

## ORIGINAL ARTICLE

# Supply and utilization of traditional Chinese medicine services in the nine Pearl River Delta cities in the Greater Bay Area

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**Objective:** To analyze the present situation of traditional Chinese medicine (TCM) service supply and utilization in 9 cities in the Pearl River Delta (PRD) region of China and provide the specific suggestions for further rational allocation of TCM service resources in the 9 cities in PRD region. **Methods:** Excel was used to conduct a descriptive statistical analysis of the main indicators of TCM service supply and utilization from 2010 to 2019. **Results:** In 2019, there were 100 TCM hospitals in the nine cities of the Pearl River Delta in the Greater Bay Area, with the number (0.155) of TCM hospitals for every 100,000 people; and the numbers (0.97 in Zhuhai and 0.19 in Dongguan) of TCM hospital beds for every 1,000 people. The utilization rate of TCM hospital beds was the highest in Zhongshan (93.3%), and the lowest in Huizhou (71.9%) for 10 consecutive years. The city with the highest average daily medical visits was Foshan (4051.2). **Conclusion:** In Shenzhen and Zhuhai, the input of TCM service personnel and materials is large but the utilization rate is low. The supply of TCM services in Dongguan is insufficient, and there is a huge gap between the demand and the supply. Thus, it is necessary to rationally allocate TCM medical resources, increase the supply of TCM services in some areas, and improve the utilization efficiency of TCM resources.

**Key words:** traditional Chinese medicine, medication, services

**INTRODUCTION**

The development of a traditional Chinese medicine (TCM) heritage and innovative services has become a major national strategy to address the social change caused by the aging population. The “Opinion on Promoting Heritage and Innovative Development of Traditional Chinese Medicine” of the Central Committee

of the Communist Party of China and the State Council indicates that TCM plays a unique role in promoting the health of the population. In addition, a goal of “developing a TCM hub in the Guangdong-Hong Kong-Macau-Greater Bay Area” has been proposed.<sup>[1]</sup> There has been a long history of collaboration in TCM among the 9 cities in the Greater Bay Area, and from the early one-way “spur” to the “interaction” within the area. Promoting the development of this collaboration in TCM in the Greater Bay Area can further promote construction in the Greater Bay Area metropolis. In this study, we Review and analyze the current availability and utilization of TCM services in nine cities in the Pearl River Delta (PRD) in the context of construction in the Greater Bay Area and propose targeted policy recommendations to promote the development and integration of TCM services in this region.

**DATA AND METHODS**

Data were obtained from the “Statistics on TCM in

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Guangdong Province” between 2010 and 2019. The nine cities in the PRD region selected for the study were Guangzhou, Shenzhen, Foshan, Dongguan, Zhuhai, Zhongshan, Huizhou, Jiangmen, and Zhaoqing, China. Microsoft Excel was used for database creation and descriptive statistical analysis.

## RESULTS

### **Availability of traditional Chinese medicine services in the Pearl River Delta region**

The number of TCM hospitals in the PRD region grew rapidly between 2010 and 2019, with an average annual growth rate of 19.05%, slightly higher than the overall annual growth rate in Guangdong Province (17.95%). There were only 86 TCM hospitals in the PRD region in 2010, and it increased to 100 by 2019.

Because of the high variation in population density among the nine cities of the PRD region, the increase in the absolute value of TCM hospitals does not necessarily indicate an increase in the TCM hospitals per capita. With respect to relative numbers, the distribution of TCM hospital resources among the nine cities of the PRD region was extremely imbalanced. Three cities, Zhuhai, Zhaoqing, and Guangzhou, had a high number of TCM hospitals per capita, while four cities, Shenzhen, Foshan, Zhongshan, and Dongguan, had a lower number of TCM hospitals per capita than the average number of TCM hospitals per capita in the PRD region (Table 1).

The regional differences in the number of TCM hospital beds were significant, and the growth rate in the less developed regions was low. As of 2019, the cities with the most TCM hospital beds per 1,000 population were Zhuhai (0.97 beds), Guangzhou (0.93 beds), and Jiangmen (0.87 beds), and the cities with the fewest were Dongguan (0.19 beds), Huizhou (0.29 beds), and Shenzhen (0.33 beds) (Table 2).

