


Hospital Pharmacy Technician Workforce over 12 Years (2006–2017) in Saudi Arabia

Yousef Ahmed Alomi* , The Former General Manager of General Administration of Pharmaceutical Care, The Former Head, National Clinical Pharmacy and Pharmacy Practice, The Former Head, Pharmacy R & D Administration, Ministry of Health, Riyadh, SAUDI ARABIA.

General Administration of Pharmaceutical Care, Ministry of Health, Riyadh, SAUDI ARABIA.

Saeed Jamaan Alghamdi, General Administration of Pharmaceutical Care, Ministry of Health, Riyadh, SAUDI ARABIA.

Radi Abdullah Alattyh, General Administration of Pharmaceutical Care, Ministry of Health, Riyadh, SAUDI ARABIA.

Correspondence:

Dr. Yousef Ahmed Alomi, The Former General Manager of General Administration of Pharmaceutical Care, The Former Head, National Clinical pharmacy and pharmacy practice, The Former Head, Pharmacy R & D Administration, Ministry of Health, Riyadh, SAUDI ARABIA.

Phone no: +966504417712

E-mail: yalomi@gmail.com

ABSTRACT

Objective: To explore the workforce of pharmacy technician at Ministry of Health (MOH) hospitals over the past 12 years (2006–2017) in the Kingdom of Saudi Arabia.

Methods: This is a retrospective analysis of 12 years (2006–2017) of MOH pharmacy technician workforce at hospital practice. All data were derived from MOH's Statistical Year Books and any missing appropriate information of pharmacy technician workforce was estimated through allied healthcare professional's data at each region including gender or nationality. It included pharmacy technician and excluded all types of pharmacists or clinical pharmacist's workforces at MOH hospital setting. All calculations were based on MOH workforce standards of hospitals. All calculations were performed using Microsoft Excel version 10. **Results:** A total of 8373 pharmacy technicians were employed with 6620 (79.06 %) and 1623 (19.38%) pharmacy technicians employed at various hospitals and primary healthcare centers, respectively; while in the medical administration sectors was 130 (1.55 %). The total number of pharmacy technicians were 4578 (range: 2899–6620). The average number of pharmacy technicians working per bed per region of the hospital was 0.25 (range: 0.08–1.66). The average number of pharmacy technicians per pharmacist per region was 3.04 (range: 2.00–5.57) annually. The average number of male pharmacy technicians was 195 (85.15%) (range: 114–285), whereas the number of female technicians was 34 (14.84%) (range: 21–46). An estimated average number of 211 (92.14%) were Saudi nationals per region (range: 104–319), whereas an average of 18 (7.86%) were non-Saudi individuals (range: 10–41). **Conclusion:** There are more number of pharmacy technicians working at MOH hospitals. The majority of them were Saudi nationals and there were more males than that of female technicians. The ratio of pharmacist to technician was acceptable. The annual assessment of pharmacy technician workforce in the MOH healthcare institutions is required in the Kingdom of Saudi Arabia.

Keywords: Hospital, Pharmacy technician, workforce, Ministry of Health, Saudi Arabia

INTRODUCTION

Over the past several years, MOH hospitals have expanded tremendously with better quality services. The healthcare services are being provided to an overall 20 regions within primary, secondary and tertiary care hospitals.^[1,2] The healthcare system consisted of medical, nursing and pharmaceutical care. The pharmacy service is provided through a pharmacist or a clinical pharmacist in addition to the support pharmacy personnel called pharmacy technician. The pharmacy technician plays an essential role in helping pharmacists to provide pharmaceutical care. The international society declared several roles of a pharmacy technician in the hospital practice.^[3] Previous studies have shown the actual types of roles or services provided to the patients by a pharmacy technician.^[4–6] The workforce of a pharmacy technician was part of those investigations. However, to the best of our knowledge, there are no studies conducted in the KSA, except for a few studies about pharmacy technician workforce during mass gatherings during hajj.^[7–9] Therefore, in this study, we aimed to explore the workforce of pharmacy technician at MOH hospitals over the past 12 years (2006–2017) in the KSA.

