Pharmacist's Perception of Forensic Pharmacy Services

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ABSTRACT

Goal: To illuminate the pharmacist perception of forensic pharmacy in Saudi Arabia. **Methods:** It is cross-sectional of convenient sampling and planned number of the subject with power eighty. An electronic survey was dispersed to the pharmacist and pharmacy intern, excluding pharmacy students and other healthcare professionals. The survey entailed of demographic data, pharmacist's perception of forensic pharmacy, and barriers preventing implementation of forensic pharmacy. Survey monkey, Microsoft Excel, and Statistical Package of Social Science (SPSS) were used in this study. **Results:** The total number of responding pharmacists was 402. Of those, 198 (49.75%) were male, while 200 (50.25%) were female, with statistical significance between them ($p<0.001$). Almost three-quarters of the pharmacists had bachelor's degrees 303 (75.56%), with statistically momentous among all pharmaceutical degrees ($p<0.001$). The total average scores of pharmacist perception of forensic pharmacy services were (3.93). The high scores element was under-working in forensic pharmacy in the healthcare institutions (4.15). On the contrary, the lowest score medical staff feel like their mistakes are held against them when an event is stated (3.35). The total average scores of barriers prevent the implementation of forensic pharmacy services were (3.41) with high scores element was lack of periodic training of pharmacy staff about forensic pharmacy (4.13). At the same time, the lowest score aspect of forensic pharmacy was the pharmacist shred in forensic sciences is too trivial to work (1.88). The most suggestions for facilitating forensic pharmacy implementation were implementing an electronic forensic pharmacy 306 (77.86%) and raise the number of forensic pharmacist staff by 319 (81.17%). **Conclusion:** The pharmacist had a positive insight of forensic pharmacy. However, various barriers are requisite to eliminate to start the implementation of forensic pharmacy services. Therefore, education and training are indispensable elements for establishing forensic pharmacy services in the Kingdom of Saudi Arabia.

Key words: Perception, Pharmacist, Forensic, Pharmacy, Saudi Arabia.

INTRODUCTION

The attitude and perception are the keystones of knowledge and practice of pharmacy services, containing forensic pharmacy. The perception entailed of general perception or factors preventing the innovation of pharmacy services. If the pharmacist had good perception lead to the outstanding performance of knowledge and practice and trance versa. As a result, pharmacists' perception of forensic pharmacy is vital to create this kind of pharmacy service as a new project. Forensic science since created before more than 100 years until now.[1] It developed to be standardized and electronic documentation.[2,3] They discussed the perception of forensic science from a different angle. Sometimes as professionals or public perception, others related to forensic techniques used.[4-7] Most of the studies did not comprise the pharmacist. Moreover, the authors are not familiar with any investigation about pharmacists' perception of forensic pharmacy in Saudi Arabia, Gulf and Middle East countries, or the rest of the world. The contemporary study goals to declare the pharmacist perception of forensic pharmacy in the Kingdom of Saudi Arabia.

METHODS

It examines a cross-sectional survey that debated pharmacist's perceptions of forensic pharmacy in Saudi Arabia. It self-reported an electronic survey of dentists, counting pharmacists from internship to consultant, pharmacist specialties, and Saudi Arabia. All non- pharmacist or students and non-completed surveys will be omitted from the study. The survey entailed of respondents' demographic information about pharmacists and perceptions of forensic pharmacy. The barriers to executing forensic pharmacy services in pharmaceutical care and suggestions for simplifying the implementation of nuclear pharmacy. The 5-point Likert response scale system was applied with closed-ended questions. According to the previous literature with unlimited population size, the sample was planned as a cross-sectional study, the confidence level 95% with z score of 1.96 and margin of error 5-6.5%, population percentage 50%, and drop-out rate 10%. As a result, the sample size will equal 380 to 420 with a power of study of 80%.[8-10] The response rate obligatory of calculated sample size at least 60-70% and above.[10, 11]

The survey was dispersed through social media of what's applications and telegram groups

of pharmacists. The prompt message had been sent every 1-2 weeks. The survey was authorised through the revision of expert reviewers and pilot testing. Besides, various tests of reliability McDonald's ω, Cronbach alpha, Guttmann's λ2, and Guttmann's λ6 had been finished with the study. The data analysis of the pharmacist's perceptions of nuclear pharmacy is done through the survey monkey system. Besides, the statistical package of social sciences (SPSS) and Jeffery's Amazing Statistics Program (JASP), Microsoft excel sheet version 16 with description and frequency analysis, good of fitness analysis, correlation analysis, and inferential analysis of factors moves pharmacist's perceptions of forensic pharmacy. The STROBE (Strengthening the reporting of observational studies in epidemiology statement: guidelines for reporting observational studies) showed the reporting of the current study.[12,13]