The number of practitioners reflects the overall level of human resources and strength of the health service institutions in the region. Table 3 shows that the cities with the highest number of TCM practitioners per 1,000 population were Zhuhai, Guangzhou, and Jiangmen, while Dongguan had the lowest number, with only 0.214 in 2019, less than one third of the average of the nine cities in the PRD region. In addition, Shenzhen and Huizhou were also far below the average of the nine cities, but the rate of growth in Shenzhen was very high. As of 2019, Zhuhai had the highest number of professional (assistant) TCM physicians per 1,000 population at 0.483, whereas Dongguan had the lowest, at only 0.078 (Table 4).

### **Traditional Chinese medicine service outputs in the Pearl River Delta region**

Table 5 shows that the TCM hospital bed utilization rate in the PRD region was slightly higher than the provincial average bed utilization rate. As of 2019, the three cities with the highest TCM hospital bed utilization rates were Zhongshan (93.30%), Zhuhai (92.30%), and Foshan (90.90%), and the cities with the lowest rates were Huizhou (71.90%) and Zhaoqing (75.30%). Over the 10-year period, Huizhou has consistently had the lowest TCM hospital bed utilization rate.

Table 6 shows that as of 2019, the city with the highest average number of consultations per practitioner per year was Foshan, with 4051.2 consultations, and the city with the lowest number of consultations was Zhuhai, with 2145.1 consultations. The highest rate of growth in the daily average number of consultations per physician in Foshan over the past 10 years indicates high awareness and demand for TCM services in this city.

Table 7 shows the average number of inpatient bed-days per practitioner between 2010 and 2019 in the PRD region and municipal government-run Chinese hospitals. In descending order, the cities were Foshan, Dongguan, Jiangmen, Zhongshan, Zhaoqing, Guangzhou, Zhuhai, Shenzhen and Huizhou.

## DISCUSSION AND RECOMMENDATIONS

### **Increasing availability of traditional Chinese medicine services**

The results of the present study show that the number of TCM hospitals in the PRD region increased from 84 to 100 from 2010 to 2019, with an average annual growth rate of 19.0%. The number of TCM hospitals per 10,000 population, the number of TCM practitioners per 1,000 population, the number of TCM hospital beds per 1,000 population, and the number of professional (assistant) TCM physicians per 1,000 population increased in nearly all nine cities, indicating that TCM medical resources in the PRD were growing in both absolute and relative terms. There are many reasons for the growth of TCM medical resources in the nine cities, but we believe that it is driven primarily by policy. Since the implementation of the “Strategy for Building a Strong TCM Province” in 2006, Guangdong Province has promulgated a series of policies and documents to promote the development of TCM and has continued to increase the investments in TCM hospitals in accordance with the need for TCM development in the province.

### **Rational allocation and utilization of traditional Chinese medicine resources**

The results of the present study show that the availability of TCM services in Guangzhou was much higher than

**Table 1: Number of traditional Chinese medicine hospitals per 10,000 population in the nine cities of Pearl River Delta region, 2010–2019**

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Guangzhou	0.252	0.243	0.241	0.248	0.245	0.244	0.256	0.241	0.242	0.229
Shenzhen	0.067	0.067	0.066	0.075	0.083	0.079	0.076	0.072	0.061	0.082
Zhuhai	0.256	0.255	0.253	0.252	0.248	0.245	0.239	0.227	0.264	0.247
Foshan	0.097	0.097	0.083	0.082	0.095	0.108	0.134	0.157	0.152	0.147
Zhongshan	0.096	0.095	0.095	0.095	0.094	0.093	0.093	0.092	0.091	0.089
Dongguan	0.061	0.061	0.060	0.060	0.072	0.073	0.085	0.108	0.095	0.083
Zhaoqing	0.280	0.228	0.226	0.224	0.223	0.222	0.245	0.219	0.241	0.239
Jiangmen	0.157	0.157	0.178	0.178	0.177	0.177	0.176	0.175	0.174	0.173
Huizhou	0.174	0.173	0.150	0.170	0.190	0.189	0.188	0.188	0.186	0.184
Pearl River Delta region	0.150	0.143	0.141	0.145	0.151	0.152	0.160	0.159	0.157	0.155
Guangdong province	0.183	0.174	0.174	0.175	0.179	0.181	0.188	0.192	0.194	0.190

