

# “Knowledge, Views, and Beliefs of Pharmacy Interns about Pharmacoeconomics Education and Applications: A Descriptive Study from Saudi Arabia”



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## Abstract:

**Background:** Pharmacoeconomics (PE), a part of health economics (HE), focuses on evaluating therapeutic options for treating diseases by identifying, measuring, and comparing the costs of pharmaceutical interventions and their outcomes. Its purpose is to help and guide decision-makers, especially when resources are limited. As a relatively new field in some countries, it continues to evolve slowly, along with several challenges in education, training, and expertise.

**Objectives:** This study assessed pharmacy interns' knowledge, views, and beliefs regarding PE and its applications in healthcare. Moreover, we assessed their insights into PE content in undergraduate curricula and the benefits of implementing PE and HE in practical settings.

**Methods:** Pharmacy interns at the College of Pharmacy, Unaizah campus, Qassim University, Saudi Arabia, who completed more than 9 months of internship following graduation from the PharmD program, completed an online questionnaire. All 80 pharmacy interns were invited to participate in the study, which was conducted between March and April 2024.

**Results:** Among 80 pharmacy interns, 59 completed the survey (response rate: 73.75%). The participants included 29 male interns (49.2%) and 30 female interns (50.8%). Only ten (16.9%) of the total interns had attended educational courses and activities in PE. Among the total participants, 40% (24) thought that the current coverage of PE in the PharmD program was low/very low; 54.2% (32) believed it was average, and only 5.1% (3) believed it was high/very high. Notably, 83.1% (49/59) of the participants reported low/very low familiarity with organizations and conferences related to PE. Approximately two-thirds of the participants (64.4% [38/59]) regarded the necessity of training in PE applications during their internship to be of high/very high importance, whereas 35.6% (21/59) considered it to be of moderate/little importance. The participants scored  $3.35 \pm 1.43$  out of 5 on their knowledge of basic PE analysis concepts. All seven statements concerning the application of PE/HE in healthcare received positive responses from most participants. For example, 56% (33/59) believed that PE/HE enabled pharmacists to accomplish more tasks, 76.3% believed that PE/HE reduced the cost of health services, and 72.9% reported that it facilitated the optimal use of available resources. Approximately 89.8% (53/59) of the participants were interested in acquiring more knowledge about PE/HE through self-learning, specialization, training courses, or further studies.

**Conclusion:** Participants had positive views and perceptions of PE/HE in healthcare. They showed good knowledge about PE analysis methods and believed that PE/HE could ensure efficient spending of resources without adversely affecting the quality of care. They were interested in acquiring knowledge through graduate studies, training courses, and self-learning. However, a large proportion of participants believed that the PE/HE content in undergraduate education was insufficient, and most had not attended any related activities. Therefore, we highly recommend increasing PE/HE content at the undergraduate level to ensure adequate exposure. Furthermore, more encouragement from students and interns is needed to attend regional PE activities and gain more knowledge and skills in the field.

**Keywords:** Pharmacoeconomics, Health economics, Health, Survey, Education, Pharmacy.

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## 1. INTRODUCTION

Pharmacoeconomics (PE) is a relatively new field in many countries, and its applications are rapidly increasing [1, 2]. It overlaps with health economics (HE) and focuses on the evaluation of therapeutic options for treating diseases by identifying, measuring, and comparing the costs of pharmaceutical interventions and their outcomes [2-4]. This field has gained importance in recent times following a surge in the cost of healthcare services [4, 5].

The main objective of PE is to help and guide decision-makers, especially when resources are limited. The increasing expenditure and cost of healthcare have pushed several governments and health insurance companies to adopt plans aimed at controlling the escalating costs of health services and medications, including the use of PE [6]. The development of pharmaceutical analysis has resulted in the application of evaluation methods beyond pharmaceutical assessment. Several developed countries have established concepts and applications for health technology assessments, including medications, medical procedures, and medical devices [7].

Four types of PE evaluations could be applied to evaluate the costs and the outcomes of pharmaceutical agents [8], which include cost-minimization analysis (CMA), cost-benefit analysis (CBA), cost-utility analysis (CUA), and cost-effectiveness analysis (CEA). The CMA compares only the costs of alternatives assumed to be equivalent to their outcomes. CBA compares costs and outcomes in terms of monetary value. The CUA compares alternatives considering the cost of the intervention and the outcomes related to the quality of life of the patient. CEA is the most common analysis in the literature and compares alternatives considering the cost and clinical effect of the intervention on the disease [3].

