

## An Investigation of Current Trends of Medical Postgraduates' Enrollment in China

Jia-xing PAN<sup>1</sup>, Chen ZHANG<sup>1</sup>, Yi QIN<sup>1</sup>, Wen-man LEE<sup>1</sup>, Shi-xing LEE<sup>1</sup>,  
Die ZHU<sup>1</sup>, Wei-ting DENG<sup>1</sup> and Chao-xian YANG<sup>2,\*</sup>

<sup>1</sup>Department of Clinical Medicine, Southwest Medical University, Luzhou 646000, China

<sup>2</sup>Research Center for Preclinical Medicine, Southwest Medical University, Luzhou 646000, China

\*Corresponding author

**Keywords:** Medical postgraduate, Higher education, Current trends, Enrollment, Admission quota.

**Abstract.** The study aims to provide clues for further reform and find out the effective ways for the healthy development of higher education in medical colleges and universities. The author investigated the enrollment in different first-class disciplines of medicine, gathered data including admission quota and enrollment from 99 colleges and universities (in Mainland China) from 2011 to 2016, compared the ratio obtained by dividing the admission quota by the enrollment. The ratio showed an upward trend in annual (except 2012 and 2014). Among all the first-class disciplines, stomatology medicine ranked the highest ratio, basic medicine the lowest. The constituent ratio of the enrollment in clinical medicine accounted for about 48% annually, of which the counterpart in basic medicine counted less than 5%. The discrepancy of the ratio indicates imbalanced development in these medical subjects.

### Introduction

From 1993 to 2016, the number of students entering for National Postgraduate Entrance Examination took on an increasingly upward trend, despite of the first decline in 2008 which might coincide with the international financial crisis and the charge system for postgraduate education coming into effect that year. After two years of continuous decline before 2016, the trend showed another apparent rise up to 1.77 million or so [1]. At the same time, for the full implementation of the National Medium and Long-term Education Reform and Development Plan (2010-2020) which aims at speeding up economic construction and meeting the social needs for higher education [2], the admission quota had maintained a slow but stable growth. However, the competition remained fierce under the huge pressure of the postgraduate fever.

Considering that the enrollment of medical postgraduates is an important part of the whole, Chinese authorities are calling for the complement of two independent examination systems for professional degree and academic degree [3]. The Ministry of Education and the National Health and Family Planning Commission are vigorously promoting the development of the clinical training system named Clinical Medicine (“5+3”) which focuses on postgraduates who specialize in clinical medicine [4]. Up to now, no researcher has fully studied the enrollment situation of medical postgraduates in China. Therefore, in the era of reform, it is necessary to go through the enrollment data, and provide clues for further reform and find out the effective ways for the healthy development of higher education in medical colleges and universities.

### Methods

#### Study Population

Survey data were taken from the official website of colleges or universities and other related sites where staff would update the admission list annually after the National Postgraduate Entrance Examination. The study investigated 99 medical colleges and comprehensive universities from most territories of China (excluding Hong Kong, Macao and Taiwan).

## Statistical Analyses

According to "Subject catalogue for degree conferring and personnel training (2011)" promulgated by the Minister of Education of China [5], first-class disciplines of medicine includes basic medicine (BM), clinical medicine (CM), stomatology medicine (SM), public health & preventive medicine (PHPM), traditional Chinese medicine (TCM), integrated traditional Chinese and western medicine (ITCWM), pharmacy, Chinese materia medica (CMM), medical aspects of specific environments (MASE), medical technology (MT) and nursing. Because that MASE, a burgeoning category, intercrosses with other disciplines, it is not listed separately. The ratio, selected as the main item for discussion, was obtained by dividing the admission quota by the enrollment. Researchers collected enrollment and admission quota across 10 disciplines in each college, and obtained the annual total of planned number and admitted number respectively. The trends in medical postgraduate enrollment from 2011 to 2016 were analyzed as follow. A vertical comparison of the overall trend was performed by dividing the annual planned total by the enrollment total. A horizontal comparison was made by dividing the admission quota by the enrollment of different disciplines. Besides, to analyze the popularity among candidates of different disciplines, a constituent ratio of the enrollment was performed.

## Results

### Distribution of Data Sources

Data finally were taken from 73 colleges and universities, including 12 211/985 project universities (key universities that are internationally renowned) and 61 general colleges and universities (not fully reported here, details available on request). The data covered all levels of medical colleges and universities in China. The 73 colleges and universities involved in the study were distributed in 27 provinces, municipalities and autonomous regions, covering the majority of the country (Fig.1).

