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Original Study

Evaluating Attitudes Toward and Knowledge of Human Immunodeficiency Virus and Sexually Transmitted Infections in First-Year Medical Students

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Abstract

Background: Medical students have been shown to have knowledge deficiencies and stigmatizing attitudes that may compromise their care of patients with human immunodeficiency virus (HIV) and other sexually transmitted infections (STIs). Many medical schools now offer early exposure to patient care and encourage students to volunteer in free clinics where sexual health care is a common patient concern. In light of increased student involvement in patient care, we sought to characterize knowledge gaps and stigmatizing attitudes in first-year medical students in a major United States city.
Methods: We developed a survey instrument by integrating previously validated HIV and STI knowledge questionnaires. These multiple-choice questions tested concepts such as disease transmission, clinical testing modalities, and sexual health care practice standards. In addition, we created a 4-item Likert-type scale to determine student attitudes toward patients with HIV and STIs.
Results: A total of 459 medical students completed the questionnaire. The students were predominantly female (254; 55.3%), white (294; 64.1%), and Christian (241; 52.5%), with a mean age of 23.7 (standard deviation 2.45) years. The survey instrument demonstrated significant knowledge gaps in certain areas of HIV/STI testing and counseling, as well as a consistent minority of students who expressed discomfort examining or treating patients with HIV. Overall, 57.8% of the knowledge questions were answered correctly, and 14.3% of students (n=65) were not comfortable touching a patient with HIV.
Conclusions: These findings suggest that medical students possess knowledge gaps and stigmatizing attitudes, which could potentially impact patient care in the practice settings in which medical students provide sexual health care. Future research should focus on 3 approaches to overcoming deficiencies in knowledge and attitudes: (1) cultural sensitivity training, (2) targeted education modules, and (3) practical testing training.

Background

A thorough understanding of sexual health is essential to prepare preclinical medical students for clinical clerkships. Specific modules focused on the treatment and prevention of sexually transmitted infections (STIs) are becoming increasingly important as infection rates, especially with respect to human immunodeficiency virus (HIV), remain epidemic in certain parts of the United States.[1] Several reviews of existing medical school courses in sexual health found that students were allotted fewer than ten hours of sexual health training.[2] Prior studies assessing medical students' understanding of HIV and acquired immune deficiency syndrome (AIDS) have shown that general, preventive, and disease transmission knowledge was inconsistent or entirely lacking.[3-10] One study

identified deficiencies in knowledge regarding STIs and increased HIV transmission,[8] and another showed that preclinical students did not know HIV category B symptoms or AIDS indicator diseases.[7] While most of these investigations were conducted in Asian, European, and African medical schools, similar results were obtained in a study conducted at a Liaison Committee on Medical Education–accredited private medical school in the United States. The study reported significant knowledge deficiencies with respect to sexual health disparities in minority populations, perinatal risk of HIV infection, and central nervous system involvement with AIDS.[4] Other studies have revealed that knowledge of HIV post-exposure prophylaxis and hospital exposure is also lacking.[5,9]

However, there is evidence that students in their final clerkship years are able to compensate for deficiencies in preclinical education. While both first- and fourth-year students knew of the various screening tests available,[5] fourth-year students have demonstrated more accurate knowledge of HIV transmission routes.[9]

Although an overwhelming number of students demonstrated gaps in pertinent knowledge related to STIs, many of the same studies found that most students exhibited generally positive attitudes toward patients diagnosed with HIV and other STIs.[3,4,6-9] However, a consistent minority held stigmatizing attitudes toward these patients, ultimately influencing their willingness to treat, interact with, or examine patients with a known history of STIs.[3,4,6-9] Chew, et al. reported that stigmatizing attitudes toward HIV-positive patients were higher among preclinical compared to clinical students, however clinical students were more uncomfortable treating patients with HIV/AIDS compared to pre-clinical students.[3] Stigmatizing attitudes could sometimes extend beyond the medical setting. A minority of medical students felt strongly about imposed measures for HIV-positive patients (i.e., isolation and quarantine) and workplace restrictions for people with HIV.[6,9] In 2009, Popa et al. reported that most medical students (66%) supported compulsory HIV status disclosure at the workplace.[6]

