AN EXAMINATION OF THE STATE OF PHARMACEUTICAL HUMAN RESOURCES IN CENTRAL HIGHLANDS DISTRICT HOSPITALS AS OF 2022

ABSTRACT

Introduction: Improving the quality of healthcare human resources, particularly pharmacists, is vital for community health care in the Central Highlands region. Challenges in infrastructure and human resources make enhancing the pharmaceutical workforce an **Objectives:** urgent task. То analyze the distribution and structure of the pharmaceutical workforce in district-level hospitals and health centers in the Central Highlands, assess disparities, and provide recommendations to address shortages. Subjects and methods: A cross-sectional descriptive study was conducted on 724 pharmaceutical personnel across 69 district-level general hospitals in the Central Highlands provinces as of December 31, 2022. Results: Pharmacists with university degrees or higher accounted for 33.3%, while pharmacy technicians with associate degrees (DCĐ), secondary-level qualifications (TCD), and assistant pharmacists (DT) made up 62.7%. represented pharmacists Assistant 0.6%. Imbalances in personnel distribution were evident between urban and rural areas. Ratios of pharmacists to doctors, beds, and hospitals were below the standards specified in Circular No. 03/2023/TT-BYT. On average, each hospital had 3.9 pharmacists, with shortages most acute in Kon Tum and Dak Lak. Conclusion: The Central Highlands region faces significant challenges in the structure and number of its pharmaceutical workforce. Pharmacists with higher qualifications

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are limited, with most personnel being pharmacy technicians. There is a marked imbalance in workforce distribution between urban and rural areas. Policies are needed to attract and develop pharmaceutical personnel to meet healthcare demands in this region.

Keywords: pharmaceutical workforce, general hospitals, The Central Highlands, current situation.

I. INTRODUCTION

In recent years, the number of pharmacists (DS) per 10,000 population in the Central Highlands region has increased from approximately 1.2 in 2010 to 1.8 in 2015 [1]. However, this figure remains significantly lower than the national average. The National Healthcare Human Resource Development Plan has set a target of reaching 4 pharmacists per 10,000 population by 2030, strengthening primary healthcare the network, and improving the professional ethics, and responsibility capacity, of healthcare personnel, including the pharmaceutical workforce [2].

Currently, the pharmaceutical workforce in the Central Highlands faces many challenges: a severe shortage in remote and isolated areas, along with an imbalance in professional structure and quality [3].

This study aims to "Analyze the structure and distribution of the pharmaceutical workforce in general hospitals in the Central Highlands region in 2022." It seeks to identify unreasonable issues in the allocation and utilization of pharmaceutical personnel

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VIETNAM MEDICAL JOURNAL Vol .550 No. 1 | 2025

in hospitals across the region, and to propose specific solutions for the development of the pharmaceutical workforce. This is expected to improve the quality of healthcare services, especially in the disadvantaged areas of the Central Highlands.

II. SUBJECTS AND METHODS

2.1. Materials and methods

- Data source: Pharmaceutical workforce data from district-level general hospitals (BVĐK) in the Central Highlands provinces, including Kon Tum, Gia Lai, Dak Lak, Dak Nong, and Lam Dong, as of December 31, 2022.

- Secondary data: Sourced from the Department of Medical Services Administration and annual reports of districtlevel general hospitals, stored in hospital workforce management software.

2.2. Study subjects

- Pharmaceutical workforce: Includes the following groups:

+ Pharmacists (DS): Bachelor of Pharmacy (Pharmacist) and Higher of Pharmacy (Master, Doctor of Pharmacist).

+ Pharmacy Technicians (DCĐ, TCD, DT): Includes associate-degree pharmacists (DCĐ), secondary-level pharmacists (TCD), and assistant pharmacists (DT).

- The study focuses on pharmaceutical personnel working in district-level general hospitals and health centers (referred to collectively as BVDK) in the Central Highlands region as of December 31, 2022.

2.3. Research Methods

- Study design: Descriptive retrospective study, based on data collected from reports

and hospital workforce management software.

- Data collection: Comprehensive collection of pharmaceutical workforce data from BVĐK and health centers in the Central Highlands. The data is sourced from annual hospital reports submitted to the Department of Medical Services Administration and verified by the reporting units. The data is stored in hospital workforce management software.