METHODS

This is a retrospective analysis of 12 years (2006–2017) of MOH pharmacy technician workforce at hospital practice. All data were derived from the MOH's *Statistical Year Books* and any missing appropriate information of pharmacy technician workforce was estimated through allied healthcare professionals data from each region including gender or nationality.^[1,2,10–19] It included pharmacy technician and excluded all types of pharmacists or clinical pharmacist workforces at MOH hospital setting. All types of hospital services were included in the study for example, general, public, pediatrics, maternity and psychiatric hospitals. All specialized centers for example, cardiac, oncology and dental centers were also included in the study. All pharmacy technicians were expected to provide pharmaceutical care according to the ASHP definition and requirements. All types of pharmacy services were based on CBAHI, Joint Commission on Hospital Accreditation, ASHP best practice standards and General Administration of Pharmaceutical Care strategic plan.^[20–24] All pharmacy technicians working at MOH's PHCs or in the administration or in the non-MOH government-based hospitals and PHCs were excluded from this study. All private hospitals and community pharmacists

Received: 20-01-2019;

Accepted: 29-03-2019

Copyright: © the author(s), publisher and licensee International Journal of Pharmacology and Clinical Sciences. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

This is an open access article distributed under the terms of the Creative Commons Attribution-Non-Commercial-ShareAlike 4.0 License

Access this article online



www.ijpcs.net

DOI:
10.5530/ijpcs.2019.8.27

were also excluded from the study. All calculations were based on MOH workforce standards of PHCs. All calculation were conducted by using Microsoft Excel version 10. The following calculations were performed for each region for a total of 21 regions; the hospital's distribution numbers, the pharmacy technician distribution numbers, the ratio of pharmacy technician per hospitals, the ratio of pharmacist to the pharmacy technician, the gender distribution of pharmacy technician per region, the gender distribution of Saudi pharmacy technician per each region overall Saudi Arabia.

RESULTS

A total number of 282 hospitals, 2361 PHCs and 20 administration regions were included in the analysis. There were a total number of 166 (58.85%) small (50–100 beds), 82 (29.1%) medium (101–300 beds) and 34 (12.05%) large hospitals (>300 beds). A total number of 8373 pharmacy technicians were distributed in the hospital (6620 (79.06 %)) at PHCs (1623(19.38%)) and at administration regions (130 (1.55%)) (Table 1). A total number of 4578

pharmacy technicians were employed annually (range: 2899–6620), whereas the average number of pharmacy technicians per region was 299 (range: 234–411). Riyadh region had highest average number of hospital pharmacy technicians (910) followed by East Province (421) and Jeddah (366) (Table 2). The average number of hospital pharmacy technicians per bed per region was 0.25 (range: 0.08–1.66) annually. Jeddah had the highest average number of hospital pharmacy technicians per bed (0.42) followed by Makkah (0.36) and Al-Hasa region (0.31) (Table 3). The average number of pharmacy technicians per pharmacist per region was 3.04 (range: 2.00–5.57) annually. The highest average number of hospital pharmacy technicians per pharmacist was located in Qunfetha (4.26) followed by Madina (3.81), Quseem and Hail region (3.59) (Table 4).

The estimated average number of male pharmacy technicians per hospital per region was 195 (85.15%) (range: 114–285), whereas female technicians were 34 (14.84%) (range: 21–46). The average number of male pharmacy technicians per region was as follows: Riyadh (778),

followed by East province (358) and Quseem (304). The average number of female pharmacy technicians was as follows: Riyadh (136), followed by East province (63) and Jeddah (54) (Table 5). The estimated average distribution of nationality of pharmacy technician per region was 211 (92.14%) for Saudi (range: 104–319) and 18 (7.86%) for non-Saudi nationals (range: 10–41). The highest average number of Saudi pharmacy technicians was as follows: Riyadh (840), followed by East province (390) and Jeddah (335). The highest average number of non-Saudi pharmacy technicians was as follows: Riyadh (70), followed by East province (31) and Quseem (30) (Table 6). The estimated average number of male Saudi pharmacy technicians per region was 3769 (89.56%) (range: 1951–5653) and female technicians was 439 (10.44%) (range: 118–720). The highest average number of males was as follows: Riyadh (752), followed by East province (348) and Jeddah (301) and the highest average number of females was as follows: Riyadh (89) and followed by East province (42), both the Jeddah with Quseem were (34) (Table 7).

DISCUSSION

The healthcare system is improving over the past few years by increasing the number of hospitals, PHCs and specialized centers in the KSA.^[1,10] Most of the hospitals were small and they require a big area to provide essential services for adults, pediatric and maternity healthcare services. People living in all big cities and villages should receive healthcare services. Moreover, some people live in remote villages which do not have better healthcare services. As a result, such regions require better healthcare services. Medium-sized and large hospitals were considered as secondary and tertiary care services located in the cities with large and medium populations, which can receive patient's transferred from small hospitals. All types of hospitals need human resources, including a pharmacist, clinical pharmacist and pharmacy technician. The number of pharmacy technicians required is much greater than that of pharmacists. This is due to the establishment of pharmacy technician colleges. The number of colleges of pharmacy are very few not exceeding three. In addition, the private colleges of pharmacies are not well established yet. Majority of the pharmacy technicians had more than two-third of the hospital's work, whereas PHCs had one-third less work and very few percentages works at medical affairs administration or medications stores and administration secretary jobs. This result contradicts the results reported in previous studies.^[5,25] However, with the new updated pharmacy strategic plan with New

Table 1: Total number of hospitals in the Kingdom of Saudi Arabia 2017.