Gaps in knowledge and stigmatizing attitudes diminish the quality of patient care that medical students deliver,[11] but there are ways to address this issue. Emerging changes to medical school curricula include preclinical modules that provide early patient exposure, and as many as 111 medical schools provide free student-run health care clinics for underserved populations.[12] Early adopters of new HIV education modules in the United Kingdom have already shown improvements in both knowledge and students' confidence to provide appropriate testing and screening.[13] Medical students may encounter patients with STIs during their preclinical involvement at student-run clinics and may need to conduct a diagnostic test or deliver a positive result, which are scenarios that can have a significant negative impact for patients if medical students' training is inadequate. Thus, the purpose of this study was to evaluate general and testing knowledge of HIV and STIs, assess attitudes toward patients with HIV and AIDS, and elucidate deficiencies in sexual health education among medical students in a United States (US) city where the prevalence of HIV and STIs is among the highest among US urban centers.[14]

Methods

Survey

The knowledge and attitude survey was developed by the co-investigators using questions from previously validated HIV- and STI-related questionnaires and other published source material.[4] Each participant was assigned a random identification number that was not linked to any personal identifiers. Students provided consent to participate at the time of survey administration and study data were collected from only those who consented to and completed the survey. This study was approved by the institutional review boards of two US medical schools prior to data collection.

The survey was self-administered during the fall semesters of 2014-2015 and 2015-2016 by first-year medical students at two US medicals schools. The survey collected data on demographic characteristics including age, gender (male, female, intersex, and transgender), race/ethnicity (black, white, and other), and religious affiliation (Christian, non-Christian, and none). The 30-question survey contained 4 demographic questions, 22 knowledge questions (Cronbach's alpha in our sample was 0.71), and 4 attitude questions (Cronbach's alpha in our sample was 0.62) (Appendix 1).

Single-choice questions about HIV and STI knowledge were awarded a full point if correctly answered; no partial credit was given. For "check all that apply" questions, full credit was awarded if all correct responses were selected. Partial credit was awarded if some, but not all, of the correct responses were selected and ranged from one-fourth to three-fourths of a point. No points were awarded for incorrect or skipped responses. The mean points awarded and standard deviation (SD) were calculated and plotted by question. The percentage of questions answered correctly on the knowledge assessment was calculated for each student and was our outcome of interest.

HIV/STI attitudes were assessed by Likert-type items using a 4-point scale (strongly agree, agree, disagree, and strongly disagree). Participants were asked to indicate their level of agreement with four attitude statements: (1) I would feel comfortable talking openly with patients about safer sex; (2) I would feel comfortable taking detailed sexual history from a patient; (3) I would feel comfortable physically touching patients with HIV infection; and (4) I would feel comfortable treating HIV-infected patients.

Statistical Analysis

The distributions of demographics and total knowledge score were generated using frequencies and means. Multivariate linear regression was conducted to assess the association of demographic characteristics and total survey score adjusted for age, gender, race/ethnicity, and religious affiliation. Students reporting transgender or intersex as gender were removed from analyses owing to the small number of respondents in these categories (n=4). Selection criterion for model fit was assessed by the R^2 value.

To assess gaps in HIV/STI knowledge, the overall percentage of correctly answered items across all knowledge questions was calculated with a 95% confidence interval (CI). Any question that fell below the lower confidence limit was identified as a "gap in knowledge." Further, we used a generalized linear mixed model to investigate the association of age, religion, race/ethnicity, and gender with the percentage of questions correctly answered.

Latent class analysis (LCA) is a method of identifying unobserved groups within a population using subjective measurements, rather than objective measurements. We sought to identify subgroups among medical students based on their attitudes about HIV/STIs. These attitudes were assessed using four statements with which students could strongly agree, agree, disagree, or strongly disagree. Prior to LCA, responses were dichotomized into strongly agree/agree and strongly disagree/disagree owing to low cell counts in one or more of the original response categories. The appropriate number of classes for the model was selected based on the bootstrap likelihood ratio test that compares the fit of one LCA model with k classes to an LCA model with k+1 classes. All analyses were performed using SAS (Version 9.4, SAS Institute).

