


RESEARCH ARTICLE

# PharmD students' perceptions of their education and future career: A cross-sectional study in Batna, Algeria

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## Keywords

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## Abstract

**Background:** As pharmacy education globally shifts toward patient-centred care, Algeria introduced the Doctor of Pharmacy (PharmD) in 2011 to modernise clinical training. This study explores the perceptions, motivations, and career expectations of PharmD students at the University of Batna 2 in Algeria. **Methods:** A descriptive cross-sectional survey was conducted among 407 PharmD students using a 37-item electronic questionnaire. The survey assessed sociodemographics, motivations, satisfaction with pharmacy education, preferred learning and assessment methods, and career aspirations. Descriptive statistics were employed to identify key trends. **Results:** The cohort was mainly female (83%), with 85.6% choosing pharmacy after their baccalaureate results, and only 29.5% listing it as their first choice. There was significant dissatisfaction with the theory-practice balance ( $1.44 \pm 0.59/5$ ). Only 34.6% completed an internship, and 35% recommended increasing practical training. Career outlook was pessimistic regarding local employment ( $1.86 \pm 0.82/5$ ), with 63% intending to emigrate, primarily to Germany and Canada. While 75% plan to specialise—mainly in medical biology (30.7%) and industrial pharmacy (23.1%)—community pharmacy was undervalued. **Conclusion:** The findings highlight a disconnect between the PharmD curriculum's theory and practical application, with limited clinical exposure and perceived local opportunities contributing to a high "brain drain." Urgent reforms are needed to modernise training, align curricula with workforce needs, and implement policies to retain pharmacy graduates in Algeria's healthcare system.

## Introduction

Pharmacy education plays a critical role in preparing healthcare professionals to meet the evolving demands of patient care, pharmaceutical services, public health systems, and medication therapy management (Felemban *et al.*, 2024). Understanding students' educational experiences and career expectations is increasingly important, as these factors influence professional readiness, career satisfaction, and workforce alignment (Wali *et al.*, 2025). Previous research has shown that pharmacy students' perceptions of their training, particularly regarding its relevance and practical applicability, are closely

associated with their future professional engagement and performance (Kassam *et al.*, 2013; Murad *et al.*, 2025).

Globally, pharmacy education has undergone substantial transformation over the past two decades, shifting from product-oriented training toward patient-centred and clinically focused practice models (Bangwal *et al.*, 2025). This transition has been supported by international frameworks emphasising competency-based education and the expanded role of pharmacists in healthcare systems (International Pharmaceutical Federation, 2016; Shahiwala, 2025). However, the implementation of such reforms remains

uneven, particularly in low- and middle-income countries, where limitations in infrastructure, experiential training capacity, and workforce integration can hinder effective curriculum delivery (WHO, 2013; Buabeng & Amo-Darko, 2025). As a result, discrepancies may arise between intended educational outcomes and students' actual learning experiences.

In Algeria, pharmacy education has evolved within a distinct historical and institutional context. Following independence in 1962, the pharmaceutical sector became largely state-controlled, with an emphasis on ensuring equitable access to medicines and developing national production capacity (Meklat & Kandi, 2025). Pharmacy training during this period was primarily oriented toward theoretical knowledge and industrial applications. Economic reforms introduced in the 1990s led to increased private sector participation, expanding professional opportunities and creating demand for pharmacists with more diverse and practice-oriented competencies (Benkediad & Hadada, 2024)

To align with international developments, Algeria introduced the Doctor of Pharmacy (PharmD) programme in 2011 (Azzouz, 2019). This reform aimed to strengthen clinical training, pharmacotherapeutic knowledge, and practical skills in order to better prepare graduates for patient-centred roles. Nevertheless, several challenges have been reported, including limited availability of structured clinical placements, variability in training quality, and difficulties in integrating experiential learning into the curriculum. Similar implementation challenges have been documented in other educational contexts undergoing curricular transition (Al-Worafi, 2024).

The Department of Pharmacy at the University of Batna 2 represents a key institution for pharmacy education in eastern Algeria. Established in 2001, it enrolled 1,651 students during the 2024–2025 academic year. The programme offers a comprehensive curriculum covering pharmaceutical sciences, biological sciences, and emerging clinical components. However, as in many comparable settings, the integration of practical and clinical training remains constrained by infrastructural and logistical limitations, including restricted access to training sites and evolving partnerships with healthcare institutions (Al-Worafi, 2024).

In this context, examining students' perceptions provides valuable insight into how educational reforms are experienced at the ground level. This study explores the perceptions of PharmD students at the University of Batna 2 regarding the quality and structure of their education, preferred learning and assessment methods, and future career aspirations. By focusing on

a single institutional setting, the study aims to offer a contextualised understanding of pharmacy education in Algeria while contributing to broader discussions on aligning educational outcomes with professional expectations.

Ultimately, the findings may inform efforts to enhance curriculum design, strengthen experiential learning opportunities, and support students' transition into professional practice within an evolving pharmaceutical landscape.

## Methods

### Study design

This descriptive cross-sectional study was conducted among PharmD students enrolled at the University of Batna 2, Batna, Algeria. A structured questionnaire was developed based on published instruments (Noble *et al.*, 2014; Yousif *et al.*, 2014; Nathan *et al.*, 2017; Alhaddad, 2018; James *et al.*, 2018; Ouahab *et al.*, 2024) and the CROSS checklist (Sharma *et al.*, 2021). The questionnaire comprised 37 items across four main sections: sociodemographic characteristics, motivations for choosing pharmacy, satisfaction with the current pharmacy education programme, and career aspirations and perceptions. The complete survey is in Appendix A.

The sociodemographic section comprised 11 items, including age, gender, academic year, and socioeconomic background. The career motivation section included six items addressing intrinsic and extrinsic factors influencing the choice of pharmacy as a career. The educational satisfaction section consisted of 13 items evaluating students' perceptions of the quality of theoretical instruction, practical training, and overall curriculum satisfaction. The professional trajectory section included seven items capturing sector preferences, career expectations, and perceived barriers to employment. Most items employed closed-ended response formats, such as multiple-choice questions and Five-point Likert scales ranging from "strongly disagree" to "strongly agree," while a small number of open-ended questions allowed participants to elaborate on suggestions or experiences.