Region	No of hospitals	≤50	51-100	101-200	201-300	301-400	4001-500	500<
Riyadh	49	18	5	13	8	1	2	2
Makkah	10	2	1	1	3	0	3	0
Jeddah	13	1	4	2	3	0	2	1
Taif	15	10	0	1	1	0	2	1
Madinah	19	9	3	3	2	0	1	1
Quseen	19	10	0	4	3	0	2	0
East Province	20	10	4	1	0	2	2	1
Alhasa	9	2	3	1	1	0	1	1
Heralbatin	7	4	0	1	2	0	0	0
Aseer	20	7	7	5	0	0	1	0
Bisha	7	4	1	1	0	1	0	0
Tabouk	12	3	5	2	1	0	1	0
Hail	12	8	0	2	1	1	0	0
North Boarder	10	4	2	2	1	1	0	0
Jazan	21	10	4	6	0	0	1	0
Najran	11	5	2	3	0	1	0	0
Albaha	10	4	4	0	0	2	0	0
Aljouf	9	3	1	3	2	0	0	0
Alqurayat	4	2	0	1	1	0	0	0
Qunfetha	5	3	1	1	0	0	0	0
TOTAL	282	119	47	53	29	9	18	7

Table 2: Total number of hospital pharmacy technician per region.

Region	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	mean
Riyadh	449	464	513	568	917	1053	1018	1038	1175	1141	1268	1324	910
Makkah	218	189	173	212	212	169	840	280	406	426	439	463	336
Jeddah	273	245	265	293	342	364	0	383	487	555	552	631	366
Taif	146	126	122	141	183	196	0	204	257	269	278	281	184
Madina	260	210	194	225	275	338	345	332	458	468	473	481	338
Quseen	235	252	258	215	330	362	355	343	480	487	478	488	357
East Province	142	221	243	246	397	452	719	436	542	545	547	566	421
Alhasa	153	126	123	134	170	157	0	168	197	211	216	206	155
Heralbatin	49	37	27	56	65	56	0	78	109	134	144	143	75
Aseer	151	186	177	158	221	231	321	262	361	359	352	350	261
Bisha	29	33	17	27	53	58	0	58	84	76	79	74	49
Tabouk	143	74	80	83	101	134	140	157	187	216	211	216	145
Hail	108	82	77	97	114	119	123	138	209	201	195	195	138
North Boarder	53	37	54	74	85	100	112	127	142	127	118	117	96
Jazan	203	199	175	206	267	291	303	298	396	403	412	419	298
Najran	83	106	99	95	128	123	130	149	246	264	255	268	162
Albaha	89	53	73	71	97	112	99	118	153	145	146	136	108
Aljouf	60	47	58	57	80	97	134	101	142	138	129	127	97
Alqurayat	34	35	20	31	35	43	0	54	63	58	59	58	41
Qunfetha	20	15	14	28	41	37	0	44	76	73	77	77	42
TOTAL	2899	2737	2762	3018	4113	4492	4639	4768	6171	6296	6427	6620	4578
Average per region	234	226	227	239	292	310	317	323	390	396	402	411	229

Table 3: Total number of hospital pharmacy technician per bed.