Results

There were 459 medical students who completed the questionnaire. Students were predominantly female (254; 55.3%), white (294; 64.1%), and Christian (241; 52.5%), with a mean (SD) age of 23.7 (2.45) years. Participating students scored an average of 57.8% on the knowledge survey (Table 1).

There was no statistically significant association of age, gender, or religious affiliation with total knowledge score among the students. However, students who identified as "other race/ethnicity" had a 0.65-point decrease in the total knowledge score compared with white students (Table 2). There were no statistically significant differences between black and white students.

On average, students answered 57.8% (95% CI, 54.1%-61.5%) of the knowledge questions correctly. We identified 8 questions for which the percentage answered correctly fell below 54.1%, indicating a gap in knowledge (Figure 1). Most students (92.0%) answered question 14 ("Which of the following ways is HIV infection transmitted?") correctly, while question 17 ("Rank highest to lowest the following risks of HIV infection") presented the most challenge to students, with only 14.1% answering correctly (Table 3).

There were three latent classes identified among the students based on their responses to the four attitude statements. Most students

(77.9%; n=318) fell into class 1, which was characterized as being comfortable with talking openly with patients about safer sex, taking detailed sexual history, physically touching patients with HIV, and treating patients with HIV. Class 2 students (7.8%; n=32) were largely not comfortable with talking openly about safer sex or taking detailed sexual history, but they were comfortable with touching and treating patients with HIV. Class 3 students (14.3%; n=58) were comfortable with talking openly about safer sex, taking detailed sexual history, and treating patients with HIV, but they were not comfortable with physically touching patients with HIV (Table 4).

Discussion

In this study, we found that 57.8% of survey questions assessing knowledge of HIV/STIs were correctly answered by first-year medical students at two US private medical schools. While most students knew how HIV was transmitted, most could not correctly rank the risk of HIV infection posed

Table 1. Demographic Characteristics (n=459)

Characteristic	No. (%)
Age, Mean (SD), years	23.7 (2.45)
Gender	
Female	254 (55.3)
Male	201 (43.8)
Transgender	3 (0.7)
Intersex	1 (0.2)
Race/ethnicity	
White	294 (64.1)
Black	34 (7.4)
Other	131 (28.5)
Religion	
Christian	241 (52.5)
Non-Christian	162 (35.3)
None	56 (12.2)
Knowledge assessment, % answered correctly	57.8