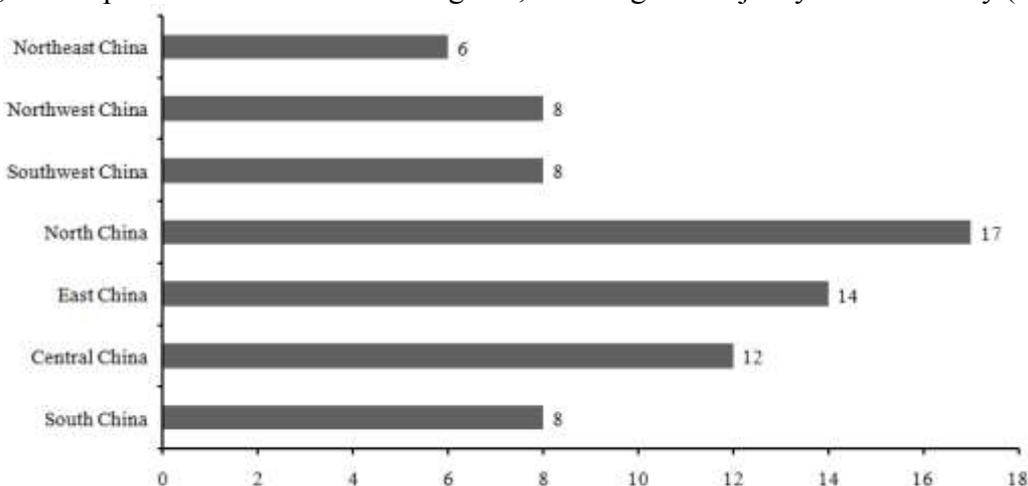


Figure 1. Distribution of the investigated 73 colleges and universities in China.

### Ratios in Annual (A Vertical Comparison)

From 2011 to 2016, the enrollment ratio, on the whole, took on an upward trend, with a slight of fluctuation each year. In 2012, it dropped to the lowest point (96.04%), and went through a significant pick-up in 2013. The ratio declined again in the next two years. Then it was not until 2016 that the data rebounded up to 97.97% (Fig.2).

### The Ratio in Different Disciplines (A Horizontal Comparison)

The ratio of basic medicine postgraduates, on one hand, showed a fairly steady increase, except for a slight of decline in 2012. On the other hand, the ratio over the years stayed at the lowest level (75%) among all the first-class disciplines. The ratio of clinical postgraduates had been stable at a high level

which was all above 98% and fluctuated within 2 per cent. For stomatology and TCM, the ratio maintained at a high level - out of six years, there were four years when the ratios were more than 100%. In PHPM the ratio maintained at a low level yet still higher than those of the basic medicine. In ITCWM, ratios showed a box-fluctuation trend - compared with 2011, the ratio dropped by 3.68 per cent in 2012, and sharply increased by 12.86 per cent in 2013, then reduced by 9.09 per cent in 2014 and had maintained a stable rise since then. Besides, there were 2 years when the ratio was above 100% (2013, 2016). The ratios in MMC made a drop to the lowest point at 84.57% in 2012, and reached a sharp spike at 107.6% in 2016. The ratio of medical technology had been near 90% for 3 consecutive years. It appeared a decline in 2014, and rapidly grew to 104.9% in 2016. The ratio of nursing, apart from the decrease in 2012 and 2016, had been at 100% or so over the years (table 1).