Region	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	mean
Riyadh	1.24	0.08	0.08	0.08	0.13	0.14	0.14	0.13	0.15	0.14	0.16	0.16	0.22
Makkah	2.90	0.09	0.08	0.10	0.11	0.09	0.12	0.11	0.15	0.16	0.16	0.17	0.36
Jeddah	3.64	0.09	0.10	0.11	0.12	0.15	0.00	0.13	0.16	0.17	0.18	0.20	0.42
Taif	1.40	0.07	0.06	0.07	0.09	0.10	0.00	0.08	0.11	0.12	0.12	0.11	0.19
Madina	1.94	0.10	0.09	0.10	0.12	0.13	0.13	0.12	0.17	0.17	0.17	0.17	0.28
Quseen	1.66	0.12	0.12	0.10	0.15	0.16	0.15	0.13	0.17	0.17	0.17	0.17	0.27
East Province	1.26	0.08	0.09	0.09	0.14	0.16	0.14	0.14	0.17	0.17	0.17	0.17	0.23
Alhasa	2.69	0.09	0.09	0.10	0.11	0.10	0.00	0.11	0.11	0.11	0.11	0.11	0.31
Heralbatin	1.71	0.08	0.06	0.11	0.13	0.11	0.00	0.08	0.11	0.13	0.14	0.14	0.23
Aseer	0.60	0.09	0.09	0.08	0.11	0.12	0.11	0.11	0.16	0.16	0.15	0.15	0.16
Bisha	0.79	0.07	0.04	0.04	0.07	0.08	0.00	0.08	0.11	0.10	0.10	0.10	0.13
Tabouk	2.31	0.08	0.08	0.08	0.09	0.12	0.12	0.13	0.16	0.18	0.12	0.12	0.30
Hail	1.23	0.09	0.08	0.10	0.11	0.11	0.11	0.12	0.18	0.17	0.17	0.15	0.22
North Boarder	1.32	0.05	0.07	0.10	0.09	0.11	0.12	0.13	0.14	0.10	0.09	0.09	0.20
Jazan	1.51	0.11	0.10	0.11	0.16	0.17	0.17	0.16	0.19	0.18	0.19	0.19	0.27
Najran	1.36	0.12	0.11	0.10	0.12	0.11	0.12	0.14	0.21	0.22	0.21	0.20	0.25
Albaha	1.04	0.05	0.06	0.06	0.09	0.11	0.10	0.11	0.14	0.12	0.12	0.12	0.18
Aljouf	2.08	0.06	0.07	0.07	0.10	0.12	0.10	0.12	0.11	0.11	0.10	0.10	0.26
Alqurayat	1.87	0.10	0.06	0.08	0.10	0.13	0.00	0.11	0.13	0.12	0.12	0.12	0.24
Qunfetha	0.68	0.10	0.09	0.18	0.27	0.19	0.00	0.22	0.38	0.21	0.22	0.19	0.23
TOTAL	33.24	1.72	1.64	1.88	2.40	2.49	1.63	2.45	3.20	3.01	2.98	2.92	4.97
Average per city	1.66	0.09	0.08	0.09	0.12	0.12	0.08	0.12	0.16	0.15	0.15	0.15	0.25

Table 4: Total number of hospital pharmacy technician per pharmacists.

Region	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	mean
Riyadh	3.28	1.91	1.57	1.71	2.50	2.61	2.58	2.36	2.36	2.26	1.88	1.96	2.25
Makkah	3.51	3.15	2.51	2.33	2.02	2.25	2.72	2.32	1.76	1.77	1.80	1.59	2.31
Jeddah	5.69	6.28	3.54	2.82	3.11	3.57	0.00	3.64	3.43	3.06	2.89	2.63	3.39
Taif	4.87	4.68	3.49	3.35	3.46	3.93	0.00	2.48	2.86	2.34	2.36	1.81	2.97
Madina	7.44	5.52	4.51	2.62	2.93	4.08	3.45	2.82	3.34	3.41	3.18	2.42	3.81
Quseen	6.19	4.28	3.43	2.63	3.06	3.73	4.28	3.01	3.53	3.61	2.93	2.39	3.59
East Province	2.83	2.57	2.64	2.25	2.54	2.95	2.60	2.66	3.21	2.85	2.78	2.28	2.68
Alhasa	3.64	4.68	3.63	2.92	2.88	2.91	0.00	2.94	3.18	2.57	2.38	2.10	2.82
Heralbatin	7.07	4.63	2.41	2.16	2.03	2.14	0.00	2.98	3.42	3.84	3.12	2.30	3.01
Aseer	7.57	4.53	3.35	2.19	1.99	2.10	1.96	1.70	2.21	1.98	1.85	1.66	2.76
Bisha	2.38	3.70	0.81	2.11	2.64	3.07	0.00	2.33	2.01	2.72	1.97	1.75	2.12
Tabouk	7.16	2.83	2.85	1.88	2.72	4.61	4.01	2.96	2.83	2.85	2.13	1.77	3.22
Hail	3.86	3.41	2.84	3.14	3.35	5.17	4.90	3.63	3.95	3.46	3.00	2.41	3.59
North Boarder	8.79	5.34	4.13	1.91	2.30	3.32	3.98	3.42	3.56	3.17	1.94	1.43	3.61
Jazan	4.95	4.53	3.51	2.21	2.34	3.07	2.92	2.81	3.10	2.99	2.73	2.52	3.14
Najran	11.89	3.79	1.90	1.79	1.85	2.20	2.21	2.33	3.12	2.67	2.30	1.89	3.16
Albaha	3.88	5.31	2.42	1.52	2.43	3.21	2.36	2.23	2.72	2.79	2.31	1.81	2.75
Aljouf	3.54	2.61	3.24	1.84	2.43	3.71	3.18	3.25	3.73	2.77	2.38	1.60	2.86
Alqurayat	3.07	4.32	3.36	1.74	2.34	3.55	0.00	3.02	2.86	2.33	2.09	1.70	2.53
Qunfetha	9.84	7.50	2.03	6.90	5.83	4.66	0.00	2.96	3.17	3.02	3.23	1.93	4.26
TOTAL	111.46	85.56	58.17	50.01	54.76	66.83	41.16	55.89	60.35	56.47	49.23	39.97	60.82
Average per city	5.57	4.28	2.91	2.50	2.74	3.34	2.06	2.79	3.02	2.82	2.46	2.00	3.04