The questionnaire was pilot-tested with 20 students who were not included in the final sample to assess clarity and comprehension. Feedback from the pilot led to minor wording modifications to enhance clarity. Internal consistency was assessed only for the 13-item educational satisfaction domain. CROSS reporting guidelines were followed to ensure transparent reporting of the study methods, although they were

used solely as a reporting framework rather than a development tool.

### **Data collection**

Data were collected between 15 March 2025 and 15 May 2025 using a structured electronic questionnaire administered via Google Forms. The survey link was distributed through institutional Telegram channels and faculty-managed social media groups to reach all PharmD students enrolled at the University of Batna 2. Participation was voluntary, and electronic informed consent was obtained from all respondents prior to completing the survey. To ensure privacy, no personally identifiable information was collected, and mandatory response fields minimised missing data.

Although the minimum required sample size of 312 was calculated using Cochran's formula, the study employed convenience sampling, and therefore the sample may not be fully representative of the total student population.

### **Sample characteristics**

Participants were current PharmD students at the University of Batna 2 across all six years of study. A convenience sampling method was used. Inclusion criteria were enrollment in the PharmD programme during the data collection period and provision of informed consent. Based on an estimated student population of 1651, and to achieve a 95% confidence level with a 5% margin of error, the minimum sample size required was 312 students. Since all participants responded to the same standardised online form, measurement methods were consistent across the entire sample, with no subgroup-specific instruments or variations in administration.

### **Ethical considerations**

Ethical approval was obtained from the scientific committee of the department of pharmacy at the University of Batna 2 (Approval No. 11/CS/DP/FM/2024). As this study involved an anonymised online survey and did not collect identifiable personal data or images, formal written consent was not required, in accordance with the journal's ethical guidelines. Participation in the survey was voluntary.

### **Statistical analysis**

Data were exported from Google Forms to Microsoft Excel and analysed using IBM SPSS Statistics version 27.0. Descriptive statistics—including means and standard deviations for continuous variables, and

frequencies and percentages for categorical variables—were used to summarise participant responses.

No multivariate analyses or confounder adjustments were performed, as the study was exploratory in nature. Subgroup and interaction analyses were not conducted due to the absence of predefined stratifications or interaction hypotheses. Missing data were not an issue, as all questionnaire items were mandatory in the electronic survey platform. Given the convenience sampling approach, no weighting or sampling strategy adjustments were required. Sensitivity analyses were not applicable due to the descriptive and cross-sectional design of the study.

## **Results**

### **Sociodemographic information**

Based on the data collected from 407 pharmacy students in Batna, Algeria, as shown in Table 1, corresponding to a participation rate of 24.6% (407/1,651 eligible students). The average age of the respondents was 21.19±2.28 years. The mean baccalaureate score was 15.81±0.62 out of 20. The gender distribution was 83% female and 17% male. Nationality was 99.8% Algerian and 0.2% Syrian. City of residence was 52.1% Batna and 47.9% out of Batna. Marital status was 98.8% single and 1.2% married. High school branch of study was 95% Experimental sciences, 2.5% Mathematics and 2.5% Technical mathematics. Year of study distributed as comes: 27.3% first year, 15.2% second year, 9.8% third year, 8.8% fourth year, 30% fifth year and 8.8% sixth year. Preferred language of study was 18.9% Arabic, 29.2% English and 51.8% French. Preferred language was defined as the language that students personally favour for receiving instruction and academic materials. 56.8% of students resided in the college dorm, 42% with family and 1.2% resided independently. 11.5% of students' family members were pharmacists, 42.8 health care professionals and 45.7 occupied other jobs.

### **Motivation and reasons for choosing pharmacy**

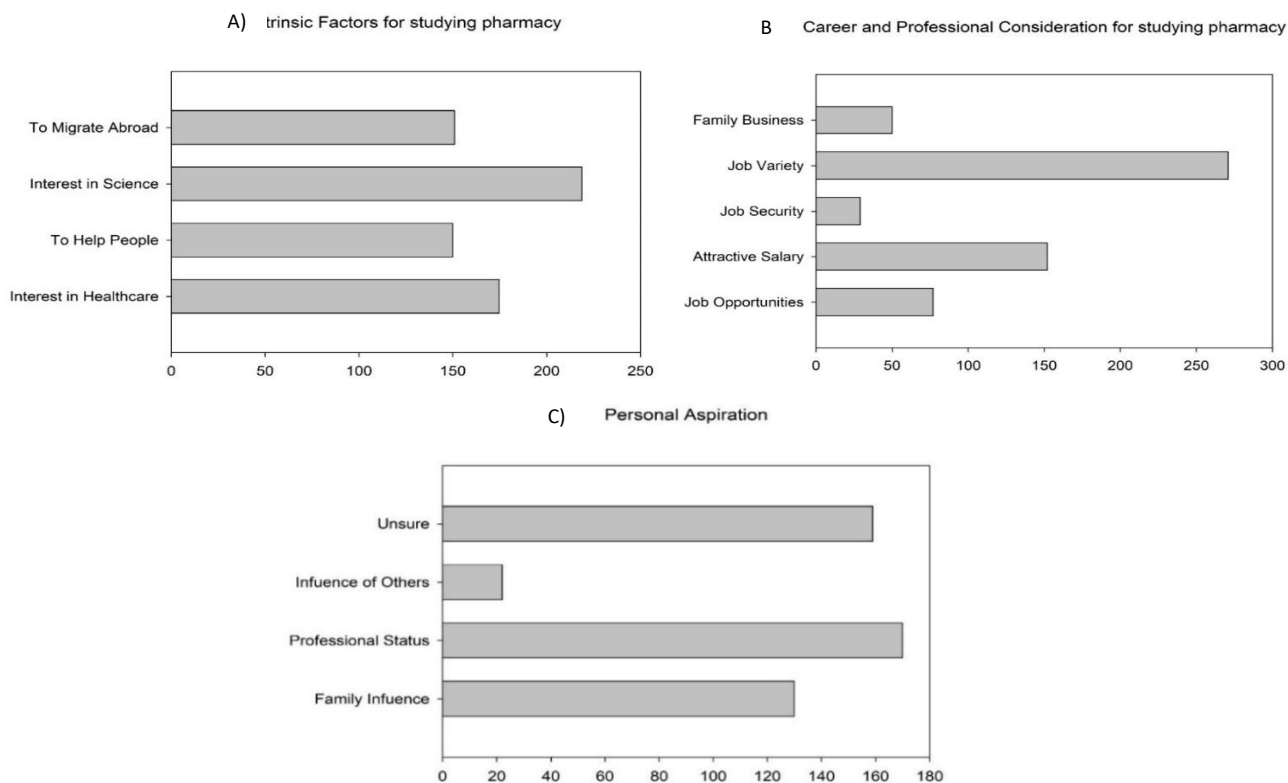
As shown in Table I, Most students (85.6%) decided to pursue pharmacy after receiving their baccalaureate results, while only 14.4% had considered it earlier. Pharmacy was the first academic choice for 29.5% of respondents, compared to 48.4% who initially preferred medicine. In university selection rankings, pharmacy was listed as the third choice by the largest proportion (34.2%), followed by second (32.2%) and first (24.6%).