- Analysis indicators: Number of pharmaceutical personnel by category, number of pharmacists per bed (DS/GB), number of pharmacists per hospital (DS/BV), and number of pharmacists per doctor (DS/BS).

- Scope of study: Data analysis focuses on the provinces of Kon Tum, Gia Lai, Dak Lak, Dak Nong, and Lam Dong.

2.4. Data Processing Methods

- Collected data was entered and processed using SPSS 22.0 statistical software.

- Results were analyzed and presented in tables and charts, comparing pharmaceutical workforce indicators across provinces and the entire region, including ratios of pharmacists to doctors (DS/BS) and pharmacists to beds (DS/GB).

- Excel 2013 was used for preliminary data processing and calculations before detailed analysis.

III. RESULTS

3.1. Structure of the Pharmaceutical Workforce in General Hospitals in 2022 in the Central Highlands Region

Province	Number of hospitals	Higher of Pharma cist	%	Pharma cist	%	Pharmacy Technician or Assistant Pharmacist	%	Total	Pharmacist /No of H (c+e)/b
а	b	С	d	е	f	g	h	i	j
Kon Tum	10	5	3.6	19	13.6	116	82.8	140	2.4
Gia Lai	19	4	2.9	54	39.1	80	57.9	138	3.1
Dak Lak	18	6	3.0	64	32.0	130	65.0	200	3.9
Dak Nong	8	1	1.0	40	39.6	60	59.4	101	5.1
Lam Dong	14	9	6.2	64	44.1	72	49.6	145	5.2
Total	69	25	3.5	241	33.3	458	63.2	724	3.9

Table 1: Structure of the pharmaceutical workforce in district-level general hospitals in 2022 by province in the Central Highlands

In 2022, out of 724 pharmaceutical personnel working across 69 district-level general hospitals (BVĐK) in the Central Highlands, the majority held associate (DCĐ) or secondary-level (TCD) qualifications, accounting for 63.2% of the workforce.

- The highest proportion of Pharmacy Technicians or Assistant Pharmacists was observed in Kon Tum (82.8%), followed by Dak Lak (66.0%), and the lowest in Lâm Dong (49.6%).

- Pharmacists (DS), including those with postgraduate (DSSĐH) and undergraduate (DSĐH) qualifications, numbered 266, representing 36.8% of the workforce. This percentage was unevenly distributed across provinces, with Lâm Dong having the highest ratio at 44.51%, still lower than the Mekong Delta average of 46.6%.

- The average number of Pharmacists per hospital (DS/BV) was 3.9, with Lâm Đồng having the highest ratio of 5.2 DS/BV, while Kon Tum had the lowest at 2.4 DS/BV.

- The proportion of associate and secondary-level personnel (Pharmacy Technicians or Assistant Pharmacists) in the Central Highlands was 62.7%, significantly higher than the national average of 50.9%.

- The pharmacist-to-doctor ratio (Pharmacists)/Doctors) in the region averaged 1/1.7, lower than the national average of 1/1.1.

3.2. Structure of the pharmaceutical workforce in district-level general hospitals in urban and rural areas in 2022

Table 2: Structure of the pharmaceutical workforce in district-level general hospitals by urban and rural areas in the Central Highlands region.

Region	Number of hospital	Higher of Pharmacist (1)		Pharmacist (2)		Pharmacy Technicians or Assistant Pharmacists (3)		Total
		No	(%)	No	(%)	No	(%)	
Urban	8	12	0.0694	61	0,3526	100	0.578	173
Rural	61	13	0.0236	180	0,3267	358	0.6497	551
Total	69	25	0.0345	241	0,3329	462	0.6381	724

VIETNAM MEDICAL JOURNAL Vol .550 No. 1 | 2025

In the Central Highlands, the pharmaceutical workforce is predominantly concentrated in rural areas, accounting for 76% of the total workforce, yet the proportion of high-level qualifications (Higher of Pharmacist - DSSDH and Pharmacist - DSĐH) is lower compared to urban areas. Urban areas represent 24% of the workforce, with 6.9% DSSDH and 35.3% DSÐH, totaling 42.2% of high-level personnel. In contrast, rural areas have 35.1% high-level personnel (2.4% DSSDH, 32.7% DSDH) and heavily rely on associate and secondary-level personnel (DCĐ & TCD), which constitute 64.9% of the rural workforce compared to 57.8% in urban areas.