RESULTS

The total number of responding pharmacists was 402, with most of them coming from the south area 252 (62.69%) with statistically noteworthy among the regions (*p*<0.001). Of those, 198 (49.75%) were male, while 200 (50.25%) were female, with statistical significance between them (*p*<0.001). Most of the responders were in age (24–30) years 269 (67.08%) with statistically significant between all ages level (*p*<0.001). Almost three-quarters of the pharmacists had bachelor's degrees 303 (75.56%), with statistically weighty among all pharmaceutical degrees (*p*<0.001). The majority of responders worked at community pharmacy 124 (30.85%), MOH hospitals 107 (26.62%), and military hospitals 76 (18.91%). Most pharmacists were staff pharmacists 284 (70.65%), and half of the responders had experienced three years and less 213 (53.25%) with the majority of their practice at the community pharmacy 115 (31.86%) and outpatient pharmacy 88 (24.38%) with statistically significant between them (*p*<0.001). There is a strong positive correlation between Age (years) and Years of experience at pharmacy career Kendall's tau_b (0.699) or Spearman's rho (0.747) with statistically significant difference (*p*<0.001). On the other hand, there is a negative medium correlation between position and age or Years of experience at pharmacy career with Kendall's tau_b (-0.447) or Spearman's rho (-0.488) or Kendall's tau_b (-0.460) or Spearman's rho (-0.511) respectively with statistically significant difference (*p*>0.05) as explored in Table 1 and 2.

The total average scores of pharmacist awareness of forensic pharmacy services were

Table 1: Demographic information.			
Nationality	**Response Count**	**Response Percent**	**p-value (X2)**
Central area	72	17.91%	< 0.001
North area	24	5.97%	
South area	252	62.69%	
East area	11	2.74%	
West area	43	10.70%	
Answered question	**402**		
Skipped question	**0**		
Gender	**Response Count**	**Response Percent**	
Male	198	49.75%	< 0.001
Female	200	50.25%	
Answered question	**398**		
Skipped question	**4**		
Age	**Response Count**	**Response Percent**	
24-30	269	67.08%	< 0.001
31-35	73	18.20%	
36-40	28	6.98%	
41-45	9	2.24%	
46-50	8	2.00%	
> 50	14	3.49%	
Answered question	**401**		
Skipped question	**1**		

(3.93). The high scores element was under-working in forensic pharmacy in the healthcare institutions (4.15), the forensic pharmacy to assure justice (4.13), and the forensic pharmacy demands to classify factors which might predispose to crime problems (4.11). On the contrary, the lowest score medical staff feel like their mistakes are held against them when an event is conveyed (3.35). On the other hand, the hospital promotes itself as an organization that responds to Medication Errors (MEs) and other safety-related issues (3.57). The system in my hospital, counting policy and procedure, is good at minimizing the occurrence of medication errors (3.76) with statistically significant between answers (*p*<0.001) as discovered in Table 3.

The total average scores of barriers prevent the implementation of forensic pharmacy services were 3.41 with high scores element was lack of periodic training of pharmacy staff about forensic pharmacy (4.13). In addition, the forensic pharmacy was not taught appropriately in pharmacy school (4.10), and the level of clinical knowledge of forensic pharmacy (3.99). On the contrary, the lowest score aspect of forensic pharmacy was the pharmacist shred in forensic sciences is too trivial to work (1.88), and lack of confidence in discussing the forensic pharmacy with the physician (2.91). Besides,

lack of time to fill in a report (2.94), and no enough information from the patient (2.95) with statistically significant between answers (*p*<0.001) as explored in Table 4. The most recommendations for simplifying Forensic pharmacy implementation were implementing an electronic forensic pharmacy 306 (77.86%). Besides, surge the number of forensic pharmacist staff by 319 (81.17%), standardized the forensic pharmacy 141 (60.26%), and implement medication safety tools of forensic pharmacy 291 (74.05%) as explored in Table 5. The reliability test of McDonald's ω, 0.946, Cronbach alpha 0.943, Guttmann's λ2, 0.948, and Guttmann's λ6, 0.968.

Factors persuading the perception of forensic pharmacy services and perception reasons preventing forensic pharmacy implementation. Using independent samples Kruskal-Wallis test and the Bonferroni correction for multiple tests have adjusted significant values, the results showed as follows. The numerous factor might impact the perception of forensic pharmacy services. Five locations exaggerated the perception with the highest average score with statically significant differences among north (3.3807) and south (4.0330) with *p*=0.010. Thirteen levels of the site of work affected the perception without statically significant differences (*p*=0.693). Six groups of age affected

Table 2: Demographic, social information.