**Table 1: Respondent characteristics**

		Mean	Std. deviation
Age		21.19	2.28
High school baccalaureate score /20		15.81	0.62
		Number N( total n=407 )	Percentage %
<b>Gender</b>	Male	69	17
	Female	338	83
<b>Nationality</b>	Algerian	406	99.8
	Syrian	1	0.2
<b>City of residence</b>	Batna	212	52.1
	Outside of Banta	195	47.9
<b>Marital status</b>	Single	402	98.8
	Married	5	1.2
<b>High school branch of study</b>	Experimental sciences	387	95
	Mathematics	10	2.5
	Technical mathematics	10	2.5
<b>Year of study</b>	1st	111	27.3
	2nd	62	15.2
	3rd	40	9.8
	4th	36	8.85
	5th	122	30
	6th	36	8.85
<b>Preferred language of study</b>	Arabic	77	18.95
	English	119	29.2
	French	211	51.85
<b>Residence</b>	College dorm	231	56.8
	With family	171	42
	independent	5	1.2
<b>Family member</b>	Pharmacist	47	11.5
	Health care professional	174	42.8
	Other	186	45.7
<b>Decision to pursue pharmacy</b>	Before high school	14	3.4
	During high school	45	11
	After baccalaureate exam	349	85.6
<b>First choice of academic specialisation</b>	Pharmacy	120	29.5
	Medicine	197	48.4
	Dentistry	57	14
	Other	33	8.1
<b>Rank of pharmacy in university choices</b>	1st	100	24.6
	2nd	131	32.2
	3rd	139	34.2
	4 <sup>th</sup>	37	9.1

Students reported a combination of intrinsic, personal, and professional motivations for selecting pharmacy. Interest in science was the most cited intrinsic factor, as shown in Figure 1A. Personal influences were more evenly distributed, with relatively fewer students

indicating external encouragement or family pressure (Figure 1B). Professionally, job variety and the prospect of an attractive salary were the dominant drivers, as displayed in Figure 1C, highlighting the weight of career-related expectations in their academic choice.



**Figure 1: Factors for choosing pharmacy among Batna PharmD students: A) Intrinsic factors for studying pharmacy, B) Career and professional consideration for studying pharmacy, C) Personal Aspiration**

**Learning experience & curriculum quality**

As shown in Table II, students rated the balance between theory and practice the lowest ( $1.44 \pm 0.59$ ), followed by curriculum alignment with current advancements ( $2.09 \pm 0.95$ ) and laboratory equipment

( $2.03 \pm 1.00$ ). The highest ratings were given to teachers' competence ( $3.04 \pm 1.11$ ) and transportation accessibility ( $3.45 \pm 1.13$ ). These findings reflect dissatisfaction with practical training and overall infrastructure.

**Table II: Satisfaction with education**

Statement	Number of students' level of agreement					Mean	Std. deviation
	1	2	3	4	5		
The education is good	43	156	128	72	8	2.62	0.959
The curriculum is well-structured	93	171	109	32	1	2.21	0.901
The curriculum is aligned with current advancements	116	188	55	46	2	2.09	0.954
There is a balance between theory and practice	244	151	8	4	0	1.44	0.588
The timetable is organised	81	141	91	88	6	2.5	1.082
The teachers are competent	38	97	113	128	31	3.04	1.11
The assessment system is fair	80	148	116	60	3	2.41	0.988
The university provides learning resources	96	165	91	53	2	2.26	0.979
The classrooms are well-equipped	125	166	71	42	3	2.10	0.977
The laboratories are well-equipped	143	159	56	46	3	2.03	1.004
The library is a good studying environment	137	144	68	52	6	2.13	1.065
The administration is cooperative	78	133	136	55	5	2.45	0.989
The transportation is accessible	38	78	48	147	96	3.45	1.129

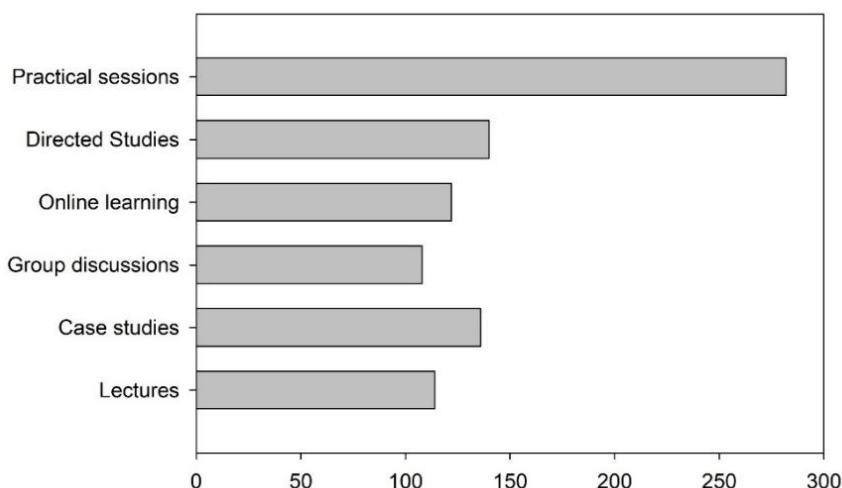
Cronbach's Alpha: 0.855

As presented in Table III, only 34.6% of students had completed an internship, while 61.7% were planning to do so, and 3.7% expressed no interest. Regarding assessment preferences, nearly half of the students (49.2%) favoured simple-choice questions, followed by multiple-choice questions (38.8%), with far fewer

preferring short-answer (8.8%) or essay-type assessments (3.2%). As illustrated in Figure 2, students favoured visual and practical learning methods over traditional lectures, highlighting a preference for applied, student-centred approaches.