This disparity highlights the shortage of highly qualified personnel in rural areas, attributed to limited working conditions, career opportunities, and healthcare infrastructure. To address this imbalance, efforts should focus on enhancing local training programs, implementing incentive policies, and investing in the development of healthcare facilities in rural areas.

Νο	Province	GB Province	BS Doctor	DS Pharmacists	DS/GB Pharmacists per bed	DS/BS Pharmacists per Doctor	
1	Kon Tum	1960	412	24	1/81.7	1/17.2	
2	Gia Lai	3368	573	58	1/58.1	1/9.9	
3	Dak Lak	4770	924	70	1/68.1	1/13.2	
4	Dak Nông	1381	374	41	1/33.7	1/9.1	
5	Lâm Dong	2876	686	73	1/39.4	1/9.4	
Total		14355	2969	266	1/54.0	1/11.2	

Table 3. Distribution of pharmacists per doctor and per hospital bed

In the Central Highlands, the pharmaceutical workforce is unevenly distributed across provinces. The region has a total of 14,355 hospital beds (GB), 2,969 doctors (BS), and 266 pharmacists (DS), with an average ratio of 1 DS per 54.0 GB and 1 DS per 11.2 BS.

Đắk Nông has the highest ratios of DS/GB (1/33.7) and DS/BS (1/9.1), whereas Kon Tum shows the lowest ratios at 1/81.7 and 1/17.2, respectively. Lâm Đồng leads in the number of pharmacists (73 DS) and

maintains favorable ratios of 1/39.4 (DS/GB) and 1/9.4 (DS/BS). Meanwhile, Gia Lai and Dak Lak lag behind, with DS/GB ratios of 1/58.1 and 1/68.1, requiring further improvement.

To balance the pharmaceutical workforce in the region, priority should be given to supporting Kon Tum and Dak Lak through targeted policies to attract pharmacists, compared to Dak Nông and Lam Dong, where the workforce distribution is relatively better.

3.3. Distribution of pharmacists in hospitals by urban and rural areas *Table 4.* Distribution of pharmacists in hospitals by urban and rural areas

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Region	Number of	Pharmacists		Hospit	al beds	Doctor				
	hospital	No.	DS/BV	No.	DS/GB	No.	DS/BS			
Urban	8	73	9.1	6559	1/89.8	881	1/12.1			
Rural	61	193	3.2	7796	1/40.4	2088	1/10.8			
Total	69	266	3.9	14355	1/54.0	2969	1/11.2			

In the Central Highlands, a total of 69 hospitals employ 266 pharmacists (DS), with an average ratio of DS/GB at 1/54.0 and DS/BS at 1/11.2.

Urban areas have 8 hospitals with 73 pharmacists (an average of 9.1 DS/BV), but their ratios are less favorable, with DS/GB at 1/89.8 and DS/BS at 1/12.1, lower than those in rural areas. In contrast, rural areas, with 61 hospitals and 193 pharmacists (an average of

3.2 DS/BV), achieve better ratios: DS/GB at 1/40.4 and DS/BS at 1/10.8.

Although urban areas have a higher concentration of pharmacists, their distribution does not align with the number of hospital beds, indicating a mismatch. Rural areas, despite having fewer pharmacists per hospital, maintain better DS/GB ratios, suggesting more effective allocation.

Province	Hospital has no pharmacists		Hospital has 01 pharmacists		Hospital has 02 pharmacists		Hospitals with Three or More Pharmacists	
	No.	No. (%)		(%)	No.	(%)	No.	(%)
Kon Tum	0	0.0%	3	30.0%	5	50.0%	2	20.0%
Gia Lai	2	10.5%	2	10.5%	6	31.6%	9	47.4%
Đắk Lắk	4	22.2%	2	11.1%	1	5.6%	11	61.1%
Đắk Nông	2	25.0%	0	0.0%	0	0.0%	6	75.0%
Lâm Đồng	2	14.3%	2	14.3%	0	0.0%	10	71.4%
Total	10	14.5%	9	13.0%	12	17.4%	38	55.1%

3.4. Classification of general hospitals (BVĐK) by the number of pharmacists *Table* 5. Classification of general hospitals by the number of pharmacists employed

In the Central Highlands, out of 69 hospitals, 14.5% have no pharmacists (DS), with Dak Nong having the highest proportion at 25%. Hospitals with one pharmacist account for 13%, with Kon Tum leading at 30%. Hospitals with two pharmacists make up 17.4%, with Gia Lai having the highest proportion at 31.6%.