**Table 2: Number of traditional Chinese medicine hospital beds per 1,000 population in the nine cities of the Pearl River Delta region, 2010–2019**

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Guangzhou	0.68	0.71	0.73	0.77	0.78	0.85	0.86	0.84	0.91	0.93
Shenzhen	0.14	0.15	0.17	0.17	0.20	0.22	0.25	0.27	0.26	0.33
Zhuhai	0.36	0.36	0.40	0.40	0.40	0.46	0.45	0.45	1.04	0.97
Foshan	0.43	0.43	0.46	0.46	0.48	0.56	0.68	0.69	0.68	0.65
Zhongshan	0.43	0.43	0.43	0.52	0.52	0.52	0.51	0.60	0.60	0.58
Dongguan	0.09	0.09	0.13	0.13	0.13	0.14	0.17	0.19	0.19	0.19
Zhaoqing	0.28	0.31	0.36	0.37	0.44	0.47	0.51	0.53	0.55	0.56
Jiangmen	0.40	0.46	0.63	0.67	0.69	0.73	0.76	0.81	0.82	0.87
Huizhou	0.20	0.20	0.22	0.23	0.25	0.31	0.32	0.32	0.30	0.29
Pearl River Delta region	0.35	0.36	0.40	0.42	0.44	0.49	0.52	0.53	0.56	0.58
Guangdong province	0.28	0.29	0.32	0.34	0.38	0.42	0.45	0.47	0.50	0.51

**Table 3: Number of traditional Chinese medicine practitioners per 1,000 population in the nine cities of Pearl River Delta region, 2010–2019**

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Guangzhou	0.875	0.930	0.952	1.031	1.094	1.130	1.188	1.202	1.226	1.253
Shenzhen	0.267	0.280	0.300	0.315	0.346	0.358	0.352	0.390	0.422	0.482
Zhuhai	0.439	0.449	0.463	0.479	0.538	0.622	0.719	0.724	1.253	1.266
Foshan	0.487	0.508	0.518	0.528	0.556	0.584	0.690	0.702	0.707	0.707
Zhongshan	0.475	0.572	0.598	0.620	0.644	0.646	0.669	0.705	0.713	0.736
Dongguan	0.115	0.128	0.137	0.165	0.179	0.181	0.189	0.203	0.217	0.214
Zhaoqing	0.412	0.404	0.462	0.506	0.569	0.623	0.653	0.670	0.698	0.715
Jiangmen	0.561	0.604	0.681	0.731	0.763	0.811	0.867	0.891	0.925	0.993
Huizhou	0.285	0.275	0.299	0.328	0.338	0.357	0.376	0.405	0.417	0.425
Pearl River Delta region	0.462	0.489	0.514	0.551	0.588	0.615	0.656	0.678	0.715	0.744
Guangdong province	0.353	0.379	0.398	0.426	0.465	0.494	0.532	0.557	0.586	0.609

that of other cities with respect to the number of various TCM resources per 1,000 population, but the utilization of services in TCM hospitals in Guangzhou is not as high as that in other cities, indicating that TCM medical resources in Guangzhou are not fully utilized and should

be further coordinated and managed for efficient use. Foshan, adjacent to Guangzhou, has achieved some economic and cultural success through interconnection of transportation networks, the staggered development of industrial zones, and the interconnection of resources

**Table 4: Number of professional (assistant) traditional Chinese medicine physicians per 1,000 population in the nine cities of Pearl River Delta region, 2010–2019**

