Addressing Pre-exposure Prophylaxis Awareness and Knowledge Gaps Among Lebanese Medical Professionals: A Cross-Sectional Study

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ABSTRACT

OBJECTIVE: In Lebanon, HIV prevalence among key populations such as men who have sex with men is high at 12%, warranting a need for targeted healthcare efforts. Pre-exposure prophylaxis (PrEP) is an effective prevention measure, yet global challenges persist, including limited awareness of PrEP among healthcare professionals. This study investigates PrEP awareness within the Lebanese medical community.

METHODS: A survey targeted 201 participants from the Saint Joseph University of Beirut, Faculty of Medicine, comprising students, residents, and physicians. Analyses, including chi-square tests, mid-*P* exact test, and point-biserial correlation, assessed PrEP knowledge and perceptions.

RESULTS: Significant disparities in PrEP awareness were noted among medical students, residents, and physicians, revealing misconceptions about its purpose, administration, and effectiveness. Positive correlations between age and awareness among medical students suggest evolving awareness during medical education. Residents exhibited higher awareness compared to physicians, emphasizing the impact of recent training. No significant correlation based on specialty was found among physicians, indicating the need for uniform PrEP education across all medical fields.

CONCLUSION: Addressing PrEP awareness gaps among medical professionals is crucial for effective HIV prevention in Lebanon, necessitating tailored educational strategies integrated into medical curricula and ongoing professional development.

KEYWORDS: pre-exposure prophylaxis, PrEP awareness, healthcare professionals, HIV prevention, medical education, Lebanon

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Introduction

In 2020, Lebanon reported a low national adult HIV prevalence of less than 0.1%, with fewer than 200 new diagnoses and a significant apparent 52% drop in cases since 2010. However, among key populations such as men who have sex with men (MSM), the HIV prevalence is significantly higher, currently estimated at 12%. While 92.3% of MSM are aware of their HIV status, there are a lack of targeted healthcare actions that focus on those who remain unaware of their status and on promoting prevention measures for individuals at continued risk of HIV acquisition.[1]

Pre-exposure prophylaxis (PrEP), using tenofovir disoproxil fumarate and emtricitabine, can, with full adherence, effectively prevent HIV.[2] Data from oral PrEP users showed an incidence of 0.19 HIV cases per 100 person-years, highlighting its efficacy in reducing transmission.[3]

Despite its effectiveness, global challenges persist in PrEP adoption. Limited awareness among healthcare professionals, financial barriers, and restricted access are significant obstacles. Additionally, stigma from healthcare providers and societal discrimination remain significant barriers to PrEP use, especially among MSM, potentially limiting access to this preventive measure despite its effectiveness.[4] Overcoming these barriers through comprehensive education, financial strategies, and improved provider networks is crucial for expanding PrEP use.[5]

Examining PrEP awareness among healthcare professionals in various countries reveals similar trends. A French study found limited awareness and knowledge among general practitioners,[6] while a survey in the US highlighted high awareness but insufficient knowledge among healthcare students.[7] These studies emphasize the need for targeted educational strategies to enhance PrEP knowledge and implementation.

A recent study found that over half (55%) of the young Lebanese MSM population, most of whom were aged less than 25 years, expressed a willingness to use PrEP, with substance use prior to or during sex and a sense of community being significant predictors of this willingness; however, stigma and discrimination remain key barriers to accessing HIV prevention services.[8]

In Lebanon, the situation is compounded by gaps in HIV awareness and the lack of comprehensive PrEP programs, which rely heavily on sporadic NGO initiatives.[8,9] Addressing

these gaps, especially in urban–rural imbalances in access, is crucial for effective HIV prevention. Medical professionals play a pivotal role in these efforts, making it essential to understand and improve their awareness of PrEP.[10]

This study aims to explore PrEP awareness among Lebanese medical students, residents, and healthcare professionals, aligning PrEP implementation with the country's healthcare system and societal context, thereby providing insights for informed public health policies.