Figure 1. Percentage of Questions Correctly Answered Among Medical Students

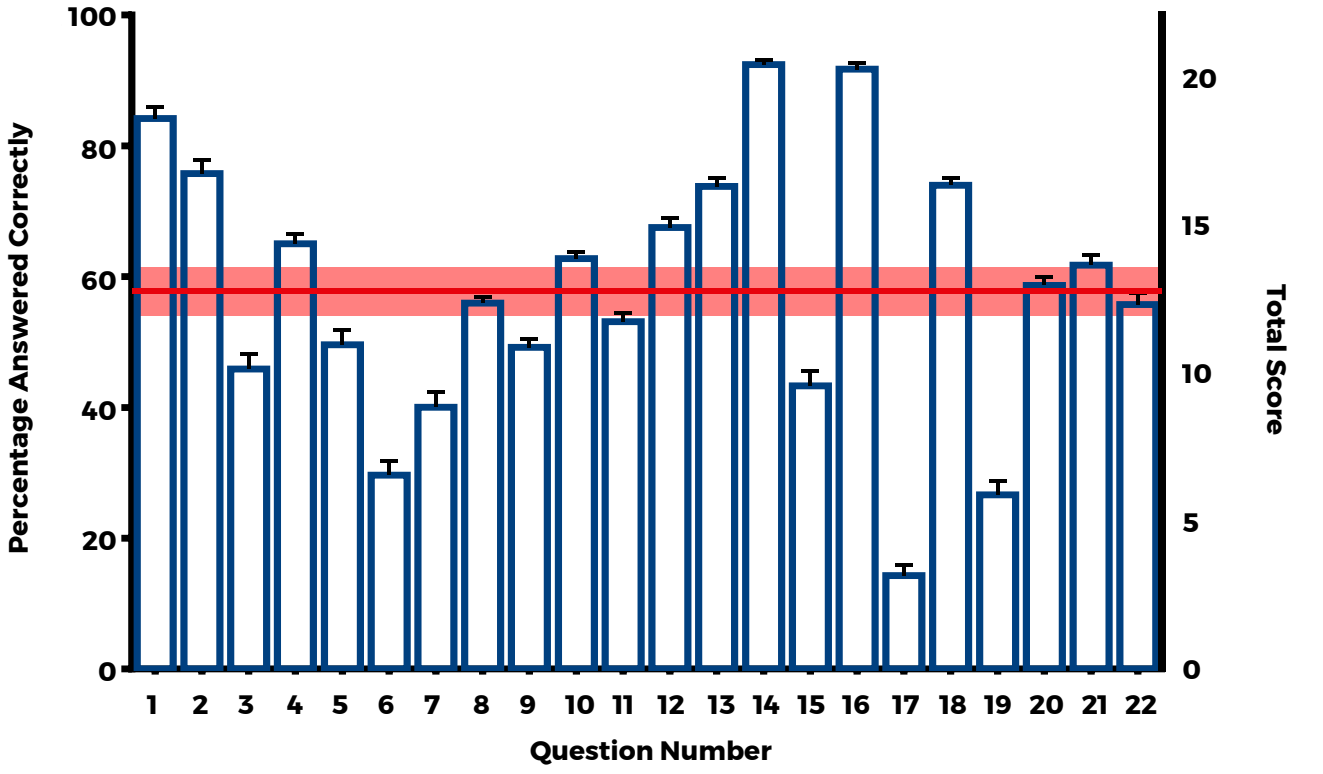

Table 2. Multivariate Linear Mixed Modeling of the Percentage of Questions Correctly Answered

Characteristic	Estimate	95% CI		Pr > |t|
Age (standardized)	-0.0379	-0.1449	0.0691	0.4867
Gender				
Female	-0.3590	-0.8880	0.1699	0.1829
Male	[Referent]	-	-	-
Religion				
Non-Christian	0.3888	-0.1990	0.9766	0.1942
None	0.2535	-0.5906	1.0975	0.5540
Christian	[Referent]	-	-	-
Race				
Black	0.0555	-0.9498	1.0607	0.9137
Other	-0.6535	-1.2529	-0.0542	0.0327
White	[Referent]	-	-	-

Table 3. Identified Gaps in HIV/STI Knowledge

Question No.	Question
4	For whom is PrEP recommended?
5	The most common STI is: (1) Chlamydia, (2) HPV, (3) HIV, or (4) Trichomonas.
6	Which of the following STIs is most commonly reported to the US CDC?
7	Which of the following best describes the clinical signs/symptoms of chlamydial infection in women?
8	Which are clinical features of syphilis?
15	Antiretroviral drugs are recommended for prevention of perinatal transmission of HIV for pregnant women with…
17	Rank from HIGHEST to LOWEST the following risks of HIV infection: I. A child born to a HIV+ mother taking antiviral medication treatment regimen. II. An African American male engaging in unprotected sex with a male. III. A health care worker injured via needle stick.
19	Please choose the best matches for the following testing procedures: A. Test(s) for HIV screening. B. Test(s) for quick screening. C. Test(s) for confirmation of HIV. D. Detecting HIV within 1 to 2 weeks of infection. 1) Western Blot test. 2) Enzyme immunoassay tests (i.e., ELISA). 3) Rapid HIV antibody test. 4) Antigen tests or polymerase chain reaction test detecting HIV viral RNA.

US CDC, United States Centers for Disease Control and Prevention; ELISA, enzyme-linked immunosorbent assay; HIV, human immunodeficiency virus; HPV, human papillomavirus; PrEP, preexposure prophylaxis; STI, sexually transmitted infection

Table 4. Class Membership and Item-Response Probability of HIV/STI Attitudes

Items and Responses	Class 1 (77.9%; n=318)	Class 2 (7.8%; n=32)	Class 3 (14.3%; n=58)
I would feel comfortable talking openly with patients about safer sex.			
Strongly agree/agree	0.9961	0.1190	0.9986
Strongly disagree/disagree	0.0039	0.8810	0.0014
I would feel comfortable taking detailed sexual history from a patient.			
Strongly agree/agree	0.9668	0.2504	0.8104
Strongly disagree/disagree	0.0332	0.7496	0.1896
I would feel comfortable physically touching patients with HIV infection.			
Strongly agree/agree	0.9940	0.5754	0.0637
Strongly disagree/disagree	0.0060	0.4246	0.9363
I would feel comfortable treating HIV infected patients.			
Strongly agree/agree	0.9723	0.7604	0.5681
Strongly disagree/disagree	0.0277	0.2396	0.4319

