



Prevalence and Evaluation of Yemeni Pharmacy Graduates' Interest in Pursuing Master's Degrees: A Cross-Sectional Study

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ABSTRACT

Objective: This study examines the prevalence of interest among Yemeni pharmacy graduates in pursuing a master's degree and validates a culturally sensitive questionnaire designed for the same purpose.

Method: A cross-sectional study was conducted using an online questionnaire distributed to 123 pharmacy graduates or in their final year of study. Data was collected via Google form in the period between June – July 2024. Participants were either pharmacy graduates or students in their final year of pharmacy. The survey was validated using pilot study and analyzed by SPSS version 26.

Results: indicated that majority of participants were under 25 years old (65%), with a slight male predominance 83 (67.5%). In addition, 70 (56.9%) of respondents already graduated, while the remaining 53 (43.1%) were in their final year of pharmacy studies or the first year of a master's program. 86 (69.6%) of participants declared that they have less than 5 years of experience and 37 (30.1%) reported the opposite. The survey indicated a high prevalence of interest in postgraduate studies, particularly in clinical pharmacy 77 (62.6%), pharmacology 60 (48.8%), industrial pharmacy 28 (22.8%), medicinal chemistry 20 (16.3%), social and administrative pharmacy 19 (15.4%), pharmacognosy 17 (13.8%), and pharmacy practice 16 (13%). The questionnaire demonstrated good internal consistency (Cronbach's alpha > 0.70).

Conclusion: This study developed a robust survey instrument to assess Yemeni pharmacy graduates' interest in pursuing master's degrees, revealing a strong inclination towards clinical pharmacy followed by pharmacology and low interest towards pharmacognosy.

Keywords: Yemeni Pharmacy Graduates, Master's Degree Pursuit, Pharmacy Education

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INTRODUCTION

Postgraduate education plays a pivotal role in enhancing healthcare systems globally, equipping pharmacists with the advanced knowledge and specialized skills essential for optimizing patient care, medication management, and safety protocols. Pharmacists trained through advanced programs are better positioned to implement evidence-based practices, contribute to multidisciplinary healthcare teams, and spearhead initiatives to improve public health outcomes (1,2). This significance is magnified in developing nations such as Yemen, where an underdeveloped healthcare infrastructure, coupled with a chronic shortage of healthcare professionals, demands urgent attention to workforce development. Proficient pharmacists are vital to mitigating the pressing healthcare challenges exacerbated by years of conflict, economic instability, and systemic resource constraints (3).

Recent research underscores the scarcity of qualified healthcare professionals in Yemen, with the healthcare sector facing immense pressure to address increasing patient needs amid limited resources (4). The World Health Organization (WHO) has identified that Yemen suffers from one of the lowest healthcare worker-to-population ratios globally, with severe disparities in rural areas (5). Pharmacists, who play a central role in ensuring safe and effective medication use, are particularly affected by these shortages, emphasizing the urgent need for robust postgraduate training programs tailored to the country's specific challenges (6).

Understanding Yemeni pharmacy graduates' aspirations for advanced degrees is critical for crafting targeted educational strategies aimed at alleviating these workforce deficits. Educational advancement is not only pivotal for individual professional growth but also serves as a cornerstone for national capacity building, fostering innovation in healthcare and pharmaceutical research (7). However, exploring these aspirations requires a nuanced approach that takes into account the unique socio-cultural and economic landscape of Yemen.

Accurately assessing the educational aspirations of Yemeni pharmacy graduates necessitates culturally sensitive instruments. Western-centric questionnaires, while effective in different contexts, may inadequately capture the motivations and challenges faced by Yemeni students. Socioeconomic factors, cultural norms regarding higher education, and career prospects within specific pharmacy disciplines heavily influence these aspirations (8,9). For instance, Yemeni graduates often prioritize fields that promise job security and financial stability, reflecting a pragmatic approach influenced by the nation's economic realities (10). Cultural values emphasizing social mobility and familial expectations further shape these preferences, underscoring the need for tools that align with these contextual variables.