Methods

Study design and participants

The medical curriculum at Saint Joseph University currently includes coverage of HIV prevention, with PrEP education primarily embedded within pharmacology and infectious diseases courses. Residents, who are postgraduate medical students, receive their PrEP education primarily through clinical rotations in infectious diseases and clinical courses. However, formalized training on PrEP is not standardized across all academic years.

An observational cross-sectional study was conducted at the Saint Joseph University of Beirut, Faculty of Medicine, involving medical students, residents, and physicians between early January and late March 2024. Participants were selected using convenience sampling. An invitation to participate in the survey was sent via email to all students, residents, and physicians affiliated with the Faculty of Medicine. Participation was voluntary and no financial incentives were provided.

The survey was conducted online using Google Forms and consisted of structured multiple-choice questions covering demographic information, PrEP knowledge, and perceptions. To increase response rates, reminders were sent.

The reporting of this study conforms to the STROBE statement of cross-sectional studies. A completed checklist is provided as a Supplemental Material.

Survey validation

To ensure the validity and reliability of the survey instrument, the following steps were undertaken:

1. *Content validation*: Survey content was validated based on literature, including studies on PrEP awareness from Europe.[11,12] Additionally, the questionnaire used in this study has also been validated in prior research on the general Lebanese population.[13]
2. *Pilot testing*: A pilot test was conducted with a small sample of 20 medical students, 10 residents, and 5 physicians to evaluate the clarity, relevance, and comprehensiveness of the survey questions. Feedback from the pilot test participants was used to refine the survey instrument. The data from the pilot test were not included in the final analysis.
3. *Internal consistency*: The survey's internal consistency was assessed using Cronbach's alpha to ensure reliability.

Ethical considerations

The study followed Helsinki ethical guidelines, prioritizing participant confidentiality, voluntary involvement, and informed consent. Ethical approval was granted by the institution's review board at the Hôtel Dieu de France University Hospital (ethical approval number: Tfem/2023/19). Informed consent was obtained from all participants through an online consent form.

Variables and data analysis

The main variables included age, academic year, financial situation, relationship status, and gender. The focus was on assessing the knowledge and readiness to use PrEP among individuals who were already aware of it. No missing data was reported.

Chi-square tests were used to examine associations between categorical variables and PrEP awareness and willingness to use PrEP. Point-biserial correlation analysis was used to analyze relationships between binary categorical target variables, such as PrEP awareness, and continuous variables like age. Statistical significance was established at a P-value threshold of 0.05. The mid-*P* exact test was employed to compare the statistical significance of PrEP perceptions and knowledge, as well as sources of knowledge, between medical students and residents/physicians. The test is particularly suitable for small sample sizes, allowing for the identification of significant disparities. The Shapiro–Wilk test was used to verify the normal distribution of the physicians' data.

Results

Demographic and statistical findings

There were 201 participants, comprising 20 physicians, 35 residents, and 146 students from the Faculty of Medicine at Saint Joseph University of Beirut. A total of 1200 emails were sent to potential participants, resulting in a response rate of 16.75%.

For the group of physicians and residents, there were 32 men (58.2%) and 23 women (41.6%), and none identifying as non-binary. Ten were surgeons (18.2%) and 45 were non-surgeons (81.8%). The median age was 44.8 for physicians (range 29 to 65) and 26.6 for residents (range 24 to 32).

In the student group, the median age was 22.6 (range 17 to 27 years). The distribution by year of study was as follows: 22.6% were in their seventh year, 18.5% in their fourth year, 17.1% in their first year, 15.8% in their sixth year, 15.8% in their fifth year, 6.8% in their third year, and 3.4% in their second year. There were 75 men (51.4%), 70 women (47.9%), and none identifying as non-binary.

Sources of PrEP knowledge

Figure 1 displays a 2-dimensional chart illustrating the sources of knowledge about PrEP. Institutional channels were the

primary knowledge sources for 61% of medical students (vs 34% for residents and physicians). The internet was also a significant source for both groups (60% for medical students vs 52.3% for residents and physicians).