Saudi Vision 2030 and implementation of Saudi managed care pharmacy system, the number will increase in the community pharmacies.^[26] According to our results, the number of pharmacy technicians in the past 12 years have increased approximately 2.28-folds and the majority of the pharmacy technicians work at big cities which have a large number of hospitals and colleges located in central, east and west cities.^[1,10] In addition, the high number of hospitals, including beds and pharmacist. The average number of pharmacy technicians per bed decreased by 20.75-fold and at same time, the ratio of pharmacy technician to pharmacist decreased by 2.76-fold. The number of hospital beds increased more than the number of pharmacists. The increments were very faster than that of the pharmacist. Although there was reduction in the pharmacy technician to pharmacist ratio, our results are in-line with those reported previously.^[27,28]

The highest number of pharmacy technicians per bed were present in Jeddah. However, the cities with the second most number of pharmacy technicians was Makkah and Al-Hasa because

these cities have lower number of hospitals than that of Jeddah, not number of pharmacy technician. The highest ratio of a pharmacy technician to pharmacist was recorded for Qunfetha and Madina, which might be related to a low number of pharmacists, whereas Quseem and Hail have a high number of pharmacy technicians as compared of pharmacists.

According to the results of this study, both male and female pharmacy technicians have increased over the past few years. Male technicians have increased 2.5-fold, whereas females have increased 2.2-fold. This might be because most of the colleges offering pharmacy technician's course had more number of males graduating than that of females. Similar results have been reported in previous studies.^[5,25] Riyadh and East province have a high percentage of male and female pharmacy technicians. This result is expected because of most the colleges offering pharmacy technician's course are in Riyadh and East province. However, the third city with high number of male was Quseem while highest number of female was found in

Jeddah. This is expected because female section at the college of pharmacy technician in Jeddah is available but not in Quseem. The results of nationality distribution shows that over the past few years, there was a 3-fold increase and 4.1-fold decrease in the non-Saudi pharmacy technicians. Most of the cities had a greater number of Saudi and non-Saudi nationals such as Riyadh and East province. According to our results, Saudi male pharmacy technicians have increased over the past few years by 2.89-fold, whereas Saudi female pharmacy technicians have increased by 6.1-fold. That's part of the Saudization jobs program in the KSA. Riyadh, East province and Jeddah regions had all Saudi male and female pharmacy technicians because there are more number of government and private colleges offering the course. To the best of our knowledge, this is the first study conducted in Saudi Arabia, Gulf and in Middle Eastern countries about pharmacy technician workforce. We recommend annual study on hospital pharmacy technician workforce at all healthcare institutions (governmental and private) in the KSA.

Table 5: Gender distribution of hospital pharmacy technician per region.

Region	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		mean	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Riyadh	380	69	385	78	433	80	473	95	775	142	890	162	850	167	855	183	1,029	146	990	151	1,097	171	1,139	185	775	136
Makkah	184	33	157	32	146	27	177	36	179	33	143	26	702	138	231	49	355	50	370	56	380	59	398	65	285	50
Jeddah	231	42	204	41	224	41	244	49	289	53	308	56	0	0	315	67	426	61	481	73	478	74	543	88	312	54
Taif	124	22	105	21	103	19	117	24	155	28	166	30	0	0	168	36	225	32	234	36	240	37	242	39	157	27
Madina	220	40	174	35	164	30	188	38	233	43	286	52	288	57	274	59	401	57	406	62	409	64	414	67	288	50
Quseen	199	36	210	43	218	40	179	36	279	51	306	56	297	58	282	60	420	60	423	64	413	64	420	68	304	53
East Province	120	22	183	37	205	38	204	41	335	62	382	70	600	118	359	77	474	67	473	72	473	74	487	79	358	63
Alhasa	130	23	105	21	104	19	112	22	144	26	133	24	0	0	138	30	173	25	183	28	187	29	177	29	132	23
Heralbatin	42	8	31	6	22	4	47	9	55	10	47	9	0	0	64	14	96	14	117	18	124	19	123	20	64	11
Aseer	128	23	154	31	150	28	131	26	187	34	195	36	268	53	216	46	316	45	311	47	304	47	301	49	222	39
Bisha	24	4	28	6	14	3	23	5	45	8	49	9	0	0	48	10	74	11	66	10	68	11	63	10	42	7
Tabouk	121	22	61	12	67	12	69	14	85	16	113	21	117	23	129	28	164	23	188	29	183	29	186	30	124	22
Hail	92	17	68	14	65	12	81	16	96	18	101	18	102	20	114	24	183	26	174	27	169	26	168	27	118	20
North Boarder	45	8	31	6	45	8	62	12	72	13	84	15	93	18	104	22	125	18	110	17	102	16	101	16	81	14
Jazan	172	31	166	34	148	27	171	34	225	41	247	45	254	50	245	53	347	49	350	53	356	56	360	58	253	44
Najran	70	13	88	18	84	15	79	16	108	20	104	19	109	21	123	26	216	31	229	35	221	34	231	37	139	24
Albaha	76	14	44	9	61	11	59	12	82	15	95	17	83	16	98	21	134	19	126	19	126	20	117	19	92	16
Aljouf	51	9	39	8	49	9	48	10	68	12	82	15	112	22	83	18	124	18	120	18	111	17	109	18	83	14
Alqurayyat	29	5	29	6	17	3	26	5	30	5	36	7	0	0	45	10	55	8	50	8	51	8	50	8	35	6
Qunfetha	17	3	12	3	12	2	23	5	34	6	32	6	0	0	37	8	67	9	63	10	67	10	67	11	36	6
TOTAL	2,071	828	2,123	614	2,258	504	2,709	309	3,793	320	4,122	369	4,394	245	4,426	342	5,954	217	6,092	204	6,210	217	6,373	247	4,210	368
Average	123	22	114	23	117	21	126	25	174	32	190	35	194	38	196	42	270	38	273	42	278	43	285	46	195	34