Despite the pivotal role of higher education in Yemen's professional and economic advancement, there remains a significant gap in the literature regarding the factors shaping Yemeni pharmacy graduates' decisions to pursue master's degrees. Limited studies have explored how socio-cultural factors, institutional barriers, or professional opportunities influence their choices (11). This paucity of research leaves educators and policymakers with insufficient data to design programs that align with both student aspirations and national healthcare priorities.

This study seeks to address this gap by developing and validating a culturally sensitive questionnaire tailored specifically to assess the interest of Yemeni pharmacy graduates in pursuing master's degree programs. By contextualizing the instrument within Yemen's healthcare milieu and cultural ethos, this research provides a framework for understanding the nuanced motivations of pharmacy graduates. The findings aim to inform the design of targeted educational interventions, thereby enhancing the alignment between academic offerings and the workforce needs of Yemen's healthcare system.



STUDY DESIGN & PARTICIPANTS

This study utilized a descriptive cross-sectional design to evaluate the interest of Yemeni pharmacy graduates in pursuing a master's degree. The survey was conducted in June 2024 using an online Google Form. Participants included recent graduates and first-year master's students. Convenience and purposive sampling strategies were employed, leveraging professional networks and collaborations with Yemeni pharmacy colleges to ensure broad representation.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- Yemeni pharmacy graduates or final-year pharmacy students.
- Willingness to participate and provide informed consent.
- Access to the internet for online survey completion.

Exclusion Criteria:

- Individuals not affiliated with pharmacy education.
- Respondents unable to provide informed consent.
- Incomplete responses or surveys with missing data.

Sample Size

The study aimed to recruit a representative sample of Yemeni pharmacy graduates. A total of 123 participants completed the survey, achieving the desired sample size to allow meaningful analysis.

Survey Instrument

The research utilized a culturally sensitive questionnaire developed and translated into Arabic to ensure clarity and relevance. The questionnaire was divided into the following sections:

1. Demographics:

- Participant characteristics such as age, gender, marital status, years of

professional experience, and educational status.

• Categories included:

- **Age:** ≤25 years or >25 years.
- **Gender:** Male or Female.
- **Marital Status:** Single, Married, or Other.
- **Professional Experience:** ≤5 years or >5 years.

2. Educational Background:

- Current academic status (graduate or master's student).
- Level of involvement in professional practice.

3. Interest in Master's Degree:

- Participants were asked to indicate their interest in pursuing a master's degree using a three-point Likert scale (Not Interested, Neutral, Very Interested).

4. Preferred Specialization:

- Respondents were asked, "Which specific area of a master's in pharmacy interests you the most?"
- Specializations included:
 - Clinical Pharmacy
 - Pharmacology
 - Administrative Pharmacy
 - Medicinal Chemistry
 - Social and Administrative Pharmacy
 - Pharmacognosy
 - Industrial Pharmacy
- Each specialization was briefly defined to ensure participants understood the scope of the fields. For instance, Clinical Pharmacy was described as focusing on direct patient care and optimizing therapeutic outcomes, while Industrial Pharmacy emphasized pharmaceutical manufacturing and quality control.

5. Barriers to Pursuing Postgraduate Education:



- Open-ended questions allowed participants to identify perceived challenges such as financial constraints, lack of local opportunities, and institutional support.

Data Collection Procedure

Data were collected via a Google Form distributed through academic email lists, professional pharmacy networks, and social media platforms (e.g., WhatsApp and emails). The form included an introductory section detailing the study's purpose, the voluntary nature of participation, and assurances of confidentiality. Participants were required to electronically consent before proceeding to the questionnaire. The survey was active for four weeks, during which periodic reminders were sent to encourage participation. Upon submission, responses were automatically entered into a secure database for further analysis.