Pharmacist working site	Response Count	Response Percent	*p*-value (X2)
MOH Hospitals	107	26.62%	
Military hospitals	76	18.91%	
National Gaurd Hospital	11	2.74%	
Security forces hospitals	4	1.00%	
University hospital	12	2.99%	
MOH primary care centers	15	3.73%	
Private hospitals	12	2.99%	
Private ambulatory care clinics	1	0.25%	
Private primary healthcare center	6	1.49%	
Community pharmacy	124	30.85%	
Pharmaceutical company	15	3.73%	
University (Academia)	9	2.24%	
Retried	2	0.50%	
Un-employment	8	1.99%	
Answered question	**402**		
Skipped question	**0**		

Academic Qualifications	Response Count	Response Percent	
Diploma in Pharmacy	29	7.23%	
Bachelor's in pharmacy	303	75.56%	
Master	47	11.72%	
Pharm D	73	18.20%	
Ph. D	9	2.24%	
PGY 1	6	1.50%	
PGY 2	8	2.00%	
PGY 3	4	1.00%	
Fellowship	1	0.25%	
Other (please specify)	0	0.00%	
Answered question	**401**		
Skipped question	**1**		

Position Held	Response Count	Response Percent	
Director of Pharmacy	18	4.48%	<0.001
Assistant Director of Pharmacy	18	4.48%	
Supervisor	32	7.96%	
Pharmacy staff	284	70.65%	
Pharmacy Intern	50	12.44%	
Answered question	**402**		
Skipped question	**0**		

Years of experience at Physician career	Response Count	Response Percent	
Less than one year	213	53.25%	< 001
1-3	87	21.75%	
4-6	41	10.25%	
7-9	15	3.75%	
10-12	12	3.00%	
>12	32	8.00%	
Answered question	**400**		
Skipped question	**2**		

The practice area	Response Count	Response Percent	
Inpatient Pharmacy	46	12.74%	< 001
Outpatient Pharmacy	88	24.38%	
Satellite Pharmacy	3	0.83%	
Narcotics and Controlled	4	1.11%	
Extemporaneous Preparation	1	0.28%	
Clinical Pharmacy	46	12.74%	
Inventory Control	8	2.22%	
Drug Information	5	1.39%	
IV admixture	11	3.05%	
Pharmacy informatics	1	0.28%	
Hospital Pharmacy administration	4	1.11%	
Forensic medicine	1	0.28%	
Community pharmacy	115	31.86%	
Lecturer (Academia)	2	0.55%	
Pharmaceutical company	14	3.88%	
Non-specific	12	3.32%	
Answered question	**361**		
Skipped question	**41**		

Continued...

the perception of forensic pharmacy without any statically significant differences (*p*=0.061). The gender factor exaggerated the perception of forensic pharmacy with the highest score with females (4.0689) with statically significant differences (*p*=0.001). There are non-statically significant differences in swaying the perception of forensic pharmacy in position (*p*=0.070). Finally, there were six levels of the number of years experiences that affected the perception of forensic pharmacy without statically momentous differences (*p*=0.103).

The various factor might impact the reasons preventing forensic pharmacy implementation. Five locations pretentious the perception with the highest average score with statically significant differences among central (3.0878) and south (3.5768) with *p*=0.000. Thirteen levels of the site of work affected the perception without statically noteworthy differences (*p*=0.047). Six groups of age affected the perception of forensic pharmacy without any statically significant differences (*p*=0.241). The gender factor affected reasons preventing

forensic pharmacy implementation with the highest score with females (3.5123) with statistically significant differences (*p*=0.005). Five levels of a position affected the Reasons preventing forensic pharmacy implementation between Director of pharmacy with average score (2.7632) and pharmacy staff with average score (3.4836) with statically significant differences (*p*=0.004). Finally, six levels of the number of years' experience pretentious the Reasons preventing forensic pharmacy implementation without any statically