**Table III: Internship and assessment type**

		Number N( total n=407 )	Percentage%
Opportunity to do an internship	Yes	141	34.6
	No, planning to	251	61.7
	No, don't want to	15	3.7
Favourite assessment type	Multiple-choice questions	158	38.8
	Simple-choice questions	200	49.2
	Short-answer questions	36	8.8
	Essays	13	3.2



**Figure 2: Preferred learning methods of Batna PharmD students**

As presented in Table IV, students' subject preferences varied by academic level and were summarised using an interest score, calculated by dividing the number of mentions by the number of students eligible to rate each academic year (i.e., those who had completed or were currently enrolled in that year). In the first year, cell biology (0.61), general chemistry (0.56), and organic chemistry (0.51) were the top choices. In the second year, genetics

(0.65) and biochemistry (0.63) led preferences. Third-year students favoured pharmacology (0.85), galenic pharmacy (0.76), and therapeutic chemistry (0.73). In the fourth year, hemobiology (0.85), clinical biochemistry (0.72), and microbiology (0.71) were the most selected. By the fifth year, toxicology (0.90) and clinical pharmacy (0.88) emerged as the most appreciated subjects, reflecting a growing interest in applied clinical content.

**Table IV: Preferred subjects across academic years**

Subject	Mentions	Eligible students	Year	Interest score
Cell Biology	247	407	1	0.61
General Chemistry	226	407	1	0.56
Organic Chemistry	209	407	1	0.51
Physiology	171	407	1	0.42
Anatomy	162	407	1	0.40
Plant Biology	136	407	1	0.33
History of pharmacy	88	407	1	0.22
Physics	47	407	1	0.12
French for Medical Studies	39	407	1	0.10
Bio maths	36	407	1	0.09
Bio stats and informatics	36	407	1	0.09
Genetics	192	296	2	0.65
Biochemistry	185	296	2	0.63
Physiopathology	154	296	2	0.52
Pharmaceutical Botany	123	296	2	0.42
Mineral chemistry	102	296	2	0.34
Analytical Chemistry	86	296	2	0.29
Biophysics	48	296	2	0.16
French and English	24	296	2	0.08
Pharmacology	200	234	3	0.85
Galenic Pharmacy	177	234	3	0.76
Therapeutical Chemistry	171	234	3	0.73
Pharmacognosy	97	234	3	0.41
Semiology	91	234	3	0.39
Analytical Chemistry	70	234	3	0.30
Hemobiology	164	194	4	0.85
Clinical Biochemistry	139	194	4	0.72
Microbiology	138	194	4	0.71
Immunology	114	194	4	0.59
Parasitology	107	194	4	0.55
Toxicology	142	158	5	0.90
Clinical Pharmacy	139	158	5	0.88
Industrial Pharmacy	74	158	5	0.47
Hospital Pharmacy	48	158	5	0.30
Hydro-Bromatology	30	158	5	0.19
Pharmaceutical Management	28	158	5	0.18
Pharmaceutical Law	27	158	5	0.17
Epidemiology	26	158	5	0.16

**Future goals & career aspirations**

As shown in Table V, 75% of students indicated their intention to pursue further specialisation, with the

most desired fields being medical biology (30.7%), industrial pharmacy (23.1%), and hospital pharmacy (14.5%).

**Table V: Future goals and aspirations**

		Number N( total n=407 )	Percentage%				
Pursuing Further specialisation	Yes	305	75				
	No	102	25				
Preferred future pharmacy job	Medical biologist pharmacist	125	30.7				
	Industrial pharmacist	94	23.1				
	Distribution pharmacist	16	3.9				
	Hospital pharmacist	59	14.5				
	Community pharmacist	54	13.3				
	Teacher and Researcher	59	14.5				
Applying for jobs abroad	Yes	258	63.4				
	No	149	36.6				
Opening own pharmacy	Yes	333	81.8				
	No	74	18.2				
Advise to study pharmacy	Yes	226	55.5				
	no	181	44.5				
Score	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	Mean	SD
Ease of finding a job after graduation	154	167	75	10	1	1.862	0.815

Table VI details specific specialty preferences, where cosmetology and dermopharmacy (23%) and clinical pharmacy (16.4%) received the highest interest. Regarding employment outlook, only 3% of students rated finding a job after graduation as easy, while the

majority expressed pessimism, with a mean score of  $1.86 \pm 0.82$  on a 5-point scale (Table V). Ideal starting monthly salaries reported by students averaged  $82400 \pm 36400$  DZD/month.

**Table VI: Specialty of choice**

Speciality	Number N( total n=305 )	Percentage%
Cosmetology and dermopharmacy	70	23
Clinical pharmacy	50	16.4
Immunology	30	9.8
Microbiology	26	8.5
Toxicology	22	7.2
Hemobiology and blood transfusion	21	6.9
Biochemistry	20	6.6
Pharmacognosy	11	3.6
Galenic pharmacy	10	3.3
Pharmacoeconomics and market access	10	3.3
Hospital pharmacy	6	2
Metrology and quality in the pharmaceutical industry	6	2
Parasitology and mycology	5	1.6
Therapeutic chemistry	5	1.6
Analytical chemistry	4	1.3
Regulatory affairs in the Pharmaceutical industry	4	1.3
Cryptogamy and medical botany	4	1.3
Pharmaceutical biophysics	1	0.3
Hydrology and bromatology	0	0

In response to an open-ended question on preferred destinations for going abroad, among the 63% of students who expressed intent to work abroad, Germany was the most frequently cited destination (26.9%), followed by Canada (19.7%), France (14.7%), and the United States (13%), as shown in Table VII. Gulf countries such as Qatar (10.1%) and Saudi Arabia (5%) were also notable preferences. A smaller proportion considered other European countries, including Belgium, the UK, and Switzerland. Only 3.4% had not yet decided on a destination, indicating a strong tendency among students to plan migration early in their career thinking.