Pilot Testing and Instrument Validation

The questionnaire underwent a pilot test with 20 Yemeni pharmacy graduates to assess content validity, clarity, and reliability. Feedback from participants was used to refine question phrasing and ensure comprehensiveness. Cronbach's alpha was calculated to measure internal consistency, yielding a robust coefficient of 0.86, indicating excellent reliability. Expert reviews by educators and researchers further validated the instrument's content.

Data Analysis

The data were analyzed using IBM SPSS Statistics 26. Descriptive statistics (e.g., frequencies, percentages, means) were used to summarize demographic characteristics and interest levels in pursuing a master's degree.

Ethical Considerations

The study received ethical approval from the University of Science and Technology Yemen – Aden number MEC No. (MEC /AD018). Participants

provided informed consent, which was documented electronically. The study adhered to international ethical guidelines, including the Declaration of Helsinki, ensuring respect for participants' rights, autonomy, and confidentiality throughout the research process.

RESULTS

Participant Characteristics

The study included 123 participants, representing Yemeni pharmacy graduates and final-year pharmacy students. The demographic analysis revealed several notable characteristics Table 1.

The sample showed a slight male predominance, with males accounting for 67.5% (n = 83) and females comprising 32.5% (n = 40). This imbalance reflects the broader gender dynamics within Yemen's educational and professional sectors, where males often have higher participation rates in tertiary education and professional fields due to socio-cultural factors.

Participants were divided into two age groups: those aged ≤ 25 years (47.1%, n = 58) and those aged ≥ 25 years (52.8%, n = 65). This near-equal distribution suggests a mix of younger graduates who recently entered the workforce and more experienced professionals pursuing further academic qualifications.

A majority (56.9%, n = 70) of the respondents were pharmacy graduates, while the remaining 43.1% (n = 53) were still completing their studies or were in the first year of a master's program. This reflects a broad spectrum of academic stages within the sample, providing diverse insights into motivations and aspirations.

Most participants (69.9%, n = 86) reported having five or fewer years of professional experience, with an average of 3.5 years. A smaller proportion (30.1%, n = 37) had more than five years of experience, potentially reflecting a cohort with established careers seeking advanced qualifications for professional growth.



Table 1: Demographic distribution of variables n = 123

Demographics		n (%)
Gender	Male	83 (67.5%)
	Female	40 (32.5%)
Age	< 25	58 (47.1%)
	≥25	65 (52.8%)
Education status	Graduated	70 (56.9%)
	Still students	53(43.1%)
Year of experience	<5 years	86 (69.9%)
	≥ 5 years	37 (30.1%)

Interest in Master's Degrees

The preferences for various master’s specializations among Yemeni pharmacy graduates are detailed in Figure 1. This analysis provides insights into the career aspirations and academic inclinations of the participants, reflecting global trends in postgraduate pharmacy education as well as specific contextual factors in Yemen.

Clinical Pharmacy

Clinical pharmacy emerged as the most preferred specialization, with 62.6% (n = 77) of participants expressing interest. This finding underscores the

increasing recognition of clinical pharmacists’ roles in enhancing patient care, optimizing therapeutic regimens, and contributing to multidisciplinary healthcare teams. Globally, clinical pharmacy has gained prominence due to its focus on medication therapy management and patient-centered care, which aligns with the World Health Organization’s (WHO) objectives for improving healthcare delivery in resource-limited settings such as Yemen. The high level of interest among Yemeni pharmacy graduates indicates their aspiration to engage in roles that directly impact patient outcomes and support evidence-based healthcare interventions.