With the increasing cost of healthcare, several governments have introduced committees or authorities at the national level to regulate the healthcare market and to act as advisory bodies for issues related to drug evaluation. In addition, some governmental bodies, such as the Pharmaceutical Benefits Advisory Committee in Australia, help in decision-making by listing new medications based on health outcomes and by including information such as the safety, efficacy, and cost-effectiveness of the medications. In addition, the Institute for Quality and Efficiency in Health Care was founded in Germany to support national healthcare decision-making,

particularly in the context of medication usage [8].

The authorities in Saudi Arabia have been planning a healthcare transformation over the past decade to fulfill the Saudi National "Vision 2030," which aims to make healthcare more accessible to the population. It also aims to enhance the quality of healthcare services and ensure the value of money spent on the resources used [9-11]. Saudi Arabia has the largest economy in the region, offering free healthcare services to millions of residents. The majority of these healthcare services are offered by the government through the Ministry of Health (MOH) in conjunction with other governmental authorities and face several challenges, particularly with regard to the availability of medications and efficient use of resources. To overcome these challenges, the government has planned to enhance privatization of the healthcare sector [12, 13].

Several organizations and institutions play a role in promoting the application of HE in the field of healthcare and have organized several activities internationally as well as at the national level to educate and train healthcare providers. The International Society for Pharmacoeconomics and Outcomes Research (ISPOR) has organized several educational and scientific activities worldwide that focus on PE and health outcome research. Recent local conferences and activities of the ISPOR were organized by the Saudi Arabian Chapter of the ISPOR. The conference encouraged local experts and students to submit their research work and included activities targeting students [1, 8, 14]. Other local organizations and expert groups also hold activities and conferences related to PE [15].

Choosing optimal options in terms of safety and efficacy using available resources is a burden on healthcare budgets and pharmaceutical care providers. Skilled providers who can assist in tasks such as the construction of formularies, reimbursement decisions regarding medicine and services, and management of drug therapies are the need of the hour [1, 5, 16]. This requirement of experts in the field was mentioned in several studies. Hence, the importance of introducing PE in undergraduate curricula to educate future providers on the skills needed in their tasks was realized [1, 2, 17, 18]. PE is offered as a core course in several pharmacy schools in the Middle East, while some schools offer it as an elective course [1]. Also, some schools offer PE as a

separate course and some as a part of an integrated course. Most PE courses cover the four fundamental PE analyses, but topics such as decision analysis and modeling are mostly not covered [1].

The objective of this study was to assess pharmacy interns' views on PE applications in the health field and their knowledge of basic PE analysis methods. Moreover, this study assessed interns' insights into the content of PE in the undergraduate curriculum and the benefits of implementing PE and HE in practice.

## 2. MATERIALS AND METHODS

### 2.1. Study Design and Population

This was an online survey of pharmacy interns enrolled in their internship year at the College of Pharmacy, Unaizah Campus, Qassim University, in the central region of Saudi Arabia. Eighty interns were enrolled in the internship batch of 2023-2024, and all interns had finished the 5 didactic years of the PharmD program and had completed more than 9 months in the internship year (*i.e.*, the sixth year of the PharmD). All the interns were trained in clinical rotations in hospitals and community pharmacies. All 80 PharmD interns were invited to participate in this study. Before participation, the participants were informed of the objectives of the study and the privacy of the collected data. The participants were able to start filling out the survey only after agreeing. Ethical approval for the study was obtained from the Research Ethics Committee of Qassim University (letter number 24-76-01, dated February 4, 2024).

### 2.2. Development of the Questionnaire

The questionnaire used in this study was prepared by referring to published studies [1, 8, 16, 18-20]. The questionnaire was divided into four parts. Before commencing the first part, the participants were asked whether they had participated in any educational activities related to PE or HE outside university. In the first part, the interns were asked about their views regarding the content of PE covered in the PharmD program and the importance of education and training for pharmacists and interns enrolled in internship years in the fields of PE or HE. In addition, the interns answered questions regarding their familiarity with the activities of PE organizations such as ISPOR. For the first part, the participants responded on a five-point Likert scale ranging from very low to very high. The second part of the survey consisted of five questions that assessed interns' knowledge of the basic concepts of the four fundamental methods of PE analysis. Each question was accompanied by four choices. The correct answer was graded as "1" and the wrong answer was graded as "0." The third part of the survey consisted of seven statements that assessed the interns' beliefs regarding the benefits of implementation, the roles of PE/HE in healthcare, and the importance of the field for pharmacists and patients. The participants could answer these questions by choosing between five Likert scale options, ranging from "strongly agree" to "strongly disagree." The last part questioned the participants

whether they would seek additional knowledge in PE/HE in the future, and if the answer were "yes," they would further be questioned regarding the preferred way of acquiring this knowledge by joining a training course or by enrolling for postgraduate study, or by self-learning, or specialization in the field.