Misconceptions about PrEP

Table 1 is a comparison of PrEP knowledge and perceptions between medical students and residents and physicians. A considerable portion of participants exhibited misconceptions about PrEP. Specifically, 7.8% of medical students and 11.4% of physicians and residents mistakenly associated PrEP with efficacy against other sexually transmitted infections (STIs), potentially fostering a false sense of security.

PrEP awareness and correlations

Among medical students, 62% exhibited PrEP awareness. There was a positive correlation of 0.63 ($P < .05$) with age, indicating that older students are significantly more aware. There was also a positive correlation ($P < .05$) with university study year, showing increased awareness as education progresses. Relationship status, financial situation, and gender had weak correlations and were not significant ($P > .05$), suggesting limited or no impact on PrEP awareness.

Residents showed a higher PrEP awareness at around 91.43%, while physicians demonstrated 60% awareness. Further analysis revealed no significant correlation between surgical and non-surgical specialties and PrEP awareness: 70% of surgical specialists were aware, compared to 82% of non-surgical specialists ($P = .414$).

Discussion

PrEP knowledge and perceptions insights

This study reveals significant disparities among medical students, residents, and physicians in PrEP knowledge and perceptions within the Lebanese medical community. Intriguingly, misconceptions have surfaced concerning PrEP's purpose, administration, and effectiveness. The study reveals that a significant portion of participants mistakenly believe that PrEP offers protection against other STIs, such as gonorrhea or syphilis. This misunderstanding could impact public health messaging surrounding STIs. If medical professionals themselves are unclear about the limitations of PrEP, they may inadvertently communicate inaccurate information to their patients or the broader community. Furthermore, despite PrEP's availability in Lebanon, its uneven accessibility in pharmacies poses a challenge to widespread use. Additionally, rare gastrointestinal side effects associated with PrEP highlight the importance of comprehensive information dissemination.[14] Addressing these knowledge gaps and practical barriers is crucial for fostering informed medical community.

Medical student subgroup analysis

The positive correlation between age and university study year with PrEP awareness among medical students suggests an evolution in awareness as students progress through their studies. Early integration of PrEP education in medical curricula is paramount to ensuring comprehensive knowledge across all age groups and study years.

As students progress and have more advanced academic exposure, they might benefit from a more detailed in-depth understanding of HIV prevention strategies, including PrEP.