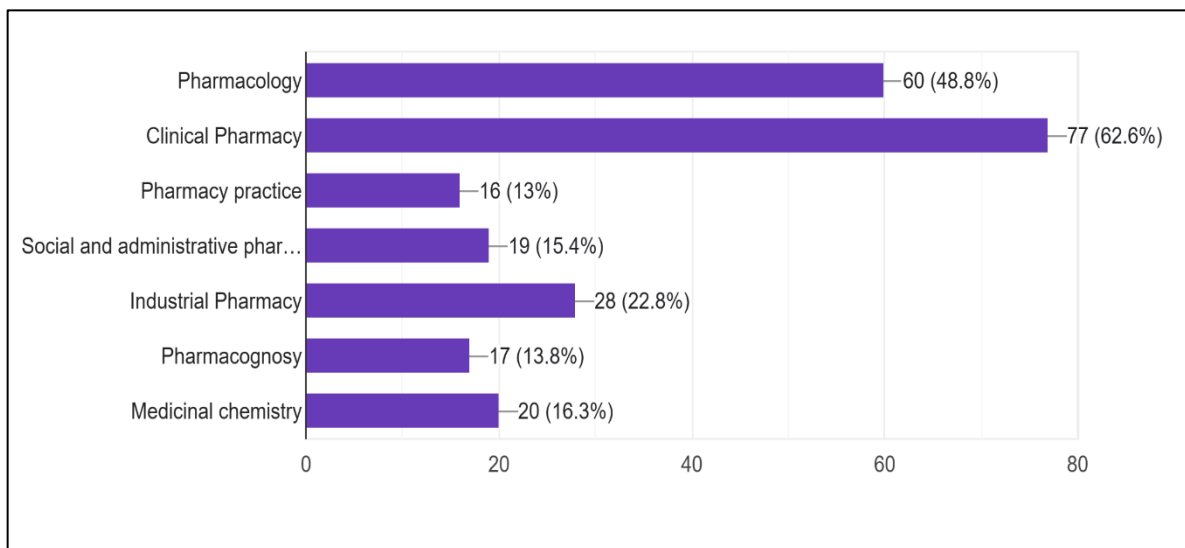


Fig 1. Distribution of Yemeni Pharmacy Graduates' Interest in Master's Specializations



Pharmacology

Pharmacology was the second most popular specialization, with 48.8% (n = 60) of respondents selecting it as their preferred field. Pharmacology offers a pathway to careers in research, drug development, and clinical trials, making it particularly attractive to graduates aiming to contribute to pharmaceutical innovation. This preference is consistent with global trends where pharmacology is considered essential for advancing drug safety, efficacy, and pharmacovigilance. The interest in pharmacology reflects the participants' desire to deepen their understanding of drug mechanisms and their application in therapeutic settings, addressing critical gaps in Yemen's healthcare system.

Pharmacy Practice

Approximately 13% (n = 16) of participants expressed interest in pharmacy practice, a specialization that emphasizes the application of pharmaceutical knowledge in clinical, community, and hospital settings. This level of interest, while moderate, highlights a recognition of the importance of pharmacy practice in ensuring the rational use of medicines and improving healthcare accessibility. However, compared to clinical pharmacy and pharmacology, the lower interest may be attributed to the limited visibility of this field's impact in Yemen's healthcare context. Globally, pharmacy practice has been identified as a cornerstone of public health interventions, underscoring the need for greater emphasis on its significance in the Yemeni curriculum.

Social and Administrative Pharmacy

Social and administrative pharmacy attracted 15.4% (n = 19) of respondents, reflecting a moderate interest in roles related to health policy, pharmacoconomics, and healthcare administration. This specialization plays a pivotal role in addressing systemic challenges in healthcare delivery, including resource allocation, policymaking, and access to medicines. The interest in this field suggests an awareness among participants of the broader systemic issues impacting Yemen's healthcare system, such as inefficiencies in pharmaceutical supply chains and regulatory frameworks. Expanding this field through postgraduate programs can

empower pharmacists to take on leadership roles in healthcare reform.

Industrial Pharmacy

Interest in industrial pharmacy was noted among 22.8% (n = 28) of participants. This field focuses on pharmaceutical manufacturing, drug formulation, and quality assurance, making it vital for ensuring the safety and efficacy of medicines. Given Yemen's limited pharmaceutical production capabilities, the moderate interest in industrial pharmacy reflects the potential for growth in this sector. Participants' preferences indicate a recognition of the importance of strengthening local pharmaceutical industries to reduce dependency on imports and address medication shortages.