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Guangzhou	0.310	0.336	0.348	0.360	0.379	0.386	0.405	0.408	0.407	0.428
Shenzhen	0.102	0.110	0.114	0.121	0.129	0.134	0.135	0.160	0.173	0.193
Zhuhai	0.018	0.170	0.171	0.179	0.196	0.220	0.247	0.270	0.475	0.483
Foshan	0.146	0.148	0.153	0.157	0.167	0.175	0.205	0.215	0.223	0.221
Zhongshan	0.142	0.143	0.165	0.177	0.191	0.197	0.206	0.227	0.242	0.269
Dongguan	0.040	0.040	0.038	0.037	0.057	0.059	0.064	0.070	0.082	0.078
Zhaoqing	0.125	0.121	0.143	0.147	0.153	0.164	0.173	0.186	0.191	0.206
Jiangmen	0.185	0.202	0.213	0.218	0.233	0.262	0.259	0.273	0.280	0.312
Huizhou	0.098	0.094	0.103	0.114	0.117	0.123	0.130	0.138	0.145	0.152
Pearl River Delta region	0.153	0.166	0.174	0.181	0.194	0.203	0.216	0.228	0.242	0.257
Guangdong province	0.125	0.133	0.140	0.145	0.157	0.166	0.176	0.186	0.197	0.209

**Table 5: Utilization of traditional Chinese medicine hospital beds in the study region, 2010–2019 (%)**

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Guangzhou	90.40	91.80	91.80	91.80	93.40	90.90	90.70	91.40	88.60	89.90
Shenzhen	90.30	93.10	87.00	91.30	90.20	93.90	93.60	97.60	93.60	89.90
Zhuhai	81.50	82.70	80.50	82.80	81.80	83.60	87.50	87.40	86.40	92.30
Foshan	101.70	103.90	102.30	107.20	101.90	92.10	92.00	89.60	91.00	90.90
Zhongshan	106.70	113.00	123.40	106.70	107.80	109.30	114.70	97.50	96.30	93.30
Dongguan	87.00	77.00	69.80	71.50	73.90	75.30	69.80	68.80	80.20	88.10
Zhaoqing	75.40	71.20	79.20	87.40	84.50	78.40	77.00	83.40	78.10	75.30
Jiangmen	96.60	94.10	84.50	84.60	84.60	76.90	82.10	85.00	87.50	88.90
Huizhou	71.20	72.80	67.60	64.60	71.80	66.10	63.80	68.10	72.60	71.90
Pearl River Delta region	88.98	88.84	87.34	87.54	87.77	85.17	85.69	85.42	86.03	86.72
Guangdong province	85.90	87.50	88.20	89.10	87.50	84.40	85.50	85.50	85.60	85.80

**Table 6: Number of consultations per practitioner per year in the government-run traditional Chinese medicine hospitals in the cities of the Pearl River Delta region, 2010–2019**

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Guangzhou	1252.8	4286.3	4458.3	4541.5	4560.3	4381.6	4196.6	3780.0	3485.2	3392.0
Shenzhen	1743.5	5668.1	5555.6	5592.5	5522.1	4450.8	3175.8	2465.8	2161.8	2164.9
Zhuhai	1129.5	3610.2	3600.9	3883.7	3612.8	2910.9	2709.3	2551.0	2204.0	2145.1
Foshan	965.1	4526.0	4606.8	4716.3	4554.6	4538.6	4455.7	4113.6	4102.5	4051.2
Zhongshan	1127.8	4976.1	4326.1	4838.8	5050.0	4521.7	4526.5	4094.9	3863.2	3537.0
Dongguan	1040.7	3459.5	3762.6	4185.6	2941.2	2886.8	3117.9	3195.5	3314.4	3593.4
Zhaoqing	890.0	3482.6	3389.1	3480.4	3353.1	3310.6	3355.2	3229.3	3410.7	3032.4
Jiangmen	969.6	3418.8	3775.0	3815.6	3707.5	3351.0	3578.0	3399.1	3653.3	3410.0
Huizhou	513.8	1935.0	1924.6	2073.0	2089.7	2070.3	2250.4	2328.8	2504.0	2690.0
Pearl River Delta region	1176.9	4234.0	4305.4	4420.4	4340.7	4035.0	3830.1	3450.6	3263.5	3165.3
Guangdong province	950.4	3279.5	3344.2	3415.6	3397.0	3188.5	3054.9	2829.4	2736.0	2658.4

to form the “Guangzhou–Foshan metropolitan area” making it one of the cities among the nine in the PRD with high TCM service investment and production. As a new first-tier city, Dongguan ranked fourth in GDP per capita in 2019, second only to Foshan. The availability of TCM services in Dongguan relative to its economic

development was severely inadequate. In recent years, the number of TCM hospital beds, TCM practitioners, and professional (assistant) TCM physicians per 1,000 population in Dongguan has been the lowest among all cities in the PRD. The local health department should find these gaps and implement policies to cover them as