HIV, human immunodeficiency virus; STI, sexually transmitted infection

by different transmission routes. Other gaps included knowing the eligibility criteria for post-exposure prophylaxis and antiretroviral drugs for prevention of perinatal transmission of HIV in pregnant women, as well as which STIs are most common.

We also found that 14.3% of first-year medical students did not feel comfortable with touching patients with HIV. Similar findings of discomfort and stigma among medical students have been demonstrated in other studies.[3,4,6,8-10,13]

The current study is limited in its relatively small sample size of 459 first-year medical students who completed the questionnaire in 2014 and 2015. The students were predominantly female (55.3%), white (64.1%), and Christian (52.5%), which may not fully represent the entire cohort of medical students in the US city in which this study was conducted. There is also possible regional bias in selecting medical students from schools in the selected city, as they may not represent medical students across the United States.

Medical education has shifted in recent years, emphasizing early clinical exposure and community-based outreach efforts that provide clinical services to the underserved while providing an opportunity for early clinical education. The research by Butala and colleagues[12,15] has been instrumental in highlighting where such clinics can improve, specifically with respect to screening tests and guidelines-based primary care. But what has not been specifically addressed is how student-run clinics associated with US medical schools can improve patient care with respect to sexual health education.

We feel strongly that a 3-pronged approach should be used to overcome deficiencies in knowledge and attitudes. This initiative can be implemented in medical schools whose students are working in clinics that deliver sexual health services. Specifically, we recommend cultural sensitivity training, targeted education modules, and practical testing training. For example, we are creating a pre- and post- knowledge and attitude web-based video training tool that can be completed by first year medical students as part of the certification process for working in a student-run clinic.

Online courses in cultural sensitivity are available through the US Centers for Disease Control and Prevention and are funded with the specific intent of decreasing stigma in the health care setting.[16] The Centers for Disease Control and Prevention has also funded development of a focused STI health curriculum, packaged as online modules developed by the University of Washington and University of California, San Francisco.[17,18] These modules were developed with particular focus on training health care workers, including nurses, physicians, and medical assistants, to improve the

delivery of STI health care. Finally, students should have an opportunity experience hands-on training administering the oral rapid HIV test on peer students, with trained clinicians overseeing their performance.

Conclusions

Our study has revealed that additional training in STI health care is warranted for first-year medical students who work in free health care clinics. To this end, we are in the process of developing an amalgamated training intervention using the aforementioned resources with the intent to test and validate it among a future cohort of first-year medical students and to replicate this training in other medical schools with student-run clinics.

Disclosures

The authors have no conflicts of interest to disclose.

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Appendix 1. Survey Questions

HIV Exposure Prophylaxis Questions:

1) Which of the following options best describes HIV Post-Exposure Prophylaxis (PEP):[1,2]

   A. Searching for sexual contacts of a newly-diagnosed HIV patient to prevent HIV transmission.
   B. Initiating anti-HIV medication as soon as possible after exposure to HIV.
   C. Anti-HIV medication taken on a daily basis by HIV-negative (HIV-) individuals at risk of being HIV infected.
   D. The immune system of a HIV+ individual is weakened using high-dose chemotherapy and radiation therapy, and is ultimately given a bone marrow transplant.

2) In which of the following situations would you recommend PEP:[1,2]

   A. A health professional is stuck with a needle contaminated with blood from an HIV+ patient.
   B. A health professional is cut deeply by a scalpel during surgery of a HIV- patient.
   C. An HIV- individual reporting frequent unprotected sex with multiple sexual partners.
   D. An HIV- *injecting drug user* (IDU) engaging in frequent needle sharing.