Table 3: The Perception of Forensic pharmacy.											
	Strongly disagree		Disagree		Uncertain		Agree		Strongly agree		Total	Weighted Average	
The system in my hospital including policy and procedure is good at minimizing occurrence of Medication Errors	4.25%	17	6.50%	26	32.75%	131	21.75%	87	34.75%	139	400	3.76	<0.001
Reporting Medication Errors (MEs) has led to positive changes	3.51%	14	2.51%	10	26.32%	105	27.82%	111	39.85%	159	399	3.98	<0.001
The hospital promotes itself as an organization that responds to Medication Errors (MEs) and other safety-related issues	5.00%	20	6.50%	26	40.50%	162	22.25%	89	25.75%	103	400	3.57	<0.001
I think there is under-working in forensic pharmacy in the healthcare institutions	2.26%	9	0.75%	3	25.88%	103	21.61%	86	49.50%	197	398	4.15	<0.001
I feel comfortable to ask for help or support from my colleagues or peers concerning Medication Errors (MEs)	3.00%	12	2.50%	10	27.75%	111	26.25%	105	40.50%	162	400	3.99	<0.001
I have the opportunity to discuss and receive feedback about my work performance with other staff	2.27%	9	5.30%	21	30.05%	119	26.01%	103	36.36%	144	396	3.89	<0.001
Medical staff feel like their mistakes are held against them when an event is reported	6.52%	26	13.03%	52	38.10%	152	24.06%	96	18.30%	73	399	3.35	<0.001
The forensic pharmacy to assure justice	2.26%	9	2.26%	9	23.56%	94	24.56%	98	47.37%	189	399	4.13	<0.001
The forensic pharmacy is required to identify the new, unknown, rare of medications involved in crimes problems	2.00%	8	2.00%	8	26.75%	107	23.50%	94	45.75%	183	400	4.09	
The forensic pharmacy demands to identify factors that might predispose to crime problems.	1.50%	6	1.75%	7	26.57%	106	24.56%	98	45.61%	182	399	4.11	
The forensic pharmacy should be mandatory	2.26%	9	2.76%	11	27.82%	111	22.56%	90	44.61%	178	399	4.05	
The forensic pharmacy needs to identify previously unrecognized Medication Errors (MEs).	2.27%	9	1.01%	4	27.71%	110	26.70%	106	42.32%	168	397	4.06	
The forensic pharmacy needs a comparison of Medication Errors (MEs) of the same drug from Different drug companies.	2.27%	9	1.76%	7	28.46%	113	25.94%	103	41.56%	165	397	4.03	
The forensic pharmacy used to know the Medication Errors (MEs) for drugs in similar Therapeutic classes.	1.76%	7	2.52%	10	25.69%	102	26.45%	105	43.58%	173	397	4.08	
The forensic pharmacy Should be optional and paid	4.77%	19	4.27%	17	33.17%	132	20.85%	83	36.93%	147	398	3.81	
											Answered	400	
											Skipped	2	

significant differences (*p*=0.272) as explored in Table 6.

The relationship between the insight of forensic pharmacy and factors location, site of wok age (years), pharmacist gender, years of experiences at pharmacy career and position held verified through a multiple regression model and measured the perception of forensic pharmacy dependent variable and factors were regarded as expletory variables. As a result, there was a weak relationship R (0.209) with (*p*=0.008) between the perception of forensic pharmacy and factors. All factors were non-significant differences (*p*>0.05). However, there was one factor only; the pharmacist gender explained 12.8% of the positive relationship of the in the perception of forensic pharmacy with a

statistically significant (*p*=0.014) through multiple regression model and confirmed by Bootstrap model. Therefore, the relationship between perception of forensic pharmacy and one factor confirmed by the non-existence of multicollinearity with gender factor Variance Inflation Factor (VIF=1.088) was less than the three[14-16] as explored in Table 7

The relationship between the perception of reasons preventing forensic pharmacy implementation and factors location, site of wok age (years), pharmacist gender, years of experiences at pharmacy career and position held proved through a multiple regression model and considered the perception of reasons preventing forensic pharmacy implementation-dependent variable and the factors were viewed

as expletory variables. As a result, there was a weak relationship R (0.209) with (*p*=0.008) between the perception of forensic pharmacy and factors. However, there were two factors only; the location elucidated 12.9% (*p*=0.011), and position explicated 19.3% (*p*=0.001) of the positive relationship of the variation in the perception of reasons preventing forensic pharmacy implementation with a statistically significant through multiple regression model and established by Bootstrap model. Therefore, the relationship between perception of reasons preventing forensic pharmacy implementation and two factors tested by the non-existence of multicollinearity with location factor Variance Inflation Factor (VIF=1.054), position factor (VIF=1.278) was less than the three[14-16] as explored in Table 8.

Table 4: Perception of barriers or factors that may prevent to implement of Forensic pharmacy.

