students and incorporate their learning needs and preferences in our intervention, as recommended by the literature (Holstrom, 2015; von Rosen et al., 2017), resulted in nurse-developed web-based

TABLE 1 Pre- and post-intervention chlamydia knowledge assessment outcomes

Chlamydia knowledge content item answered correctly	Pre-intervention (n = 34)	Post-intervention (n = 34)	p-value (test performed)
Mean number of knowledge items out of 8 correct, mean (SD)	6.5 (1.5)	8.00 (.00)	t(33) = -5.821, p < .0001* (paired t-test)
Disease prevalence, % (n)	70.6 (24)	100.0 (34)	
High-risk populations, % (n)	94.1 (32)	100.0 (34)	
Presentation in women, % (n)	94.1 (32)	100.0 (34)	
Testing process, % (n)	76.5 (26)	100.0 (34)	
Transmission, % (n)	97.1 (33)	100.0 (34)	
Presentation in men, % (n)	76.5 (26)	100.0 (34)	
Potential complications, % (n)	79.4 (27)	100.0 (34)	
Treatment process, % (n)	76.5 (26)	100.0 (34)	

Abbreviation: SD, standard deviation.

\*p < .05.

education that was feasible and acceptable to this population, and increased chlamydia knowledge among the participants.

At baseline, participants in our project knew that chlamydia testing was important but lacked sufficient knowledge about the testing and treatment processes and the disease significance, which is similar to other research demonstrating that even if AYA are aware of chlamydia as a STI, they often lack sufficient knowledge of the disease (Keizur et al., 2021; Lorimer & Hart, 2010). Nurses caring for university students and other AYA should be aware of these chlamydia knowledge gaps and not assume that knowledge of the importance of chlamydia testing or awareness of chlamydia as a STI equates to adequate knowledge needed to reduce risk. Further, lack of knowledge was a commonly reported barrier to testing among our participants, even after completing the web-based education intervention, suggesting, in line with other research (Lederer & Sheena, 2020), that continued chlamydia education for college-aged individuals is needed.

Innovative, evidence-based online interventions that are easily accessible, confidential and aimed at increasing sexual health knowledge in AYA, such as this pilot, are important (Holstrom, 2015; Lederer & Sheena, 2020; von Rosen et al., 2017). Nurses must recognize the popularity of web technology among AYA and consider using these platforms for health education. Web-based education can also be effective for reaching AYA when face-to-face interventions are not possible, including during the current COVID-19 pandemic. This pilot intervention was inexpensive, easy to access, and could be effective in other settings where AYA seek care. Replication of this pilot with larger and more diverse samples would further evaluate and validate the effectiveness of this approach. Continued development of innovative technology-based education solutions for AYA, including evaluating the relationship between increased chlamydia knowledge and testing uptake, is warranted.

#### 4.1 | Limitations

Though this was a pilot project, the small sample size and lack of evaluating long-term chlamydia knowledge retention are limitations. Recruitment constraints imposed by the institution limited the ability to target all undergraduate students for participation and resulted in using a convenience sample. The institution aimed to protect participants from disclosing sensitive sexual health information, and assessing actual sexual behaviours was not possible. The reported hypothetical participant behaviour may not have reflected actual participant behaviour. Additionally, this pilot project did not evaluate the effects of increased knowledge or other factors (e.g., cost) on actual chlamydia testing uptake. Lastly, though the web-based education and pre- and post-assessments for this pilot project were derived from evidence and scientific studies, more work is needed to determine their reliability and validity for a larger and more diverse sample including a comparison group.

#### 5 | CONCLUSION

Reducing the proportion of AYA with chlamydia is a global health priority (WHO, 2018). Inadequate chlamydia knowledge among AYA likely contributes to decreased testing (Friedman & Bloodgood, 2010). Interventions that aim to increase chlamydia knowledge and incorporate learning needs and preferences of AYA that are feasible and acceptable are needed (Denison et al., 2018; Holstrom, 2015; Keizur et al., 2021; von Rosen et al., 2017). This pilot project provides preliminary results that nurse-developed web-based education designed specifically for university students can increase their chlamydia knowledge and is feasible and acceptable.

## AUTHOR CONTRIBUTIONS

NR, PS: Made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data. NR, PS, BS: Involved in drafting the manuscript or revising it critically for important intellectual content. Given final approval of the version to be published. NR, PS, BS: Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content. NR, PS, BS: Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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## CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

## DATA AVAILABILITY STATEMENT

Supportive de-identified data for this project are available from the authors upon a reasonable request for 5 years after publication.

## PATIENT CONSENT STATEMENT

No patient consent was needed for this project.

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## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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