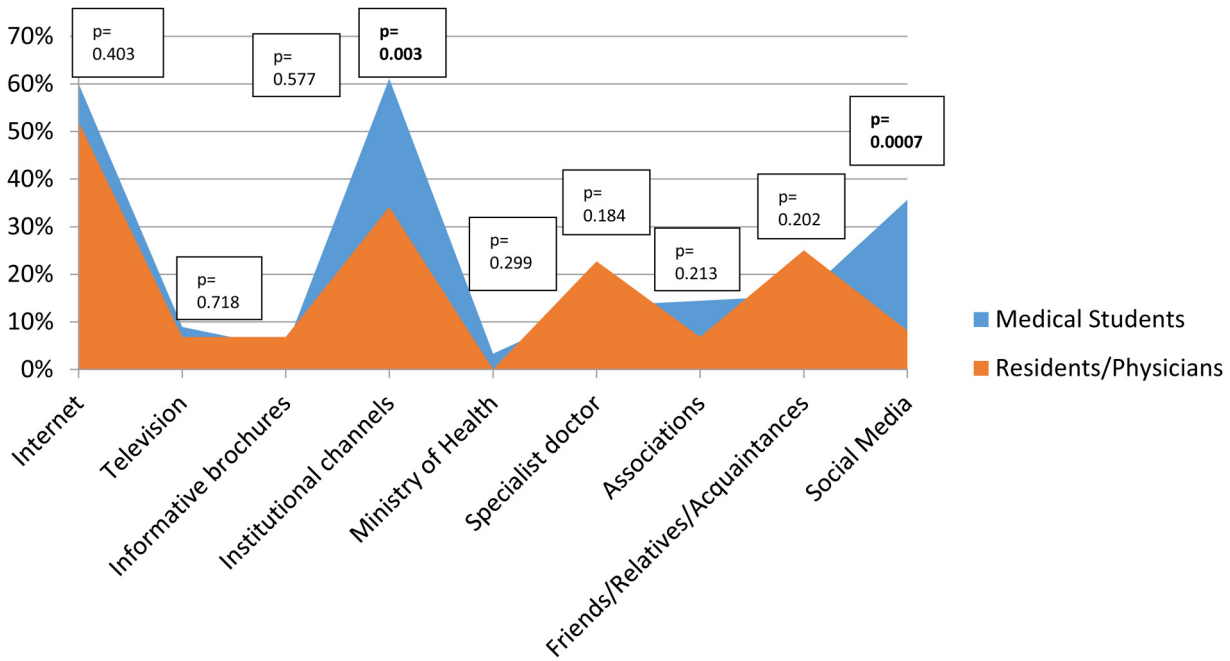

Figure 1. 2D area chart illustrating sources of PrEP knowledge among study groups.

Table 1. PrEP knowledge and perceptions among study participants.

	MEDICAL STUDENTS	RESIDENTS/ PHYSICIANS	*P*-VALUE (MID-*P* EXACT TEST)
Have you ever heard of PrEP (pre-exposure prophylaxis)?			
Yes	90 (61.6%)	44 (80%)	**0.012**
No	56 (38.4%)	11 (20%)	
What is PrEP?			
A strategy for preventing HIV (T)	83 (92.2%)	42 (95.5%)	0.524
A strategy for preventing all sexually transmitted infections (STI)	7 (7.8%)	2 (4.5%)	
How is PrEP taken?			
Monthly intravenous injection	2 (2.2%)		0.672
Daily pill (T)	75 (83.3%)	38 (86.4%)	
Don't know	13 (14.4%)	6 (13.6%)	
What are the advantages of PrEP?			
It protects against all STI	2 (2.2%)	2 (4.5%)	0.577
It significantly reduces the risk of HIV (T)	86 (95.6%)	41 (93.2%)	
Don't know	2 (2.2%)	1 (2.3%)	
Who is PrEP primarily for?			
Individuals who have already tested positive for HIV	4 (4.4%)		0.247
Individuals at high risk of HIV (T)	70 (77.8%)	38 (86.4%)	
Individuals at risk of bacterial STI such as gonorrhea, chlamydia, and syphilis	2 (2.2%)	1 (2.3%)	
Individuals at high risk of HIV and bacterial STD	9 (10%)	4 (9.1%)	
Don't know	5 (5.6%)	1 (2.3%)	
Who can benefit from PrEP? (MCQ)[a]			
Homosexual population (T)	88 (97.8%)	43 (97.7%)	Not defined
Bisexual population (T)	88 (97.8%)	43 (97.7%)	
Heterosexual population (T)	86 (95.6%)	40 (90.9%)	
Not sure	5 (5.6%)	1 (2.3%)	
What are the potential side effects of PrEP?			
Headache and nausea (T)	26 (28.9%)	9 (20.5%)	0.307
Weight loss and extreme fatigue	1 (1.1%)	1 (2.3%)	
No side effects	7 (7.8%)	8 (18.2%)	
Don't know	56 (62.2%)	26 (59.1%)	
How can you obtain PrEP in Lebanon? (MCQ)[a,b]			
Only with a medical prescription	7 (7.8%)	7 (15.9%)	Not defined
By purchasing it freely at any pharmacy	10 (33.3%)	6 (13.6%)	
By participating in HIV prevention programs (T)	30(33.3%)	11 (25%)	
Through NGO (T)	50 (55.6%)	13 (29.5%)	
Don't know	43 (47.8%)	25 (56.8%)	

(continued)

Table 1. Continued.