Medicinal Chemistry

Medicinal chemistry was selected by 16.3% (n = 20) of participants, reflecting a greater interest in the field compared to pharmacognosy. Medicinal chemistry focuses on drug design, synthesis, and chemical analysis, requiring a strong foundation in chemistry. While this specialization has substantial potential in advancing pharmaceutical innovation, the interest in Yemen may be limited due to challenges such as the perceived complexity of the field and a lack of local career opportunities. Promoting awareness of medicinal chemistry's applications and relevance through collaborative research initiatives and practical training could help boost its appeal among pharmacy graduates.

Pharmacognosy

Pharmacognosy was the least preferred specialization, with 13.8% (n = 17) of respondents indicating interest. This field, which focuses on the study of natural products and traditional medicines, has significant cultural and traditional relevance in Yemen, where herbal and alternative medicines are widely used. The lower interest may be attributed to the limited integration of pharmacognosy into mainstream pharmaceutical education and career opportunities. To increase interest in pharmacognosy, educational institutions could emphasize its relevance to drug discovery and development and provide students with opportunities for hands-on exploration of local medicinal plants.



DISCUSSION

Our study successfully developed and validated a culturally sensitive questionnaire to assess factors influencing the pursuit of master's degrees among Yemeni pharmacy graduates. The instrument demonstrated high reliability (Cronbach's alpha = 0.86) and validity, offering a valuable tool for future research in this area. The findings revealed a high prevalence of interest in postgraduate education, emphasizing Yemeni pharmacy graduates' aspirations for professional growth and development. Clinical pharmacy emerged as the most preferred specialization, with 74.8% of participants expressing interest. This finding underscores the growing recognition of the role of clinical pharmacists in optimizing therapeutic outcomes, improving medication safety, and contributing to patient-centered care. The preference aligns with global trends; for instance, a study conducted in Saudi Arabia reported that clinical pharmacy was also the most preferred specialization among pharmacy students, with over 60% indicating interest in pursuing this field (12). A study conducted in Saudi Arabia by Saleh et al. (9) found that clinical pharmacy was the most preferred specialization among pharmacy students, with over 60% expressing interest, similar to our findings (12). This alignment reflects the shared recognition of clinical pharmacy's critical role in healthcare. In contrast, the same study reported lower interest in pharmacology, with only 38% of participants selecting it as a preferred field (14). This discrepancy may stem from contextual differences; in Saudi Arabia, the established pharmaceutical industry and well-defined career pathways might lead students to prioritize other fields such as industrial pharmacy or pharmacy practice. This similarity reflects a regional alignment in recognizing the expanding role of clinical pharmacy in healthcare systems. Globally, clinical pharmacists are increasingly integrated into multidisciplinary teams, where their expertise in medication therapy management enhances patient outcomes (13). Yemeni graduates' preference for clinical pharmacy

suggests a desire to contribute to addressing local healthcare challenges, such as inadequate medication management and limited access to clinical pharmacists in underserved areas. The prominence of clinical pharmacy reflects the global trend of integrating pharmacists into clinical settings. The increasing demand for clinical pharmacists stems from their ability to improve patient outcomes by optimizing medication use. This finding highlights the urgent need for expanding clinical pharmacy postgraduate programs in Yemen to meet the aspirations of graduates and address local healthcare gaps.