Table 6: Nationality distribution of all types of pharmacy technician per region.

Region	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		mean	
	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS
Riyadh	321	128	360	104	419	94	510	58	846	71	966	87	964	54	963	74	1,134	41	1,104	37	1,225	43	1,274	49	840	70
Makkah	156	62	147	42	142	32	191	22	195	17	155	14	796	44	260	20	392	14	413	14	424	15	445	17	310	26
Jeddah	195	78	190	55	217	48	263	30	315	27	334	30	0	0	355	27	470	17	537	18	534	19	607	24	335	31
Taif	104	42	98	28	100	22	126	14	169	14	180	16	0	0	189	15	248	9	261	9	269	9	271	10	168	16
Madina	186	74	163	47	159	35	202	23	254	21	310	28	327	18	309	24	442	16	452	15	457	16	463	18	310	28
Quseen	168	67	196	57	210	47	193	22	305	26	332	30	337	19	318	25	463	17	471	16	462	16	470	18	327	30
East Province	101	40	171	50	199	44	220	25	366	31	415	37	681	38	405	31	523	19	527	18	529	18	545	21	390	31
Alhasa	109	44	98	28	101	23	120	14	157	13	144	13	0	0	156	12	190	7	204	7	209	7	198	8	141	15
Heralbatin	35	14	29	8	22	5	50	6	60	5	51	5	0	0	72	6	105	4	130	4	139	5	138	5	69	6
Aseer	108	43	144	42	145	32	141	16	204	17	212	19	304	17	243	19	348	13	347	12	340	12	337	13	239	21
Bisha	20	8	26	7	14	3	25	3	49	4	53	5	0	0	54	4	81	3	74	2	76	3	71	3	45	4
Tabouk	102	41	57	17	65	15	74	8	93	8	123	11	133	7	146	11	180	7	209	7	204	7	208	8	133	12
Hail	77	31	63	18	63	14	87	10	105	9	109	10	116	6	128	10	202	7	194	7	188	7	188	7	127	11
North Boarder	38	15	29	8	44	10	67	8	79	7	91	8	106	6	118	9	137	5	123	4	114	4	113	4	88	7
Jazan	145	58	155	45	143	32	185	21	246	21	268	24	287	16	276	21	382	14	390	13	398	14	403	16	273	25
Najran	59	24	82	24	81	18	85	10	118	10	113	10	123	7	139	11	238	9	256	9	247	9	258	10	150	12
Albaha	64	25	41	12	59	13	64	7	90	8	103	9	94	5	110	8	147	5	140	5	141	5	131	5	99	9
Aljouf	43	17	36	11	48	11	51	6	74	6	89	8	127	7	94	7	137	5	134	4	124	4	122	5	90	8
Alqurayat	24	10	27	8	16	4	28	3	32	3	39	3	0	0	50	4	61	2	56	2	57	2	56	2	37	4
Qunfetha	14	6	12	3	12	3	25	3	38	3	34	3	0	0	41	3	73	3	70	2	75	3	74	3	39	3
TOTAL	2,071	828	2,123	614	2,258	504	2,709	309	3,793	320	4,122	369	4,394	245	4,426	342	5,954	217	6,092	204	6,210	217	6,373	247	4,210	368
average	104	41	106	31	113	25	135	15	190	16	206	18	220	12	221	17	298	11	305	10	311	11	319	12	211	18

Table 7: Gender distribution of Saudi hospital pharmacy technician per region.