To improve the validity of the questions, the questionnaire was sent to two individuals from the Department of Pharmacy Practice at the College of Pharmacy who were experts in PE. Comments and suggestions from the experts were incorporated and addressed. In addition, to ensure the survey was consistent with the participants, the questionnaire was sent to five interns who provided feedback and their comments and suggestions were considered.

### 2.3. Analysis Of the Data

Descriptive statistical analyses that included frequencies and percentages were used to describe and summarize the participants' responses to the study questions and statements using the Statistical Package for the Social Sciences version 20.0 (IBM Corp., Armonk, NY, USA). Inferential statistics (*i.e.*, Student's t-tests) were used to determine whether a significant difference was observed in the mean scores in the knowledge section between male and female participants. Significance was set at  $p < 0.05$ .

## 3. RESULTS

### 3.1. Demographic Data

The survey was completed by 59 interns from a total of 80 interns, resulting in a response rate of 73.75%. The participants included 29 (49.2%) male interns and 30 (50.8%) female interns. The mean age of the participants was 24.1 years (SD) ( $\pm 1.227$ ), ranging from 22 years to 28 years. Only 16.9% (10/59) of the interns had participated in educational courses and activities in PE outside the university.

### 3.2. Pharmacy Interns' Views about Pharmacoeconomics' Content and Activities in Undergraduate Curriculum and Internship Year

Approximately 40.7% (24/59) of the participants opined that the current coverage of PE in the PharmD program was low/very low, 54.2% (32/59) considered that it was average, and only 5.1% (3/59) reported that it was high/very high. Notably, 83.1% (49/59) of the participants reported low/very low familiarity with PE organizations (*e.g.*, ISPOR). Regarding the necessity of training in PE applications in the internship year, about two-thirds 64.4% (38/59) of participants reported that it was of high/very high importance, while 35.6% (21/59) replied that it had moderate/little importance. With regards to the question whether it was necessary to include an education and training program in PE applications for pharmacists, 69.5% (41/59) interns believed that the need was high/very high; 30.5% (18/59) responded that the need was moderate/very slightly necessary, as shown in Table 1.

### 3.3. The Knowledge about Basic Definitions in PE Terms

The average score of the participants in the knowledge of basic pharmacoeconomic analysis concepts was  $3.35 \pm 1.43$  out of 5. No significant difference was observed between the male and female scores (t-test,  $p = 0.307$ ). The participants showed a good understanding of the primary goals of PE (91.5%, 54/59), followed by knowledge of CEA (67.8%, 40/59) and knowledge of CUA (64.4%, 38/59). Moreover, 55.9% (33/59) of the participants answered the questions correctly for both CBA and CMA, as shown in Table 2.

### 3.4. Beliefs of Interns about PE and HE Applications in the Field of Healthcare

In this study, approximately 78% of interns agreed/strongly agreed that PE/HE could enhance the quality of patient care, and 76.3% of participants believed PE/HE could reduce the cost of health services. Moreover, more than half of the participants (56%) agreed that PE/HE could enable pharmacists to accomplish more tasks

in their careers, and 57.6% believed that PE/HE applications could improve clinical decisions. About 76.3% of the participants believed that PE/HE could help to provide more comprehensive healthcare services. In addition, 72.9% of the participants reported that PE/HE could help in using the available resources in the best manner and 69.5% believed that PE/HE could enhance access to healthcare services by providing multiple treatment options at an acceptable cost, as shown in Table 3. Overall, most participants shared positive views regarding the application of PE/HE in healthcare.

### 3.5. Students' Willingness in Acquiring Additional Knowledge in Pharmacoeconomics

Regarding acquiring additional knowledge in PE, 27% (16/59) reported that they would seek self-learning, 23.7% (14/59) preferred to specialize in PE, and 22% (13/59) wanted to seek educational courses. About 16.9% (10/59) would seek postgraduate studies to acquire more knowledge on PE and 10.2% (6/59) reported that they were not interested in PE, as shown in Table 4.