**Table VII: Country/region preferences (open-ended questions)**

Country/region	Number of mentions	Relative frequency
Germany	64	26.9
Canada	47	19.7
France	35	14.7
USA	31	13
Qatar	24	10.1
Saudi Arabia	12	5
Belgium	11	4.6
UAE	10	4.2
UK	9	3.8
Europe	9	3.8
Have not decided yet	8	3.4
Switzerland	4	1.7
Spain	4	1.7
Turkey	4	1.7
South Korea	2	0.8
Russia	2	0.8
China	2	0.8
Ireland	2	0.8
japan	2	0.8
Gulf	2	0.8
Middle East	1	0.4
Norway	1	0.4
Italy	1	0.4

#### **Student suggestions for educational improvement**

The most frequently cited student recommendation was to increase practical training through more internships, lab sessions, and hands-on work (35%). This was followed by calls to improve and modernise the curriculum (21%) and enhance job opportunities and professional protection (14%). Additional suggestions included improving teaching quality (11%), shifting the language of instruction from French to

English or Arabic (8%), and reducing the number of admitted students to manage overcrowding (6%). Other notable concerns included infrastructure, early clinical exposure, and psychological or administrative support.

#### **Discussion**

The sociodemographic profile of the study cohort (mean age:  $21.19 \pm 2.28$  years; 83% female) reflects the prevailing gender distribution in pharmacy education across the MENA region and aligns with international patterns. For instance, a large cross-sectional study in Jordan reported 82% female enrolment in PharmD programmes (Abdelhadi *et al.*, 2025). Similarly, gendered motivations for choosing pharmacy as a field of study have been noted elsewhere: females tend to be influenced by academic performance and altruistic motives, while males often cite job opportunities and family business considerations (Abdelhadi *et al.*, 2025). These findings are consistent with our data, where 83% of respondents were female, and motivations included academic interest, job security, and perceived prestige. Reported results in our study are descriptive of this cohort and may be broadly comparable to patterns noted elsewhere, though direct equivalence cannot be assumed.

Only 29.5% of Batna students selected pharmacy as their first choice, comparable to findings from Iraq, where pharmacy is often seen as a second-tier option compared to medicine (Mohammed *et al.*, 2023). In Sudan, however, over 75% of students chose pharmacy as their first choice, highlighting cross-country variability in student motivation (Yousif *et al.*, 2014). These contrasts suggest that national contexts and admission systems substantially shape educational trajectories and perceptions.

Language was considered an important contextual factor that may influence students' perceptions. Although pharmacy education in Algeria is currently delivered primarily in French, 51.8% of respondents indicated a preference for French as the language of instruction, while others favoured Arabic or English. Accordingly, students were asked to specify their preferred language of learning (Arabic, French, or English). This consideration is particularly relevant in light of the post-2019 policy orientation of the Algerian Ministry of Higher Education and Scientific Research (MESRS) toward increasing the use of English as a medium of instruction, as part of broader efforts to align higher education with national priorities and international standards (Bouherar & Salem, 2025).

Our study also revealed dissatisfaction with practical training, with the theory–practice balance scoring lowest among all educational parameters ( $1.44 \pm 0.59/5$ ). This trend aligns with Sudanese students who also preferred practical and interactive teaching methods (Yousif *et al.*, 2014). In Iraq, more than half of PharmD students reported inadequate hands-on experience (Mohammed *et al.*, 2023), while in our study, only 34.6% had completed internships. In contrast, the U.S. and Jordan mandate structured clinical training components and report higher student satisfaction (Munger *et al.*, 2022; AlMuhaisen *et al.*, 2023). A global trend emerges where practical preparedness correlates with curriculum quality and mentorship availability.

Nearly half of the students (49.2%) indicated a preference for simple-choice assessments, making this the most commonly preferred assessment format. This finding highlights the predominant role of multiple-choice formats in the current curriculum.

Career aspirations showed relatively high emigration intent, with 63% planning to work abroad—Germany and Canada being the top destinations. This mirrors findings from the U.S., where financial stability (97%), prestige (88%), and work-life balance (87%) were key motivators (Osmond *et al.*, 2022). Yet, unlike their Western peers, Batna students face constrained local opportunities, pushing them to seek careers abroad. This reflects broader structural and policy shortcomings in workforce planning. Many students expressed concern that finding employment as a pharmacist may be challenging after graduation. This perception likely reflects the current labour market conditions and the competitive nature of pharmacy-related employment in Algeria. Addressing these concerns through career guidance, internships, and practical exposure could help align students' expectations with professional opportunities and support more informed career planning.

A total of 55.5% of respondents indicated that they would recommend pharmacy as a career. Longitudinal U.S. data showed a similar decline in willingness to recommend pharmacy over time, primarily due to increasing stress and financial concerns (Munger *et al.*, 2022). In both contexts, stress is exacerbated by unclear professional roles and unmet expectations regarding salary and job availability.

Globally, career preferences consistently favour hospital and clinical pharmacy, with community pharmacy undervalued despite being the most accessible employment sector. This paradox is confirmed in our findings (only 14.5% favoured community pharmacy) and corroborated in Malaysian

and Jordanian contexts as well (Hussain *et al.*, 2020). Socioeconomic background also plays a role.

In summary, the Algerian case aligns with global trends showing high motivation and ambition among PharmD students, but also reveals persistent disconnects between education, practice, and employment. Cross-national evidence reinforces the need for structural reforms, enhanced practical training, improved career counselling, and better alignment with labour market realities.

Finally, several limitations should be acknowledged. The study used convenience sampling, which may have introduced selection bias and potentially overrepresented students from Batna, while underrepresenting those less active on social media. It is important to note that first-year students may have limited familiarity with the structure and requirements of the PharmD programme compared to those in later years. Consequently, the insights drawn from their responses may be less comprehensive, and comparisons across academic years should be interpreted with caution. The cross-sectional design limits the ability to assess changes in perceptions over time. As a single-institution study, the findings may not be generalisable to other pharmacy programmes in Algeria. Participation was voluntary, and self-selection could have influenced the results. Non-responders could not be assessed, and social desirability bias may have affected responses. In addition, while the survey was adapted from validated instruments, formal psychometric validation for this specific context was limited, particularly beyond the educational satisfaction domain. These factors should be considered when interpreting the results.