Pharmacology ranked as the second most popular specialization, with 56.9% of participants expressing interest. This preference indicates a strong inclination toward understanding drug mechanisms, therapeutic applications, and research-driven innovation. Careers in pharmacology offer opportunities to contribute to drug discovery and clinical research, which are critical for addressing healthcare challenges in Yemen, such as the reliance on imported medicines and limited local pharmaceutical research. However, this finding contrasts with a study conducted in Saudi Arabia, where only 38% of students expressed interest in pharmacology as a career path, ranking it lower than other specializations such as pharmacy practice and industrial pharmacy (14). The difference may be attributed to the participants' context; Yemeni pharmacy graduates may perceive pharmacology as a pathway to addressing unmet healthcare needs through research and innovation, particularly in a resource-constrained healthcare system. The significant interest in pharmacology underscores the participants' inclination toward research and innovation. This finding suggests that Yemeni pharmacy graduates view pharmacology as a means to contribute to drug development and therapeutic advancements, which are critical for improving access to effective and affordable medicines in Yemen. Pharmacognosy garnered a little bit low interest among the specializations and greater than medicinal



chemistry. This outcome could be attributed to several factors, including the field's demanding chemistry requirements and the perceived lack of career opportunities within Yemen. Medicinal chemistry focuses on drug design and synthesis, which require advanced infrastructure and collaboration with pharmaceutical industries—resources that are limited in Yemen. The limited interest in medicinal chemistry highlights a potential gap in the pharmacy curriculum and career awareness in Yemen. Strengthening educational initiatives that showcase the field's importance in drug discovery and development, coupled with partnerships with international pharmaceutical industries, could enhance its appeal.

The findings align with a similar study conducted in Malaysia, where medicinal chemistry was also one of the least preferred specializations among pharmacy students (15). The study highlighted that student often lacked awareness of the field's potential contributions to drug discovery and development. Increasing awareness and providing targeted mentorship or industry exposure could help Yemeni pharmacy graduates recognize the broader applications and career opportunities in medicinal chemistry.

Another study conducted in Malaysia revealed that medicinal chemistry was among the least preferred specializations, a finding consistent with our results (16). The Malaysian study attributed this trend to limited awareness of the field's applications and perceived difficulty, mirroring the challenges faced by Yemeni graduates. These comparisons highlight the importance of tailoring educational interventions to address local needs and perceptions (17-19).

While the preferences for clinical pharmacy align with studies conducted in Saudi Arabia and other countries, the differences in pharmacology interest underscore the importance of understanding the local context. Yemeni pharmacy graduates may prioritize fields that offer direct solutions to the country's healthcare challenges, while students in countries

with more developed healthcare systems might have a broader range of career aspirations.

CONCLUSION

The findings of our study provide valuable insights into Yemeni pharmacy graduates' preferences for postgraduate education, emphasizing their aspirations for professional growth and contributions to healthcare. Clinical pharmacy and pharmacology emerged as the most preferred specializations, reflecting a focus on patient care and research-driven innovation. Conversely, the low interest in pharmacognosy underscores the need for increased awareness and institutional support for underrepresented fields. These findings serve as a foundation for developing targeted educational programs and policies that align with graduates' aspirations and the evolving needs of Yemen's healthcare system.

Limitations

This study's limitations include a small pilot sample and the use of convenience sampling, potentially limiting generalizability. Future studies with larger, more diverse samples are warranted to validate these findings further. Additionally, future research could investigate actual enrollment patterns and completion rates in master's programs among Yemeni pharmacy graduates.

Strengths and Contributions

This pilot study implemented a rigorous multi-stage approach to develop a culturally sensitive questionnaire assessing Yemeni pharmacy graduates' interest in postgraduate education. The process incorporated a literature review, consultations with Yemeni pharmacy experts, and cognitive interviewing with graduates, ensuring the instrument's relevance within the Yemeni context. Pilot testing established good reliability and validity, suggesting the questionnaire's potential for future research. Notably, this study offers a validated tool specifically designed for the Yemeni context and lays the groundwork for



large-scale quantitative and qualitative investigations into postgraduate education for Yemeni pharmacists. Furthermore, the findings hold significant implications for policymakers and educators, informing strategies such as targeted scholarships, expanded program offerings, and faculty development initiatives to promote postgraduate education in Yemen.

Disclaimer

The article has not been previously presented or published and is not part of a thesis project.

Conflict of Interest

The author reports no conflicts of interest in this work.

Authors' Contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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