**Table 1. Pharmacy interns' views regarding the Pharmacoeconomics content and activities in the undergraduate curriculum and internship year.**

Statement	Very Low	low	Average	High	Very High
	(%)	(%)	(%)	(%)	(%)
1. To what extent is the current coverage of Pharmacoeconomics in the PharmD program?	6.8	33.9	54.2	1.7	3.4
2. To what extent is training in the use of Pharmacoeconomics important for pharmacists?	5.1	25.4	0	40.7	28.8
3. To what extent are you familiar with Pharmacoeconomics conferences and activity (e.g., ISPOR)?	49.2	33.9	0	13.6	3.4
4. To what extent do you think that special training in the use of Pharmacoeconomics applications is necessary for the internship year program?	5.1	30.5	0	37.3	27.1

**Table 2. The knowledge regarding basic definitions in pharmacoeconomics.**

Question	True Answer
1. Concept and primary goal of Pharmacoeconomics	54 (91.5)
2. Cost-benefit analysis	33 (55.9)
3. Cost-effectiveness analysis	40 (67.8)
4. Cost-minimization analysis	33 (55.9)
5. Cost-utility analysis	38 (64.4)

**Table 3. Perception of interns about pharmacoeconomics and health outcome research applications in the health field.**

Statement	SA	A	N	D	SD
	(%)	(%)	(%)	(%)	(%)
1. PE/HE can enhance the quality of patient care	28.8	49.2	13.6	3.4	5.1
2. PE/HE can reduce the cost of healthcare	40.7	35.6	15.3	3.4	5.1
3. PE/HE can enable pharmacists to accomplish more tasks in his/her career	15.3	40.7	30.5	8.5	5.1
4. PE/HE can support decision-makers	22	35.6	28.8	5.1	8.5
5. PE/HE can help in providing more comprehensive healthcare services	28.8	47.5	15.3	1.7	6.8
6. PE/HE can help in using the available resources in the best way	42.4	30.5	16.9	3.4	6.8
7. PE/HE can enhance access to healthcare services by providing multiple treatment options at acceptable costs	39	30.5	18.6	1.7	10.2

**Note:** SA=strongly agree, A=agree, N= neutral, D=disagree, SD=strongly disagree.

**Table 4. Participants’ willingness in acquiring additional knowledge in PE.**

Statement	N (%)
1. Interested in acquiring additional knowledge by pursuing postgraduate studies	10 (16.9%)
2. Interested in acquiring additional knowledge through educational courses	13 (22%)
3. Interested in acquiring additional knowledge by Self-learning	16 (27.1%)
4. Interested to make Pharmacoeconomics as my Specialization	14 (23.7%)
5. Not interested in acquiring additional knowledge	6 (10.2%)

**4. DISCUSSION**

This study aimed to explore the views and beliefs of pharmacy interns about the application of PE based on their experiences at the undergraduate level and during the internship year in hospitals. It also assessed interns’ basic knowledge of common PE analyses and their views on HE in the future.

Most of the participants (83.1%, 49/59) had not attended any conferences or activities related to PE. Despite this, 69.5% of the participants believed that training in PE/HE applications was important/very important for pharmacists, and approximately 64.4% of the participants believed that the importance of training in PE/HE during the internship year was high/very high for pharmacy students. The results regarding external PE/HE activities were in accordance with a Saudi study involving pharmacists and pharmacy students conducted by Alhussien *et al.* (2024). According to the study findings, 79.5% (163/205) of interns had not attended any workshops or training courses [20]. Also, a study in Jordan revealed that only 23.3% out of 2,648 students in health colleges had attended extracurricular activities related to PE [21]. Approximately 83.1% (49/59) of the participants reported that their familiarity with PE organizations and conferences was low/very low. Several activities related to the field have been conducted locally and internationally in previous years; however, attendance has been low. One possible reason for this could be that the students were not sufficiently exposed to PE/HE in their study at the undergraduate level, as suggested by a previous study [22]. Also, in the survey, 40.5% of the participants mentioned that the coverage of PE/HE was low/very low. Increasing the content of PE/HE in the curricula of health colleges could be beneficial as all sectors of healthcare services are affected by the increase in cost.

The majority of study participants demonstrated good knowledge of questions regarding PE analysis concepts. This contradicts a local study conducted among pharmacists and pharmacy students, which indicated that only 34.1% (70/205) of participants in the study exhibited good knowledge [20].