3) Which of the following best describes Pre-Exposure Prophylaxis (PrEP):[3-5]

   A. Initiating anti-HIV medication as soon as possible after exposure to HIV.
   B. Wearing barriers such as gloves, protective clothing, disinfectants, and goggles while performing procedures on HIV patients.
   C. Taking anti-HIV medication daily to reduce their risk of becoming HIV infected.
   D. Tracing sexual contacts of a newly-diagnosed HIV patient to limit further spread of HIV.

4) For whom is PrEP recommended? (Choose all that apply):[3-5]

   A. HIV- men who have sex with men who are at very high risk for sexual exposure to HIV.
   B. HIV- men or women with HIV+ sexual partners who are currently taking anti-HIV medication.
   C. HIV- injecting drug users at high risk for HIV exposure.
   D. Health care professionals who have been exposed to HIV contaminated blood through needle-stick injuries or mucosal exposure.

STI Questions, Including Chlamydia, Gonorrhea, Syphilis:[6-12]

5) The most common Sexually Transmitted Infection (STI) is:

   A. Chlamydia
   B. Human Papillomavirus
   C. HIV
   D. Trichomonas

6) Which of the following is a commonly reported and notifiable STD to the US CDC?

   A. Human Papillomavirus (HPV)
   B. Chlamydia
   C. Herpes Simplex Virus (HSV)
   D. Gonorrhea

7) Which of the following best describes the clinical signs/symptoms of chlamydial infection in women?

   A. Most women experience discharge.
   B. Most women experience urinary symptoms.
   C. Most women have clinical signs/symptoms depending on the duration of infection.
   D. Most women are asymptomatic.

8) Which of the following is a method to diagnose chlamydial infection?

   A. Nucleic acid (DNA, RNA) amplification technique.
   B. Cell culture techniques, using live cells.
   C. Antigen detection methods.
   D. All of the above.

9) Which are clinical features of syphilis? (Choose all that apply.)

   A. Initial painless, firm, rounded sore on the penis or vulva (or site of entry).
   B. Discharge from penis, or vagina.
   C. Burning or painful urination.
   D. Rashes over the body, including palms and soles later in the course of the disease.
   E. Produces neurological manifestations in the late stage of the disease.

10) Which of the following individuals are responsible for reporting a case of syphilis to the local health department? (Choose all that apply.)

   A. The laboratory technician.
   B. The healthcare provider.
   C. The patient.
   D. The health insurance representative.
   E. None of the above—syphilis is not reportable in most states.

11) Which of the following statements are **true** about syphilis? (Choose all that apply.)

   A. Syphilis increases risk of acquiring or transmitting HIV.
   B. Syphilis is diagnosed by using an antibody blood test.
   C. Pregnant women should be screened for syphilis, since a mother can pass the infection to her unborn child.
   D. Syphilis is a viral disease.

12) Which of the following are **true** about Gonorrhea? (Choose all that apply.)

   A. Gonorrhea is caused by a virus.
   B. Gonorrhea can be treated and cured with antimicrobials.
   C. Untreated gonorrhea can increase an individual's risk of acquiring or transmitting HIV.
   D. Gonorrhea can be treated with antivirals.

13) Which of the following are **true** about clinical features of Gonorrhea? (Choose all that apply.)

   A. Pain or burning when passing urine.
   B. Initial painless, firm, rounded sore on the penis or vulva (or site of entry).
   C. Generalized body rash.
   D. Discharge from penis or vagina.

HIV Core Questions:[13]

14) Which of the following ways is HIV infection transmitted? (Choose all that apply.)

   A. Unprotected sex with an infected person.
   B. From an infected mother to her infant before birth, during birth, or during breastfeeding.
   C. Blood-to-blood transmission through injection drug use or accidental exposure to contaminated needles or sharps in a hospital, as well as blood transfusion in countries in which blood is not routinely screened.
   D. Transmission through mosquito bites.
   E. Transmission by sharing meals with an HIV-infected person.
   F. All of the above.

15) Antiretroviral (ARV) drugs are recommended for prevention of perinatal transmission of HIV for pregnant women with:

A. All CD4-cell counts and HIV RNA levels.
B. Very low CD4-cell counts and high HIV RNA levels.
C. Low CD4-cell counts and high HIV RNA levels.
D. Normal CD4-cell counts and Low HIV RNA levels.

16) What specific part of the human body does HIV attack and what does this cause?