	MEDICAL STUDENTS	RESIDENTS/ PHYSICIANS	*P*-VALUE (MID-*P* EXACT TEST)
Does PrEP protect against all STI?			
Yes, it provides some protection against all STI	7 (7.8%)	5 (11.4%)	0.423
No, it only protects against HIV (T)	73 (81.1%)	33 (75%)	
Don't know	10 (11.1%)	6 (13.6%)	
What is the recommended duration for taking PrEP before potential HIV exposure?			
One week (T)	49 (54.4%)	17 (38.6%)	0.090
One month	10 (11.1%)	4 (9.1%)	
Three months	4 (4.4%)	2 (4.5%)	
Don't know	27 (30%)	21 (47.7%)	
Is PrEP 100% effective in preventing HIV?			
Yes, it provides total protection against HIV	9 (10%)	1 (2.3%)	0.171
No, it significantly reduces the risk but it's not perfect (T)	66 (73.3%)	37 (84.1%)	
No, it has no proven effectiveness in preventing HIV	1 (1.1%)		
Don't know	14 (15.6%)	6 (13.6%)	
Is PrEP available in Lebanon?			
Yes (T)	52 (57.8%)	24 (54.5%)	0.725
No	1 (1.1%)		
Not sure	37 (41.1%)	20 (45.5%)	
Do you know the difference between daily dosing and on-demand dosing for PrEP?			
Yes	19 (21.1%)	14 (31.8%)	0.189
No	71(78.9%)	30 (68.2%)	
Have you discussed PrEP with family, friends, or patients?			
Yes	23 (25.6%)	14 (31.8%)	0.453
No	67 (74.4%)	30 (68.2%)	
Do you know any friends, family members, or acquaintances who use PrEP?			
Yes	10 (11.1%)	9 (20.5%)	0.163
No	80 (88.9%)	35 (79.5%)	

Abbreviation: T, true answer.
[a]Participants could select more than one option.
[b]In Lebanon, PrEP can be obtained by participating in HIV prevention programs or through NGOs. It does not require a medical prescription, and it is not always available at pharmacies.
Numbers in bold indicate significant *P* values (less than 0.05).

The lack of significant correlation with relationship status, financial situation, and gender indicate that PrEP awareness is not significantly influenced by these factors. While individual experiences and characteristics may vary, the uniform distribution of awareness across demographics signals the need for broad-based educational strategies.

Residents and physicians subgroup analysis

The notable divergence in PrEP awareness between residents and physcians poses an intriguing question about the influence of recent training, curriculum updates, and exposure to current medical literature[15] on PrEP knowledge and awareness. Residents, being at the forefront of evolving medical practices, might benefit from more recent educational content emphasizing PrEP. In contrast, physicians may exhibit varied levels of awareness, potentially indicating gaps in continuing medical education (CME) or the need for targeted awareness campaigns tailored to the practicing medical community.[16] Thus, the low awareness among physicians may be attributed to the absence of structured CME programs focused on recent developments in HIV prevention,

including PrEP. Another explanation for the observed difference between residents and physicians in PrEP awareness could be due to the different patient populations these groups are likely to encounter. Residents may more frequently treat priority populations at high risk for HIV, such as MSM, which could explain their increased awareness and interaction with PrEP. Conversely, physicians might encounter a broader patient base, including populations less likely to be at risk for HIV, thus influencing their exposure to PrEP education and use.

Our findings showed no significant correlation between demographic factors (such as gender, relationship status, and financial status) and PrEP awareness. This may be due to the standardized nature of clinical training, which ensures that PrEP education is delivered uniformly, regardless of demographic differences. As a result, it is logical that such factors would have little bearing on how much knowledge clinicians have with respect to PrEP.

The lack of significant correlation between surgical and non-surgical specialties and PrEP awareness among physicians is a noteworthy finding. This suggests that PrEP education efforts have penetrated various medical fields uniformly, emphasizing the recognition of PrEP's relevance across specialties. However, the absence of a strong correlation could also signal a potential lack of awareness or variable acknowledgment irrespective of specialty. Further investigation into the specific practices and patient interactions within different specialties is warranted.