	Strongly disagree		Disagree		Uncertain		Agree		Strongly agree		Total	Weighted Average	
Level of clinical knowledge of forensic pharmacy	4.29%	17	2.78%	11	25.00%	99	25.51%	101	42.42%	168	396	3.99	<0.001
Uncertain association between the forensic pharmacy and the drug related problems	9.87%	39	16.96%	67	38.48%	152	18.23%	72	16.46%	65	395	3.14	<0.001
The Pharmacist shred in forensic sciences is too trivial to work	50.38%	200	21.16%	84	21.41%	85	3.78%	15	3.27%	13	397	1.88	<0.001
Concern that a forensic pharmacy will generate extra work.	8.10%	32	14.94%	59	33.42%	132	23.54%	93	20.00%	79	395	3.32	<0.001
A forensic Pharmacist is not available when needed.	5.79%	23	10.33%	41	39.80%	158	18.89%	75	25.19%	100	397	3.47	<0.001
Lack of confidence in discussing the forensic pharmacy with the physician.	14.68%	58	21.27%	84	35.70%	141	15.44%	61	12.91%	51	395	2.91	<0.001
No enough information from the patient	8.12%	32	23.35%	92	42.64%	168	17.26%	68	8.63%	34	394	2.95	<0.001
Lack of time to fill in a report.	7.56%	30	25.69%	102	42.07%	167	14.86%	59	9.82%	39	397	2.94	<0.001
Unaware of the existence of a national forensic pharmacy system.	4.55%	18	7.32%	29	31.57%	125	25.76%	102	30.81%	122	396	3.71	<0.001
I did not know how to practice forensic pharmacy.	4.29%	17	4.55%	18	28.54%	113	24.24%	96	38.38%	152	396	3.88	<0.001
Fear of legal liability.	7.59%	30	8.61%	34	29.87%	118	25.57%	101	28.35%	112	395	3.58	<0.001
Unaware of the need of forensic pharmacy	5.56%	22	6.31%	25	26.01%	103	24.49%	97	37.63%	149	396	3.82	<0.001
Lack of financial reimbursement.	10.38%	41	12.66%	50	36.71%	145	19.24%	76	21.01%	83	395	3.28	<0.001
Don't feel the need to report well recognized reactions for a certain drug	7.58%	30	10.61%	42	31.82%	126	19.95%	79	30.05%	119	396	3.54	<0.001
Consider it the doctor's responsibility	16.62%	66	17.13%	68	32.49%	129	12.59%	50	21.16%	84	397	3.05	<0.001
The negative consequences associated with forensic pharmacy	7.30%	29	8.31%	33	36.02%	143	20.91%	83	27.46%	109	397	3.53	<0.001
Lack of Periodic training of pharmacy staff about forensic pharmacy	2.77%	11	1.76%	7	22.42%	89	25.69%	102	47.36%	188	397	4.13	<0.001
The forensic pharmacy is serious.	6.09%	24	8.63%	34	32.74%	129	17.51%	69	35.03%	138	394	3.67	<0.001
The forensic pharmacy was Not taught properly in pharmacy School	4.79%	19	3.53%	14	21.66%	86	16.62%	66	53.40%	212	397	4.1	<0.001
											Answered	397	
											Skipped	5	

Table 5: The recommendations/suggestions for facilitating the implementation of Forensic pharmacy.

Answer Choices		Responses
Implementation of an electronic forensic pharmacy	327	83.21%
Increase number of forensic pharmacist staff	319	81.17%
Applied the Quality Management standards	242	61.58%
Implement medication safety tools of forensic pharmacy	291	74.05%
Setup up the therapeutic protocol or guidelines for forensic pharmacy	275	69.97%
Standardized the forensic Pharmacy	306	77.86%
Standardized policy and procedures for forensic pharmacy	277	70.48%
Provide undergraduate and postgraduate education and training	18	4.58%
Answered	**393**	
Skipped	**9**	

DISCUSSION

Each new project, counting forensic pharmacy, had several steps. Each step wants knowledge and sound perception, and related barriers are averting implementation. The perception should be of the project owner as a pharmacist and other healthcare professionals to get feedback information and patients' perception to measure the satisfaction of the forensic pharmacy services. The current study states most of the formerly said aspects. The study with an adequate sample size of a convenience sample, high-reliability tests, and good validation of expert pharmacists. Most of the responders are from the southern region, where the author is working. Most of the responders

Table 6: Factors influencing the perception of forensic pharmacy services and Reasons preventing forensic pharmacy implementation. (average scores)