Region	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		Mean	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Riyadh	303	19	334	25	390	29	459	51	760	86	872	94	839	125	837	126	1,022	112	984	120	1,089	136	1,130	144	752	89
Makkah	147	9	136	10	132	10	172	19	176	20	140	15	692	103	226	34	353	39	368	45	377	47	395	50	276	33
Jeddah	184	11	177	13	202	15	237	26	283	32	302	33	0	0	309	47	423	46	478	58	475	59	539	69	301	34
Taif	98	6	91	7	93	7	114	13	152	17	163	18	0	0	164	25	224	25	232	28	239	30	240	31	151	17
Madina	175	11	151	11	148	11	182	20	228	26	280	30	284	42	268	40	398	44	403	49	407	51	411	52	278	32
Quseen	158	10	182	14	196	14	174	19	274	31	300	32	293	44	277	42	418	46	420	51	411	51	417	53	293	34
East Province	95	6	159	12	185	14	198	22	329	37	374	40	592	88	352	53	471	52	470	57	470	59	484	62	348	42
Alhasa	103	6	91	7	94	7	108	12	141	16	130	14	0	0	135	20	171	19	182	22	186	23	176	22	126	14
Heralbatin	33	2	27	2	20	1	45	5	54	6	46	5	0	0	63	9	95	10	116	14	123	15	122	16	62	7
Aseer	102	6	134	10	135	10	127	14	183	21	191	21	265	39	211	32	314	34	309	38	302	38	299	38	214	25
Bisha	19	1	24	2	13	1	22	2	44	5	48	5	0	0	47	7	73	8	66	8	68	8	63	8	41	5
Tabouk	96	6	53	4	61	4	67	7	83	9	111	12	116	17	127	19	162	18	187	23	182	23	184	23	119	14
Hail	73	4	59	4	58	4	79	9	94	11	99	11	101	15	111	17	182	20	173	21	167	21	167	21	114	13
North Boarder	35	2	27	2	41	3	60	7	71	8	83	9	92	14	102	15	124	14	109	13	101	13	100	13	79	9
Jazan	137	8	144	11	134	10	166	18	221	25	241	26	250	37	240	36	345	38	348	42	354	44	358	46	245	28
Najran	56	3	77	6	75	6	76	8	106	12	102	11	107	16	120	18	214	24	228	28	219	27	229	29	134	16
Albaha	60	4	38	3	55	4	58	6	80	9	93	10	82	12	96	14	133	15	125	15	125	16	116	15	88	10
Aljouf	41	2	34	3	44	3	46	5	66	7	80	9	110	16	81	12	123	14	119	15	110	14	108	14	80	9
Alqurayat	23	1	25	2	15	1	25	3	29	3	35	4	0	0	44	7	55	6	50	6	50	6	49	6	33	4
Qunfetha	13	1	11	1	11	1	22	2	34	4	31	3	0	0	36	5	66	7	63	8	67	8	66	8	35	4
TOTAL	1,951	118	1,974	149	2,102	155	2,437	268	3,408	385	3,721	402	3,823	568	3,846	578	5,366	591	5,430	661	5,522	689	5,653	720	3,769	439
Average	97.6	5.9	98.7	7.5	105.1	7.8	121.9	13.4	170.4	19.3	186.1	20.1	191.2	28.4	192.3	28.9	268.3	29.6	271.5	33.1	276.1	34.5	282.7	36.0	188.5	22.0

CONCLUSION

This is the first study which conducted an analysis of hospital pharmacy technician workforces at MOH hospitals in Saudi Arabia, Gulf, or in Middle Eastern countries. Majority of the pharmacy technicians was Saudi nationals and were males. The ratio of pharmacy technician to hospital beds or ratio of pharmacy technician to pharmacist has decreased over the past 12 years and the standardization of this ratio is highly warranted. Further studies about pharmacy technicians in all healthcare organizations including MOH is highly recommended in KSA.

ACKNOWLEDGMENT

None.

CONFLICTS OF INTEREST

None.

ABBREVIATIONS

KSA: Kingdom of Saudi Arabia; **MOH:** Ministry of Health; **ASHP:** American Society of Health-System Pharmacists; **CBAHI:** The Saudi Central Board for Accreditation of Healthcare Institutions; **PHCs:** Primary healthcare centers.