## Conclusion

This study provides critical insights into the perceptions, motivations, and career expectations of PharmD students at the University of Batna 2. While students demonstrate strong academic credentials and a clear interest in pharmaceutical sciences, the findings highlight systemic deficiencies in practical training, infrastructure, and curricular relevance. There is a marked disconnect between students' aspirations and the realities of the Algerian job market, particularly regarding community pharmacy, specialisation opportunities, and salary expectations.

The prevalence of dissatisfaction with hands-on learning, coupled with high emigration intent, underscores an urgent need for reform. Strengthening clinical exposure, modernising curricula, enhancing

faculty development, and building strategic partnerships with healthcare institutions are essential steps toward producing competent, workforce-ready graduates. Furthermore, policy-level interventions to regulate professional roles, admission quotas, and career pathways are vital to aligning pharmacy education with national health priorities and improving graduate retention.

## Funding

No funds or grants were received.

## Conflict of interest

There are no conflicts of interest.

## Ethics approval and informed consent

Ethics approval was obtained from the scientific committee of the department of pharmacy at the University of Batna 2, participants gave informed consent before taking part.

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## References

- Abdelhadi, N., Al-Meanazel, A., Al-Halaseh, L., Alsous, M., Al-Shatnawi, S., Jaffal, A., Mohammad, M., & Darwish, R. (2025). Pharmacy students' motivations, satisfaction, and future career plans: A cross-sectional study exploring gender differences. *PLOS One*, **20**. <https://doi.org/10.1371/journal.pone.0317896>
- Alhaddad, M. S. (2018). Perception of pharmacy students and pharmacists in Saudi Arabia towards preceptor and experiential learning in undergraduate pharmacy programs. *Saudi Pharmaceutical Journal*, **26**(5), 634–639. <https://doi.org/10.1016/j.jsps.2017.05.002>

- AlMuhaisen, E., AlQudah, R., Al-Delaimy, W. K., & Al-Qerem, W. (2023). Pharmacy education and practice in Jordan: Current challenges and future opportunities in the era of PharmD. *Human Resources for Health*, **21**(1), 29. <https://doi.org/10.1186/s12960-023-00836-2>

- Al-Worafi, Y. M. (2024). Pharmacy Education Training in Developing Countries. In *Medical and Health Sciences in Developing Countries: Education, Practice, and Research* (pp. 1-17). Cham: Springer International Publishing. [https://doi.org/10.1007/978-3-030-74786-2\\_151-1](https://doi.org/10.1007/978-3-030-74786-2_151-1)

- Azzouz, N. (2019). Réforme de l'enseignement supérieur en Algérie : entre politique et pratique. *Algerian Scientific Journal Platform*, **7**(2). <https://www.asjp.cerist.dz/en/article/96016>

- Bangwal, D. R., Jaiswal, D. N., Lakra, J., Sharma, A., & Bhatia, K. (2026). *Dimensions of clinical pharmacy practice: Integrating pharmacotherapy, patient-centered care, and artificial intelligence*. Deep Science Publishing (2025). <http://dx.doi.org/10.2139/ssrn.6008097>

- BENKEDIDAH, S., & HADADA, F. (2024). The Reality of the Pharmaceutical Industry in Algeria: with Reference to Saidal Group and Biopharm Company. *Management & Economics Research Journal* **6**(2), 489–507. <https://asjp.cerist.dz/en/article/247054>

- Bouherar, S., Salem, S. (2025). A Review of Algerian Higher Education Reforms, 1962–2019. In *Sustainability in Algerian Higher Education*. Palgrave Macmillan, Cham. [https://doi.org/10.1007/978-3-031-81347-4\\_3](https://doi.org/10.1007/978-3-031-81347-4_3)

- Buabeng, I., & Amo-Darko, B. (2025). Curriculum reforms without foundation: The effects of inadequate preparation in curriculum reforms on Ghanaian teachers and the education system. *Curriculum Perspectives*, **45**(2), 133–147. <https://doi.org/10.1007/s41297-025-00309-7>

- Felemban, E. J., Almasoudi, M. M., Alzaidi, N. A., Haij, H. E., Alsuqati, H. A. M., Alkhamash, A. S., ... & Alhazmi, M. A. (2024). The Evolving Role of Pharmacy Professionals in Modern Healthcare Systems. *Journal of International Crisis and Risk Communication Research*, **7**(S8), 3048. <https://doi.org/10.63278/jicrcr.vi.2313>

- Hussain, M., Sahudin, S., Fauzi, S., Manaf, N., & Wahab, M. (2020). Exploring pharmacy students' chosen career path: A year-on-year perspective. *Higher Education*, **81**, 1257–1272. <https://doi.org/10.1007/s10734-020-00610-6>

- International Pharmaceutical Federation (FIP). (2016). *Global Vision for Education and Workforce*. The Hague: FIP. [https://developmentgoals.fip.org/resources/global-vision-for-education-and-workforce-presented-at-the-global-conference-on-pharmacy-and-pharmaceutical-sciences-education-2016/?utm\\_source=chatgpt.com](https://developmentgoals.fip.org/resources/global-vision-for-education-and-workforce-presented-at-the-global-conference-on-pharmacy-and-pharmaceutical-sciences-education-2016/?utm_source=chatgpt.com)

- James, D., Namadu, M. K., & Suleiman, I. (2018). Pharmacy students' perceptions of their profession relative to other healthcare professions. *Saudi Pharmaceutical Journal*, **26**(4), 550–555. <https://doi.org/10.1016/j.jsps.2017.10.005>

- Kassam, R., Collins, J. B., & Wilson, K. (2013). Pharmacy education and practice in developing countries: Challenges and opportunities. In *Pharmacy Practice in Developing Countries* (pp. 333–349). Academic Press. <https://doi.org/10.1016/B978-0-12-407759-6.00015-3>