**Table 7: Number of bed-days per practitioner per year in the government-run traditional Chinese medicine hospitals in the cities of the Pearl River Delta region, 2010–2019 (bed-days)**

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Guangzhou	214.4	719.6	725.9	738.8	720.5	705.2	718.4	688.3	711.1	688.6
Shenzhen	150.1	483.2	481.5	493.2	502.9	546.5	627.5	555.4	496.2	530.5
Zhuhai	215.3	641.9	686.7	690.0	611.3	645.4	591.4	526.7	643.3	673.5
Foshan	250.7	1084.8	1105.3	1123.8	1062.9	1071.2	1000.3	996.7	995.8	948.0
Zhongshan	285.3	1339.2	1224.8	1167.3	1100.9	1057.0	1050.5	966.9	893.0	767.0
Dongguan	188.0	634.7	729.4	927.1	626.3	663.6	683.8	698.1	725.4	845.2
Zhaoqing	150.5	634.2	647.6	763.9	822.0	794.9	804.9	844.3	805.7	725.2
Jiangmen	204.2	729.3	812.1	868.6	837.6	734.3	806.9	822.7	817.0	783.0
Huizhou	128.1	444.3	404.8	369.8	392.7	422.8	459.6	447.0	458.5	438.2
Pearl River Delta region	204.4	740.8	752.2	772.9	744.9	733.9	752.3	724.3	720.9	700.7
Guangdong province	198.6	693.3	726.8	758.2	757.2	751.8	777.4	767.8	761.6	741.1

soon as possible to promote the development of a strong TCM province. With respect to TCM hospital bed utilization rate and the average daily workload of TCM physicians, Zhongshan and Jiangmen had a relatively heavy burden for TCM services, while Huizhou and Zhaoqing had a relatively light burden.

### **Solution to traditional Chinese medicine physician shortage**

TCM practitioners are essential for improving TCM service capacity.<sup>[2–3]</sup> Recent TCM graduates are not motivated to work at primary hospitals, and the phenomenon of TCM talent loss is prominent in less economically developed regions. The PRD region should evaluate policies aimed at attracting practitioners, including establishment of a special fund for practitioners, subsidies, guaranteed housing, and other preferential policies to attract TCM practitioners to stay at the primary level. At the same time, multi-point practice should be implemented for TCM physicians, processes should be simplified, and roadblocks to physicians practicing at public hospitals should be, enabling physicians to move within different levels and types of TCM medical institutions to promote TCM resource equity in different regions.

### **New modes of traditional Chinese medicine therapy**

With the development of “Internet plus”, the Internet of Things, and cloud computing, smart services have been implemented at primary TCM institutions.<sup>[4]</sup> Internet health care has enabled online consultations, appointments, queueing, and payments, realizing humanization and convenience of medical services. The advantages of TCM are in outpatient clinics and primary hospitals, not in wards and operating rooms,<sup>[5]</sup> and investigating smart medicine and innovative new modes of TCM treatment facilitates the integration of TCM resources in the Greater Bay Area for the benefit of the

people.

In summary, the development of the TCM industry in the nine cities of the PRD and the promotion of interoperability, policy reciprocity, and TCM resource sharing in the Guangdong-Hong Kong-Macao Greater Bay Area are conducive to the enrichment of the practice of “one country, two systems” and are significant with respect to national strategy, welfare of the people, and foreign exchange.<sup>[6]</sup>

## **DECLARATIONS**

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### **Conflicts of interest**

There is no conflict of interest among the authors.

### **Data sharing statement**

No additional data is available.

### **Secondary publication declaration**

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