ORCID ID

Yousef Ahmed Alomi  <https://orcid.org/0000-0003-1381-628X>

REFERENCES

1. Saudi Ministry of Health. Health Statistical Year Book 2017. Saudi Ministry of Health. 2017.
2. Saudi Ministry of Health. Health Statistical Year Book 2016. Saudi Ministry of Health. 2016.
3. Smestad NR, Le T, Quansah-arku A, Gumpfer KF, Laegeler A, Banzon M. ASHP Statement on the Pharmacy Technician's Role in Pharmacy Informatics. *Am J Heal Pharm*. 2014;71(3):247-50.
4. Siden R, Tamer HR, Skyles AJ, Dolan CS, Propes DJ, Redic K. Survey to assess the role of pharmacy technicians and nonpharmacist staff in the operation of research pharmacies. *Am J Heal Pharm*. 2014;71(21):1877-89.
5. Desselle SP, Holmes ER. Results of the 2015 National Certified Pharmacy. *Am J Heal Pharm*. 2017;74(13):981-91.
6. Koehler T, Brown A. A global picture of pharmacy technician and other pharmacy support workforce cadres. *Res Soc Adm Pharm*. 2017;13(2):271-9.
7. Alomi YA, Alhennawi K, Khayayt N. Pharmacy Technician Workload and Workforce Requirements at MOH Hospitals during Ten years Mass Gathering Hajj (2006-2015) in Makah Region, Saudi Arabia. *J Pharm Pract Community Med*. 2017;3(4s):S75-83.
8. Alomi YA, Alhennawi K, Khayayt N. Pharmacy Technician Workload and Human Resources Requirements at MOH Hospitals during Nine years Mass Gathering Hajj (2006-2014) in Al-Medina Region, Saudi Arabia. *J Pharm Pract Community Med*. 2017;3(4s):s101-6.
9. Alomi YA, Alhennawi K, Khayayt N. Clinical Pharmacy Technician and Human Resources Requirements at MOH Primary Healthcare Centers during Ten years Mass Gathering Hajj (2006-2015) in Makah and Al-Medina Regions, Saudi Arabia. *J Pharm Pract Community Med*. 2017;3(4s):s101-6.
10. Saudi Ministry of Health. Health Statistical Year Book 2006. Saudi Ministry of Health. 2006.
11. Saudi Ministry of Health. Health Statistical Year Book 2007. Saudi Ministry of Health. 2007.
12. Saudi Ministry of Health. Health Statistical Year Book 2008. Saudi Ministry of Health. 2008.
13. Saudi Ministry of Health. Health Statistical Year Book 2009. Saudi Ministry of Health. 2009.
14. Saudi Ministry of Health. Health Statistical Year Book 2010. Saudi Ministry of Health. 2010.
15. Saudi Ministry of Health. Health Statistical Year Book 2011. Saudi Ministry of Health. 2011.
16. Saudi Ministry of Health. Health Statistical Year Book 2012. Saudi Ministry of Health. 2012.
17. Saudi Ministry of Health. Health Statistical Year Book 2013. Saudi Ministry of Health. 2013.
18. Saudi Ministry of Health. Health Statistical Year Book 2014. Saudi Ministry of Health. 2014.
19. Saudi Ministry of Health. Health Statistical Year Book 2015. Saudi Ministry of Health. 2015.
20. American Society of Hospital Pharmacists. ASHP Statement on Pharmaceutical Care. *Am J Hosp Pharm*. 1993;50:1720-3.
21. American Society of Health-System Pharmacists. ASHP guidelines on a standardized method for pharmaceutical care. *Am J Heal Pharm*. 1996;53(14):1713-6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/8827240>
22. Saudi Center Board for Accreditation for Healthcare Institutions (CBAHI). Medication Management (MM). In: National Hospital Standards. 2nd Editio. Saudi Central Board for Accreditation of Healthcare Institutions. 2016;194-211.
23. The Joint Commission. 2016 Comprehensive Accreditation Manuals. Joint Commission Resources. 2016.
24. Alomi YA, Alghamdi SJ, Alattyh RA. Strategic Plan of General Administration of Pharmaceutical Care at Ministry of Health in Saudi Arabia 2012 – 2022. *J Pharm Pharm Scien*. 2015;1(13):1-8.
25. Desselle SP, Holmes ER. Final Report Pharmacy Technician Workforce Survey [Internet]. 2015. Available from: https://www.aacp.org/sites/default/files/final_report_pharmacy_technician_workforce_survey.pdf
26. Alomi YA, Alghamdi SJ, Alattyh RA, Elshenawy RA. The Evaluation of Pharmacy Strategic Plan in Past 2013-2016 and Forecasting of New Vision 2030 at Ministry of Health in Saudi Arabia. *J Pharm Pract Community Med*. 2018;4(2):93-101.
27. Alkhateeb FM, Shields KM, Broedel-zugg K, Bryan A, Snell J. Credentialing of pharmacy technicians in the USA. *Int J Pharm Pract*. 2011;219-27.
28. Bess DT, Carter J, Deloach L, White CL. Pharmacy technician-to-pharmacist ratios : A state-driven safety and quality decision. *J Am Pharm Assoc Pract Pharm Ed*. 2014;54(6):648-51.