	Factors	\multicolumn{7}{c|}{Perception of forensic pharmacy services}	\multicolumn{7}{c}{Perception Reasons preventing forensic pharmacy implementation}
		N	Average scores	Std. D	Median	Lower Bound	Upper Bound	P-value	N	Average scores	Std. D	Median	Lower Bound	Upper Bound	P-value
Region	Central	72	3.8596	.79552	3.9333	3.6713	4.0479		69	3.0878*	.78806	3.3158	2.8985	3.2771	
	North	23	3.3807*	1.09701	3.8000	2.9064	3.8551		23	3.0994	.92815	3.3158	2.6981	3.5008	
	South	247	4.0330*	.74337	4.3333	3.9398	4.1262	0.010	247	3.5768*	.57085	3.5789	3.5053	3.6484	0.000
	East	10	4.0148	.62697	3.8000	3.5329	4.4967		9	3.0702	.63812	3.3158	2.5797	3.5607	
	West	43	3.9444	.56639	4.0000	3.7701	4.1187		42	3.3635	.59242	3.3421	3.1789	3.5482	
	Total	395							390						
Site of works	MOH Hospitals	107	3.9560	86254	4.0667	3.7907	4.1213		105	3.3976	.77180	3.4737	3.2482	3.5469	
	Military hospitals	76	4.0193	.83030	4.3000	3.8296	4.2090		76	3.4909	.62032	3.5000	3.3491	3.6326	
	National Guard Hospital	10	3.9267	.63514	3.7667	3.4723	4.3810		10	3.1421	.59806	3.3421	2.7143	3.5699	
	Security forces hospitals	4	3.5333	.56569	3.4667	2.6332	4.4335		4	3.3816	.75708	3.3158	2.1769	4.5863	
	University hospital	11	3.5515	.67993	3.4000	3.0947	4.0083		11	3.2079	.36158	3.1111	2.9650	3.4508	
	MOH primary care centers	15	3.9600	.92507	4.5333	3.4477	4.4723		15	3.7825	.67895	4.1053	3.4065	4.1584	
	Private hospitals	12	4.0222	.48520	3.9333	3.7139	4.3305	0.693	12	3.5768	.59758	3.4050	3.1971	3.9564	0.047
	Private primary healthcare center	6	4.2444	.35444	4.4000	3.8725	4.6164		6	3.5000	.62430	3.3684	2.8448	4.1552	
	Community pharmacy	124	3.8892	.80595	4.1333	3.7459	4.0324		123	3.4204	.65818	3.4211	3.3029	3.5379	
	Pharmaceutical company	15	4.0333	.37097	4.0000	3.8279	4.2388		15	3.4502	.46437	3.3684	3.1930	3.7073	
	University (Academia)	9	3.7746	.54548	3.8000	3.3553	4.1939		9	3.4152	.49753	3.5789	3.0328	3.7976	
	Retried	2	4.2333	.14142	4.2333	2.9627	5.5040		2	3.5789	.14886	3.5789	2.2415	4.9164	
	Un-employment	8	3.8583	.68121	3.8667	3.2888	4.4278		8	2.3945	.66410	2.3746	1.8393	2.9497	
	Total	399							396						
Age	24-30	267	4.0094	.73993	4.2000	3.9203	4.0986		265	3.4668	.66409	3.4737	3.3865	3.5471	
	31-35	72	3.9361	.81768	4.0667	3.7440	4.1283		72	3.3875	.70551	3.4050	3.2217	3.5533	
	36-40	25	3.6173	.94103	3.8000	3.2289	4.0058		24	3.3750	.77962	3.3421	3.0458	3.7042	
	41-45	9	3.5333	.89876	3.5333	2.8425	4.2242	0.061	9	3.1228	.53350	3.2632	2.7127	3.5329	0.241
	46-50	6	3.7667	.91482	4.0000	2.8066	4.7267		6	3.0877	.42455	3.1053	2.6422	3.5333	
	> 50	14	3.9238	.44749	3.9000	3.6654	4.1822		14	3.3200	.62344	3.3947	2.9600	3.6799	
	Total	393							390						
Gender	Male	194	3.8349	.80288	4.0000	3.7212	3.9486	0.001	192	3.3400	.68648	3.3246	3.2423	3.4377	0.005
	Female	199	4.0689	.72235	4.2667	3.9679	4.1699		198	3.5123	.65049	3.5789	3.4211	3.6035	
	Total	393							390						
Employment	Director of Pharmacy	18	3.2630	1.26335	3.7333	2.6347	3.8912		18	2.7632*	.94120	3.0000	2.2951	3.2312	
	Assistant director of Pharmacy	17	3.9765	.73369	4.0000	3.5992	4.3537	0.070	17	3.2742	.64674	3.2632	2.9416	3.6067	0.004
	Supervisor	28	3.8895	.69014	4.0333	3.6218	4.1571		27	3.3060	.46781	3.3684	3.1210	3.4911	
	Pharmacy Staff	281	4.0197	.71592	4.1333	3.9356	4.1037		279	3.4836*	.66650	3.4737	3.4051	3.5622	
	Pharmacy intern	49	3.8556	.79817	3.8000	3.6263	4.0848		49	3.4719	.57025	3.4211	3.3081	3.6357	
	Total	393							390						
Experiences	<1	211	3.9767	.79776	4.2667	3.8684	4.0849		209	3.4529	.68717	3.4211	3.3592	3.5466	
	1-3	87	4.0204	.79018	4.3333	3.8520	4.1888		87	3.4864	.67672	3.4737	3.3422	3.6307	
	4-6	39	3.7846	.77043	4.0000	3.5349	4.0344		39	3.3616	.64321	3.4211	3.1531	3.5701	
	7-9	14	4.1313	.69138	4.3667	3.7321	4.5305	0.103	14	3.2143	.56175	3.3158	2.8899	3.5386	0.272
	10-12	12	3.6944	.40548	3.7000	3.4368	3.9521		11	3.1770	.66461	3.0526	2.7305	3.6235	
	>12	30	3.8354	.64055	3.8667	3.5962	4.0746		30	3.3563	.65214	3.3421	3.1128	3.5998	
	Total	393							390						