- Meklat, A., & KANDI, N. (2025). The Algerian pharmaceutical industry and access to medicines. *Journal of El-Manhel Economy*, **8**(1), 1103–1116. <https://asjp.cerist.dz/en/article/269441>
- Mohammed, S., Hussain, A., & Hussain, H. (2023). The PharmD students' beliefs, perceptions, and challenges regarding their first year in the PharmD program: A qualitative study. *Al-Rafidain Journal of Medical Sciences*, **4**(1). <https://doi.org/10.54133/ajms.v4i.124>
- Munger, M., Tak, C., Henchey, C., Dey, S., & Feehan, M. (2022). Longitudinal analysis of PharmD program students' satisfaction and stress. *Currents in Pharmacy Teaching and Learning*, **14**(8), 959–965. <https://doi.org/10.1016/j.cptl.2022.07.012>
- Murad, M. S., & Alajmi, Z. (2025). A Qualitative Study on Pharmacy Students' Motivation, Academic Performance, and Career Intentions Using Self-Determination Theory. *American Journal of Pharmaceutical Education*, **101916**. <https://doi.org/10.1016/j.ajpe.2025.101916>
- Nathan, J. A., Sankaranarayanan, V. S., & Sindhu, K. (2017). Pharmacy students' perception and feedback on teaching-learning methodology and evaluation methods in a medical college in South India. *Journal of Young Pharmacists*, **9**(1), 117–121. <https://doi.org/10.4103/0975-1483.210541>
- Noble, C., Shaw, P. N., Coombes, I., Nissen, L. M., & Clavarino, A. (2014). Becoming a pharmacist: The role of curriculum in professional identity formation. *Research in Social and Administrative Pharmacy*, **10**(4), 601–613. <https://doi.org/10.1016/j.sapharm.2013.05.003>
- Osmond, D., Shcherbakova, N., & Huston, S. (2022). Prestige and financial stability: Motivating factors to pursue a doctor of pharmacy degree. *The International Journal of Pharmacy Practice*, **31**(1), 95–101. <https://doi.org/10.1093/ijpp/riac086>
- Ouahab, A., Fetni, S., & Ouahab, S. (2024). Hospital pharmacists' education, career paths, and continuous education: A cross-sectional survey in Batna, Algeria. *Pharmacy Education*, **24**(1), 638–648. <https://doi.org/10.46542/pe.2024.241.638648>
- Shahiwala, A. (2025). Competency-based education in pharmacy-Challenges, opportunities, and the path forward. *Currents in Pharmacy Teaching and Learning*, **17**(7), 102358. <https://doi.org/10.1016/j.cptl.2025.102358>
- Sharma, A., Minh Duc, N. T., Luu Lam Thang, T., et al. (2021). A consensus-based checklist for reporting of survey studies (CROSS). *Journal of General Internal Medicine*, **36**(10), 3179–3187. <https://doi.org/10.1007/s11606-021-06737-1>
- Wali, S. M., Ashour, A. M., Alorfi, N. M., Alshehri, F. S., Aldurdunji, M. M., Harbi, M. H., ... & Alzahrani, S. H. (2025). Exploring the career aspirations and motivations of doctor of pharmacy students: A qualitative study. *Medicine*, **104**(24), e42866. <https://doi.org/10.1097/MD.00000000000042866>
- World Health Organization. (2013). *Transforming and scaling up health professionals' education and training: WHO education guidelines 2013*. <https://apps.who.int/iris/handle/10665/93635>
- Yousif, M., Eldalo, A., Albarraq, A., Sirag, N., & Ibrahim, M. (2014). Pharmacy students' perception about education and future career. *Archives of Pharmacy Practice*, **5**, 72–77. <https://doi.org/10.4103/2045-080X.132656>

## Appendix A: Questionnaire

Pharmacy students' perceptions of their education and future career

Thank you for taking the time to participate in this survey. This form aims to gather insights into pharmacy students' experiences, motivations, and future career aspirations. Your responses will help us better understand the factors influencing pharmacy education and career choices.

The survey consists of four sections:

- Sociodemographic Information: Basic details to understand the background of respondents.
- Motivation and Reasons for Choosing Pharmacy: Factors that led you to choose pharmacy as a career.
- Learning Experience & Curriculum Quality: Your views on the quality, challenges, and preparedness provided by your education.
- Future Goals & Career Aspirations: Your plans and preferences for specialisation and career pathways.

Your participation is completely voluntary and anonymous. All responses will be used for research purposes only. This survey should take approximately 5-10 minutes to complete.

Thank you for your valuable input! By taking part in this survey, you consent that you voluntarily want to participate.

### Section 1: Socio-demographic Information / شخصية معلومات

- Age / العمر: [Short answer text]
- Gender / الجنس:
  - Male / ذكر
  - Female / أنثى
- Nationality / الجنسية: [Short answer text]
- City of Residence / مدينة الإقامة: [Short answer text]
- Marital status / الحالة الزوجية:
  - Single / أعزب
  - Married / متزوج
  - Divorced / مطلق
  - Widowed / أرمل
- High school branch of study / شعبة الدراسة في الثانوية:
  - Experimental Sciences / علوم تجريبية
  - Mathematics / رياضيات
  - Technical Mathematics / تقني رياضي
- Bac exam result / معدل البكالوريا: [Short answer text]
- Year of study / العام الدراسي:
  - 1st / أولى
  - 2nd / ثانية
  - 3rd / ثالثة
  - 4th / رابعة
  - 5th / خامسة
  - 6th / سادسة
- Preferred language of study / اللغة المفضلة للدراسة:
  - Arabic / عربية
  - English / انجليزية
  - French / فرنسية
- Where do you currently live? / أين تقيم حالياً؟
  - Dorm / إقامة جامعية
  - Independent / بمفردك
  - With family / مع العائلة
- Any family members in the pharmacy/healthcare field? / هل لديك أفراد من العائلة في الصيدلة/المجال الصحي؟
  - Pharmacist / صيدلي
  - Healthcare field / مجال الصحة
  - No / لا

### Section 2: Motivation and Reasons for Choosing Pharmacy / دوافع وأسباب اختيار الصيدلة

- When did you decide to pursue pharmacy? / متى قررت دراسة الصيدلة؟
  - Before high school / قبل المدرسة الثانوية
  - During high school / خلال المدرسة الثانوية
  - After Bac exam / بعد امتحان البكالوريا
- First choice of academic specialisation / الاختيار الأول للتخصص الأكاديمي:
  - Pharmacy / صيدلة
  - Medicine / طب