A. HIV infects the bone marrow, and diminishes its capacity to produce blood cells in the body, affecting multiple function of the blood.
B. HIV infects the liver, and reduces capacity of the body to metabolize toxins.
C. HIV infects the immune system, specifically the CD4 cells, weakening the immune system, making it progressively more difficult to fight infection.
D. HIV infects the kidney, and impacts the ability of the body to maintain homeostasis.

17) Rank HIGHEST to LOWEST the following risks of HIV infection:

I. A child born to a HIV+ mother on anti-viral medication treatment regimen.
II. An African-American male engaging in unprotected sex with a male.
III. A healthcare worker injured via needle stick.

A. I > II > III.
B. III > I > II.
C. II > III > I.
D. III > II > I.
E. II > I > III.
F. I = II > III.

18) Which of the following is true regarding the "window period"? (Choose all that apply.)

A. It is the period between the initial infection and the time when the HIV test can detect the antibodies the body has generated in reaction to HIV.
B. It is the period between the initial infection and the production of antibodies to the HIV virus.
C. It is the period between the initial infection and the time when the patient develops AIDS.
D. It is the maximum period between infection and anti-retroviral therapy to avoid developing AIDS.
E. It is the minimum period of time an individual is exposed to the HIV virus for sufficient risk of infection.

19) Please choose the best matches for the following testing procedures:

A. Test(s) for HIV screening.
B. Test(s) for quick screening.
C. Test(s) for confirmation of HIV.
D. Detecting HIV within 1-2 weeks of infection.

1) Western Blot test.
2) Enzyme immuno-assay (EIA) tests, such as ELISA.
3) Rapid HIV antibody test.
4) Antigen tests or PCR Test (polymerase chain reaction test) detecting HIV viral RNA.

A. (A) 1, (B) 2, (C) 3, and (D) 4.
B. (A) 2, (B) 3, (C) 1, and (D) 4.
C. (A) 4, (B) 3, (C) 2, and (D) 1.
D. (A) 2, (B) 3, (C) 4, and (D) 1.
E. (A) 4, (B) 2, (C) 3, and (D) 1.

20) Which of the following is true regarding Acquired Immunodeficiency Syndrome (AIDS)? (Choose all that apply.)

A. AIDS and HIV are different terms to describe the same condition.
B. AIDS is characterized by opportunistic infections such as Pneumocystis carnii pneumonia, esophageal candidiasis, and mycobacterium avium complex.
C. AIDS is characterized by rare cancers such as Kaposi sarcoma, and primary brain lymphomas.
D. In AIDS, the immune system of a person infected with HIV becomes severely compromised, measured by CD4 cell count.

21) Regarding treatment of HIV, which of the following are true? (Choose all that apply.)

A. Anti-retroviral therapy successfully suppresses HIV progression and prolongs life.
B. Anti-retroviral therapy does not cure HIV.
C. A combination of drugs is most effective in suppressing HIV.
D. Anti-retroviral therapy also suppresses sexual transmission of HIV.

22) Reporting and documentation of a confirmed positive HIV result is mandated for which of the following patient demographics? (Choose all that apply.)

A. Pregnant females
B. Minors (<18 years of age)
C. Adults
D. Gay and bisexual men
E. Individuals co-infected with other STIs
F. Intravenous drug users

Attitude Questions:[14]

23) I would feel comfortable talking openly with patients about safer sex.

A. Strongly agree.
B. Agree.
C. Disagree.
D. Strongly disagree.

24) I would feel comfortable taking detailed sexual history from a patient.

A. Strongly agree.
B. Agree.
C. Disagree.
D. Strongly disagree.

25) I would feel comfortable physically touching patients with HIV infection.

A. Strongly agree.
B. Agree.
C. Disagree.
D. Strongly disagree.

26) I would feel comfortable treating HIV infected patients.

A. Strongly agree.
B. Agree.
C. Disagree.
D. Strongly disagree.

Answer Key:

1. B
2. A
3. C
4. A, B, C
5. B
6. B
7. D
8. A, B, C
9. A, D, E
10. A, B
11. A, B, C
12. B, C
13. A, D
14. A, B,C
15. A
16. C
17. D
18. A
19. B
20. B, C, D
21. A, B, C, D
22. A, B, C, D, E, F

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