Table 7: Multiple regression of Factors with the perception of forensic pharmacy.

Model	R	R Square	F	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
					B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1 (Constant)	.209a	.044	2.932	.008b	3.272	.278		11.770	.000	2.725	3.818		
Location					.034	.036	.049	.951	.342	-.036-	.104	.950	1.053
Site of work					-.009-	.009	-.051-	-.984-	.326	-.027-	.009	.932	1.073
Age (years)					-.076-	.056	-.116-	-1.355-	.176	-.186-	.034	.337	2.970
Pharmacist gender					.198	.080	.128	2.474	.014	.041	.355	.919	1.088
Years of experience at pharmacy career					.053	.045	.104	1.168	.244	-.036-	.142	.314	3.180
Position Held					.092	.050	.104	1.847	.065	-.006-	.191	.780	1.281

a. Dependent Variable: perception of nuclear pharmacy, Predictors: (Constant), Years of experiences at pharmacy career , Location , Pharmacist gender, Position Held , Age (years)

Bootstrap for Coefficients						
			Bootstrapa			
					95% Confidence Interval	
Model	B	Bias	Std. Error	Sig. (2-tailed)	Lower	Upper
1 (Constant)	3.272	.045	.437	.001	2.469	4.164
Location	.034	.001	.033	.305	-.032-	.099
Site of work	-.009-	-.001-	.009	.300	-.026-	.010
Age (years)	-.076-	-.001-	.060	.205	-.189-	.051
Pharmacist gender	.198	-.005-	.082	.018	.024	.351
Years of experiences at pharmacy career	.053	-.003-	.056	.331	-.063-	.162
Position Held	.092	-.005-	.073	.196	-.068-	.228

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

had a bachelor's degree or Pharm D. They operated in the community pharmacy field or hospital pharmacy with diverse experiences to imitate the actual practice of forensic pharmacy. The majority of responders were an equal sample of gender to reproduce both gender opinions with varying positions of a pharmacy career. The results exposed that the average score of perception of forensic pharmacy was good in the current examination. The highest perception was about the pharmacist, the forensic pharmacy under working at healthcare institutions; they decide that forensic pharmacy is for justice and investigation factors of the crime problem. The pharmacist had a positive outcome perception of forensic pharmacy and vindicated demand for the services. However, the pharmacist disagrees with the mistake that they hold against them or pharmacists promote position as responders to medication errors, and the policy and procedures might to avert mistakes. It is a good perception of pharmacist onset towards medications errors involved in the forensic pharmacy system.

The pharmacist settled with numerous factors preventing forensic pharmacy; for instance, forensic pharmacy education and training were weak compared to earlier forensic medicine and dentistry.[5,17] Forensic pharmacy was not correctly taught during pharmacy school, and the level of clinical knowledge of forensic pharmacy was not tolerable. The pharmacy schools recommended that the forensic pharmacy education and healthcare institutions or forensic medicine department deliver several courses about forensic pharmacy, highlighting the founded residency program about forensic pharmacy cooperation with the board of forensic medicine residency program. In contrast, the pharmacist disagrees with various barriers and does not deliberate them as barriers preventing forensic pharmacy implementation. For instance, the barriers, the importance of forensic pharmacy, lack of time working in a forensic pharmacy, or lack of confidence for physician's discussion about forensic pharmacy. They were not measured natural barriers. Most pharmacists suggest various references to offer forensic pharmacy, counting

starting the implementation of electronic forensic pharmacy, cumulative the number of forensic pharmacy staff, standardized forensic pharmacy, and connecting the medications safety issues with forensic pharmacy. All four suggestions were grave and echoed an excellent perception of forensic pharmacy in the future. Various factors might disturb the perception of forensic pharmacy or barriers preventing implementation for the site of work, age, and several years of experience do not affect pharmacist perception.