Evaluating PrEP sources of information

Figure 1 reveals significant differences in knowledge sources among medical students, residents, and physicians. Notably, 61% of medical students favor institutional channels, while residents and physicians rely on them less at 34% ($P = .003$). This divergence highlights varied information preferences. Additionally, medical students rely more on social media for PrEP information compared to physicians and residents ($P = .0007$). The shared reliance on the internet underscores its growing role in medical education. The differing dependence on institutional channels suggests opportunities for tailored interventions in medical curricula and professional development. Addressing these patterns can enhance knowledge transfer, ensuring effective information dissemination across career stages in the medical field and keeping professionals informed in a changing healthcare landscape. In the literature, within the spectrum of courses, pharmacology emerged as the predominant exposure to PrEP, accounting for 40%, while the rest were introduced to PrEP through extracurricular experiences, which have been described in another study.[17] It suggests a potential need to integrate comprehensive education about PrEP within formal medical curricula, ensuring broader and more standardized exposure.

Role of healthcare professionals and implications for practice

Medical professionals, as influential figures in healthcare, have a crucial role in educating and counseling patients. A thorough grasp of PrEP enables healthcare providers to communicate its advantages, address concerns, and empower patients to make informed choices regarding their sexual health.[18]

Healthcare professionals can play a pivotal role in advocating for inclusive practices, ensuring that PrEP is accessible to all individuals on an equitable basis.[19] Through closing awareness disparities and advocating for impartial education, healthcare professionals actively participate in lessening health inequalities and fostering a patient population that is both well-informed and empowered.[20]

Biases within healthcare providers, such as "heterosexism," a term proposed by Calabrese et al may impede PrEP access. Addressing this bias through early comprehensive medical education could be a pivotal solution.[21]

Given that MSM remains one of the most at-risk groups for HIV infection, targeted efforts to increase PrEP awareness and access for clinicians who treat these populations are crucial. While broad-based education is beneficial, ensuring that clinicians understand the unique risks faced by MSM will help improve PrEP uptake and HIV prevention efforts in this key demographic.

A survey conducted in the US, encompassing 71 medical schools, reveals that students demonstrated higher readiness to prescribe PrEP for MSM than for other high-risk patients. The limited number of medical schools preparing graduates for immediate PrEP prescription highlights the necessity to increase exposure through direct patient contacts or simulations for enhanced student preparedness.[15] Given that only 4% of eligible people are using PrEP in the US with few physicians prescribing it, a recent study recommends integrating HIV risk assessment into standard care, improving physicians' skills for identifying PrEP candidates, fostering increased proficiency in promoting PrEP uptake, and enhancing continuous care management for sustained adherence to PrEP.[22]

Collaboration between healthcare professionals, public health agencies, and educational institutions is vital for the effective implementation of PrEP. Through joint efforts, these entities can formulate strong awareness campaigns, implement targeted interventions, and establish supportive frameworks, thereby facilitating broader PrEP adoption.[23]

Limitations

This study on PrEP knowledge and perceptions within the Lebanese medical community has several limitations. The low response rate of 16.75% may affect the generalizability of the findings. This low rate can be attributed to several factors, including the lack of standardized formal training across academic years, the voluntary nature of participation, and the absence of financial incentives. Additionally, this limited response rate may have introduced selection bias, particularly if individuals with greater knowledge about HIV and PrEP were more inclined to participate. Conducted at a single institution, the findings may not fully represent the broader medical community in Lebanon. The reliance on self-reported data

introduces potential biases, such as social desirability bias, affecting the accuracy of reported awareness and perceptions. Moreover, the cross-sectional design captures a single point in time, limiting the ability to assess changes over time or the impact of ongoing educational initiatives. Future research should address these limitations by expanding the sample size, scope, and incorporating qualitative methods.

Conclusions

In conclusion, differences in PrEP awareness among medical students, residents, and physicians highlight areas for intervention. Tailored educational initiatives and ongoing CME efforts have the potential to enhance understanding, empowering healthcare professionals to contribute significantly to PrEP success and advance HIV prevention programs in Lebanon.

Author Contributions

All authors reviewed the manuscript, provided critical revisions for intellectual content, and approved the final version.

Consent to Participate

The participants provided their written informed consent to participate in this study.

Data Availability

The authors are willing to share data information upon request.

Ethical Considerations

The study was reviewed and approved by the ethics committee at the Hôtel Dieu de France University Hospital, and the procedures followed were in accordance with the Helsinki Declaration in 2013.

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Supplemental Material

Supplemental material for this article is available online.

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