Hospitals with three or more pharmacists constitute 55.1%, with Dak Nong and Lam Dong showing the highest rates at 75% and 71.4%, respectively. Dak Lak also demonstrates a favorable distribution, with 61.1% of hospitals having three pharmacists. Meanwhile, Gia Lai and Lâm Đồng maintain strong proportions at 47.4% and 71.4%, respectively.

Notably, Dak Nong and Lam Dong have low percentages of hospitals without

pharmacists, reflecting better workforce allocation in these provinces.

IV. DISCUSSION

In 2016, the Central Highlands had only 6.4 doctors (BS) and 1.1 pharmacists (DS) per 10,000 population, significantly lower than the national averages of 8.6 BS and 2.9 DS per 10,000 population. This highlights the challenges in meeting healthcare workforce requirements, particularly in hospital pharmacy. The distribution of pharmaceutical personnel is uneven across provinces, with DS/BV ratios ranging from 1/81.7 in Kon Tum to 1/33.7 in Dak Nông, reflecting severe shortages in district hospitals. The average DS/BS ratio is 1/11.2, higher than the 1/4.0 target set by Circular No. 03/2023/TT-BYT, but still insufficient to

VIETNAM MEDICAL JOURNAL Vol .550 No. 1 | 2025

meet the demands of clinical pharmacy services.

Despite an increase in the number of pharmacists over the years, uneven distribution remains a major issue, especially in rural areas. This imbalance hinders the establishment of clinical pharmacy activities and affects the overall quality of pharmacy services in hospitals. The lack of highly qualified personnel in district hospitals, with low DS/GB ratios, does not meet regulatory standards. Most tasks in district hospitals rely on pharmacy technicians (DCĐ & TCD) rather than highly qualified pharmacists, which can impact the quality and effectiveness of hospital pharmacy services, particularly in research, drug management, and clinical pharmacy.

Comparatively, DS/BS ratios in the Central Highlands average 1/11.2, with the best ratio in Dak Nông (1/9.1) and the worst in Kon Tum (1/17.2). Although the regional average is higher than the national target of 1/4.0, significant disparities persist. The average DS/BV ratio is 3.9, with the lowest in Kon Tum (2.4 DS/BV), reflecting widespread shortages in provincial hospitals. Similarly, the DS/GB ratio averages 1/54.0, with the lowest in Kon Tum (1/81.7), underscoring the failure to meet the required pharmacist workforce according regulations. While there has been growth in the pharmaceutical workforce, provinces such as Kon Tum and Đắk Lắk still struggle to attract enough pharmacists to district hospitals.

Analysis of pharmacist distribution shows that 14.5% of hospitals lack pharmacists, with Dak Nông reporting the highest proportion (25%). On the other hand, 55.1% of hospitals have three or more pharmacists, with Dak Nông (75%) and Lâm Đồng (71.4%) leading. These provinces benefit from better infrastructure and economic conditions, making them more attractive for pharmacists. However, the unequal distribution continues to challenge drug supply and community health services, particularly in rural and mountainous areas. Comprehensive strategies are needed to recruit, train, and develop the pharmaceutical workforce in underserved areas to ensure equitable healthcare delivery.

V. CONCLUSION

As of the end of 2022, the Central Highlands had a total of 724 pharmaceutical personnel, including 266 pharmacists (33.3%) with a university degree or higher. technicians (DCĐ & TCD) Pharmacy accounted for 62.7%, while assistant pharmacists (DT) comprised only 0.6%. On average, each hospital employed 3.9 pharmacists, with DS/BS and DS/GB ratios 1/11.2and 1/54.0, respectively, at highlighting workforce shortages and uneven distribution across provinces.

Although the number of pharmacists has grown, significant gaps remain, particularly in hospitals in disadvantaged areas. To improve the quality and efficiency of pharmacy services, especially clinical pharmacy, in the Central Highlands, effective policies are required to attract, train, and develop the pharmaceutical workforce. Special attention should be given to areas with severe shortages to enhance workforce allocation and meet community healthcare demands.

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Vol .550 No. 1 | 2025 VIETNAM MEDICAL JOURNAL

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