In comparison, location and gender exaggerated the perception of forensic pharmacy and barriers. The north and south more pretentious the perception than other locations, which lowered the perception score related to minor services of forensic medicine-related issues. Besides, the central region had the lowest score of seeming barriers because most forensic medicine services are situated in the central area, and they will remark many obstacles in the survey. In contrast, the south region had more barriers than the central region due to few forensic medicine services. The

Table 8: Multiple regression of Factors with the Reasons preventing forensic pharmacy implementation.

	Model	R	R Square	F	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
						B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	.274[a]	.075	5.171	.000[b]	2.519	.239		10.539	.000	2.049	2.988		
	Location					.079	.031	.129	2.554	.011	.018	.141	.949	1.054
	Site of work					-.013-	.008	-.085-	-1.666-	.097	-.029-	.002	.931	1.074
	Age (years)					-.029-	.048	-.051-	-.597-	.551	-.123-	.066	.338	2.960
	Pharmacist gender					.112	.069	.083	1.619	.106	-.024-	.247	.917	1.091
	Years of experience at pharmacy career					.032	.039	.073	.831	.407	-.044-	.109	.316	3.162
	Position Held					.149	.043	.193	3.475	.001	.065	.234	.782	1.278

a. Dependent Variable: perception of nuclear pharmacy, Predictors: (Constant), Years of experiences at pharmacy career, Location, Pharmacist gender, Position Held, Age (years)

Bootstrap for Coefficients						
			Bootstrap[a]			
					95% Confidence Interval	
	Model	B	Bias	Std. Error	Sig. (2-tailed)	Lower	Upper
1	(Constant)	2.519	.009	.323	.001	1.935	3.172
	Location	.079	.000	.033	.012	.019	.141
	Site of work	-.013-	5.408E-6	.008	.108	-.030-	.003
	Age (years)	-.029-	-.001-	.041	.461	-.105-	.055
	Pharmacist gender	.112	-.003-	.068	.093	-.024-	.238
	Years of experiences at pharmacy career	.032	.000	.042	.437	-.048-	.113
	Position Held	.149	-.001-	.052	.004	.040	.239

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

location might be exaggerated by a 12.9% surge if the location is changed. The females have more positive perceptions than males without apparent reason or are more willing to work at the forensic pharmacy than males. The position does not affect the perception of forensic pharmacy but can affect the barriers of implementation with lower perception. It might be associated to being busy with their current work and focusing on their work or not updating their forensic pharmacy knowledge and declining by 19.3% of perception of barriers preventing forensic of each one surge in their positions.

Limitations

Although very informatics knowledge had been discovered from the existing study, various limitations encompassed the responders mainly from one region only and not equal distribution of responders. In addition, the age levels came from a young age with few years of experiences not equal distribution among responders with age or experiences. Besides, unequal distribution of positions career. All those factors affected the answers of responders

and representative them. Further studies are mandatory with equal distribution of previous elements. Besides, there is no study to compare the contemporary with them.

CONCLUSION

The pharmacist's perception of forensic pharmacy was optimistic. Various barriers prevent the forensic pharmacy implementation, for case, under pharmacy staff, undergraduate during the pharmacy school, postgraduate education and training, vision, mission, and absence of strategic forensic pharmacy plan. No factors disturb the responder's answers except the gender emphasizing female, and career positions affected positively. Removing the barriers will simplify the implementation of a forensic pharmacy foundation in Saudi Arabia.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Consent for Publications

Informed consent was obtained from all the participants

Ethical Approval

This research was exempted from research and ethical committee or an institutional review board (IRB) approval.

https://www.hhs.gov/ohrp/regulations-and-policy/decision-charts-2018/index.html

ABBREVIATIONS

KSA: Kingdom of Saudi Arabia; **SPSS:** Statistical Package of Social Sciences; **JASP:** Jeffery's Amazing Statistics Program; **Strobe:** Strengthening the reporting of observational studies in epidemiology statement: guidelines for reporting observational studies; **SFDA:** Saudi Food and Drug Authority; **CBAHI:** Saudi Central Board for Accreditation of Healthcare Institutions.

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