The participants expressed positive views on all seven statements concerning PE/HE applications in healthcare. For example, 56% (33/59) of the participants believed that PE/HE enabled the pharmacist to accomplish more tasks in their career, 76.3% of participants believed PE/HE could reduce the cost of health services, and 72.9% of the participants reported that PE/HE could help in utilizing the available resources in the best way. Approximately

89.8% (53/59) of the participants were interested in acquiring more knowledge in PE/HE either through self-learning, specialization, training courses, or postgraduate studies. One of the important roles of the pharmacist is to provide an assessment of new medications prior to introducing them into the formulary, and this has become a standard practice in any pharmacy and therapeutic committee in most hospitals [23]. Hence, more attention must be paid to PE/HE educational courses and training sites with the capacity to offer training on the methods used in PE analysis.

Most participants believed that PE/HE could help reduce the cost of healthcare and support decisions aimed at spending resources in the best way. With the increase in the population of Saudi Arabia, the rate of chronic diseases has increased; hence, an objective of the health plan transformation in 2030 vision is to improve the efficiency of spending [24-27]. The Saudi government has introduced several steps to enhance the efficiency of spending on pharmaceuticals and other materials used in healthcare. The Saudi government established the National Unified Procurement Company, which is responsible for purchasing and distributing pharmaceuticals to most public hospitals and centers [25]. Recently, the MOH in Saudi Arabia, which is the largest governmental body to have offered approximately 74% of health care for Saudi citizens and residents, established a centralized entity that would be responsible for the health technology assessment, which in turn aimed to support the decision-making process and to ensure efficient spending of resources for pharmaceuticals and other health technologies [27]. In 2024, the Saudi Food and Drug Authority (SFDA) issued guidelines describing the methods for performing or submitting economic evaluation studies, which will be required by the mid of 2025, for any new application for medication registration by manufacturers or agents. This is aimed at helping the SFDA evaluate the added value provided by the new agent compared to being used by the existing agent [28]. The need for experts in PE/HE is increasing and requires additional attention and effort from academic institutions to educate and train students in this field, as a shortage in the number of experts has been pointed out in several studies [9, 11]. Many Pharmacy colleges offer a PE course over the semester as teaching courses spanning 12-20 classroom hours, which indicates low exposure to the content related to PE [9, 11]. Therefore, we recommend a more extensive curriculum. In addition, the need for postgraduate studies and training courses is obvious and has been pointed out in previous studies [9, 20].

The study highlights the positive views of pharmacy

interns regarding PE/HE after their undergraduate level and internship year and provides recommendations on the challenges in education and training on PE/HE applications. However, this study has some limitations. One limitation was the small sample size because the target population included pharmacy interns from a single college. Additionally, only a few studies have been conducted on the same topic for comparison. More comprehensive studies are required to explore the views and challenges with regard to PE/HE education and training.

## CONCLUSION

The pharmacy interns in this study expressed positive views and beliefs regarding PE/HE applications in the health field. The participants demonstrated good knowledge of PE analysis methods and had a positive impression of the application of PE/HE in terms of efficient spending of resources without affecting the quality of care. They were also interested in acquiring knowledge through graduate studies, training courses, and self-learning. However, a large proportion of the participants believed that the PE/HE content at the undergraduate level was low, and most of them had not attended any activities related to the field. Increased PE/HE content at the undergraduate level provides greater exposure to the field and is highly recommended. In addition, an increase in graduate studies, investments in training courses, and the availability of good PE/HE training sites may help solve the challenges related to the low number of experts in the country.

## AUTHORS' CONTRIBUTION

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

## LIST OF ABBREVIATIONS

HE	=	Health Economics
CMA	=	Cost-minimization Analysis
CBA	=	Cost-benefit Analysis
CUA	=	Cost-utility Analysis

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval for the study was obtained from the Research Ethics Committee of Qassim University, Saudi Arabia (letter number 24-76-01, dated February 4, 2024).

## HUMAN AND ANIMAL RIGHTS

All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

## CONSENT FOR PUBLICATION

The participants were able to start filling out the survey only after agreeing.

## STANDARDS OF REPORTING

STROBE guidelines were followed.

## AVAILABILITY OF DATA AND MATERIALS

The authors confirm that the data supporting the findings of this research are available within the article.

## FUNDING

None.

## CONFLICT OF INTEREST

The author declares no conflict of interest, financial or otherwise.

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Declared none.

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