- o Dentistry / طب الأسنان
- o Other...
- What was pharmacy's rank in your choices? / ما هو ترتيب الصيدلة في اختياراتك؟
- o 1st / الأول
- o 2nd / الثاني
- o 3rd / الثالث
- o 4th / الرابع
- Intrinsic Factors for studying pharmacy / العوامل الجوهرية لدراسة الصيدلة [Checkboxes]
- o Interest in Healthcare / الاهتمام بالرعاية الصحية
- o To Help People / لمساعدة الناس
- o Interest in Science / الاهتمام بالعلوم
- o To Migrate Abroad / للهجرة إلى الخارج
- Career and Professional Consideration for studying pharmacy / الاعتبارات المهنية والوظيفية لدراسة الصيدلة [Checkboxes]
- o Job Opportunities / فرص العمل
- o Attractive Salary / راتب مغري
- o Job Security / وظيفة مضمونة
- o Job Variety / تنوع مجالات العمل
- o Family Business / عمل عائلي
- Personal Aspiration / الأسباب الشخصية [Checkboxes]
- o Family Influence / تأثير الأسرة
- o Professional Status / سمعة المهنة
- o Influence of Others / تأثير الآخرين
- o Unsure / غير متأكد

### Section 3: Learning Experience & Curriculum Quality / تجربة التعلم و جودة الدراسة

Answer based on your opinion / أجب بناءً على رأيك:

(Scale: Strongly disagree, Disagree, Neutral, Agree, Strongly agree)

1. The educational goals are clearly defined.
  2. The curriculum is well-structured.
  3. The curriculum covers necessary practical skills.
  4. There is a balance between theory and practice.
  5. The time table is well-organised.
  6. The teachers are supportive and knowledgeable.
  7. The assessment methods are fair.
  8. The university environment is encouraging.
  9. The classrooms are well-equipped.
  10. The laboratories are well-equipped.
  11. The library is resourceful.
  12. The administration is helpful.
  13. The transportation is available.
- Which subjects do you find most interesting in 1st year? [Checkboxes: General Chemistry, Organic Chemistry, Anatomy, Physiology, Cell Biology, French for Medical Studies, Biomaths, Biostats and informatics, Plant Biology, Physics, History of pharmacy]
  - Which subjects do you find most interesting in 2nd year? [Checkboxes: Biochemistry, Analytical Chemistry, Pharmaceutical Botany, Biophysics, Genetics, Mineral chemistry, Physiopathologie, French and English]
  - Which subjects do you find most interesting in 3rd year? [Checkboxes: Pharmacology, Pharmacognosy, Analytical Chemistry, Therapeutical Chemistry, Semiology, Galenic Pharmacy]
  - Which subjects do you find most interesting in 4th year? [Checkboxes: Clinical Biochemistry, Immunology, Hemobiology, Microbiology, Parasitology]
  - Which subjects do you find most interesting in 5th year? [Checkboxes: Toxicology, Industrial Pharmacy, Clinical Pharmacy, Hospital Pharmacy, Hydro-Bromatology, Epidemiology, Pharmaceutical Law, Pharmaceutical Management]
  - Have you had the opportunity to do an internship? (hospital, laboratory, industry or community pharmacy) (1st to 5th year)
  - o Yes / نعم
  - o No, I am planning to / لا لكنني أريد
  - o No, I don't want to / لا ولا أريد
  - What learning methods do you prefer? / ما هي أساليب التعلم التي تفضلها؟ [Checkboxes: Lectures, Case studies, Group discussions, Online learning, Directed Studies, Practical sessions]
  - What is your favourite assessment type? / ما هو نوع التقييم المفضل لديك؟
  - o Multiple-choice questions (MCQs)
  - o Simple-choice questions (SCQs)

- o Short-answer questions (SAQs)
- o Essays

#### Section 4: Future goals & career aspirations / الأهداف المستقبلية والطموحات المهنية

هل تخطط لمواصلة التخصص أو الحصول على درجة؟ / Do you plan to pursue further specialisation or a higher degree?  
أعلى؟

- o Yes / نعم
- o No / لا

• If yes, what would be your specialty of choice? / إذا كانت الإجابة بنعم، ما هو التخصص الذي تفضله؟ [List includes: Biochemistry, Pharmaceutical biophysics, Cryptogamy and medical botany, Therapeutic chemistry, Hydrology and bromatology, Hemobiology and blood transfusion, Immunology, Microbiology, Parasitology mycology, Clinical pharmacy, Galenic pharmacy, Analytical chemistry, Toxicology, Pharmacognosy, Hospital pharmacy, Regulatory affairs in the pharmaceutical industry, Pharmacoeconomics and market access, Cosmetology and dermopharmacy, Metrology and quality in the pharmaceutical industry]

هل تعتقد أنه سيكون من السهل العثور على وظيفة بعد؟ / How easy do you think it will be to find a job after graduation?  
التخرج؟

- o Very difficult / صعب جداً
- o Difficult / صعب
- o Neutral / حيادي
- o Easy / سهل
- o Very easy / سهل جداً

• Preferred future pharmacy job / الوظيفة المفضلة لك في الصيدلة في المستقبل:

- o Medical biologist pharmacist / صيدلاني متخصص في علم الأحياء الطبية
- o Industrial pharmacist / صيدلي صناعي
- o Distribution pharmacist / صيدلي التوزيع
- o Hospital pharmacist / صيدلي المستشفى
- o Community pharmacist / صيدلي مجتمعي
- o Teacher and Researcher / مدرس وباحث

• What factors are most important to you when choosing a job? / ما هي العوامل الأكثر أهمية بالنسبة لك عند اختيار الوظيفة؟ [Checkboxes: Salary and financial stability, Work-life balance, Career growth opportunities, Work environment, Location]

• What is your ideal salary expectation as a newly graduated pharmacist? (millions) / ما هو الراتب المثالي الذي تتوقعه (بالملايين) كصيدلي حديث التخرج؟ [Short answer text]

• Would you consider applying for jobs in another country? / هل تفكر في التقدم بطلبات عمل في بلد آخر؟

- o Yes / نعم
- o No / لا

• If yes, which one? / إذا كان نعم، أي واحد؟ [Short answer text]

• Would you consider opening your own pharmacy? / هل تفكر في فتح صيدلية خاصة بك؟

- o Yes / نعم
- o No / لا

• Would you encourage future students to pursue pharmacy? / هل تشجع الطلاب المستقبليين على دراسة الصيدلة؟

- o Yes / نعم
- o No / لا

• Suggestions for improving pharmD education / اقتراحات لتحسين دراسة الصيدلة [Long answer text]