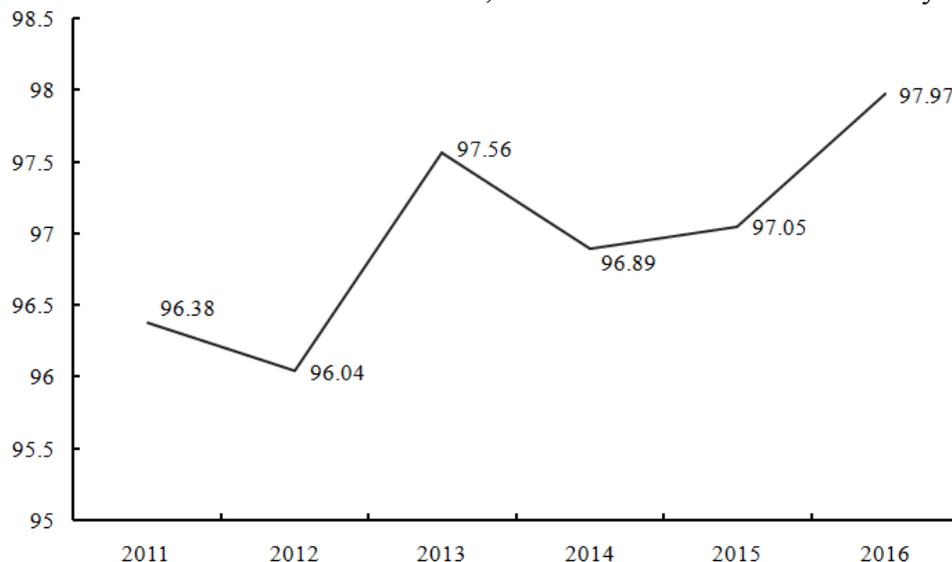


Figure 2. Annual ratios in medical postgraduate entrance examination.

Table 1. Ratio in different first-class disciplines of medicine.

	BM	CM	SM	PHPM	TCM	ITCWM	pharmacy	CMM	MT	Nursing
201			102.3	97.5						
1	75.19	99.14	0	4	103.10	91.62	85.30	100.80	88.21	100.00
201				87.0						
2	74.45	99.58	99.20	0	102.12	87.94	92.90	84.57	90.30	92.00
201			111.9	84.9						
3	77.63	98.10	0	3	103.80	100.80	98.44	86.09	90.29	101.00
201				83.6						
4	77.79	99.55	96.04	7	99.53	91.71	96.57	97.57	80.88	99.52
201			108.4	85.8						
5	79.87	99.92	0	9	98.65	97.90	89.95	92.90	98.08	100.20
201			101.4	96.3						
6	84.09	98.34	4	6	104.05	100.61	92.59	107.60	104.90	93.51

### The Constituent Ratio of Enrollment in First-class Disciplines

On average, first, students admitted in clinical medicine accounted for the largest proportion (48%), and proportion in TCM accounted for more than 18%. Second, for basic medicine it was no more than 5%. Third, the proportions of students enrolled in medical technology and nursing were the least (table 2).

Table 2. The constituent ratio of enrollment postgraduates in first-class disciplines of medicine.

	BM	CM	SM	PHPM	TCM	ITCWM	pharmacy	CMM	MT	Nursing	Total
2011	4.71	45.48	3.86	3.51	18.86	7.10	8.98	4.73	1.48	1.29	100
2012	4.51	49.05	3.65	3.40	19.24	5.38	9.66	3.03	0.89	1.19	100
2013	4.75	46.98	3.54	3.49	19.89	6.17	9.40	3.5	0.55	1.73	100
2014	3.92	43.93	2.90	3.47	22.22	8.10	7.93	5.67	0.39	1.47	100
2015	4.74	53.10	3.29	3.90	15.40	5.32	7.39	3.34	1.11	2.41	100
2016	4.78	47.96	2.90	3.18	16.43	5.74	8.24	4.00	4.87	1.90	100

## Discussion

### Interpretations

Medical colleges and universities mainly situate in North and East China including many 211/985 project universities, which may relate to the geographical superiority and prosperous economy of these regions. According to the Chinese Education Online, Beijing, Jiangsu, Shanghai has been the top 3 provinces that students favored, followed by provinces like Tianjin, Hubei etc [1]. As more students prefer Beijing, Shanghai and other medicine-strengthened areas, this may further exacerbate the imbalance of medical resources in different regions. Therefore, prompting exchanges between colleges in north, east regions and other regions will facilitate to form a virtuous circle for the mutual development of medical education and eliminate the imbalance between different regions.

From 2011 to 2016, the changes in medical postgraduate enrollment roughly kept in line with the trends in national postgraduate enrollment, both showing an increasing tendency[1]. Probably because that the requirement for higher education backgrounds is becoming more and more demanding in medical industry, which inevitably leads to the spike of medical undergraduates taking postgraduate entrance examination. Besides, many students prefer further study in order to strengthen competitiveness among peers. There are also some other reasons, such elite school complex, the keen interest in academic research and the evasion of hardship in employment[1,6]. The trends slightly declined in 2014, 2015 partly because of the postgraduate charge system. Since the autumn semester in 2014, all the postgraduates enrolled in the National Postgraduate Entrance Examination have been required to pay for tuition fees which the government would no longer support. Instead, they offer scholarships and grants to fund outstanding winners. The implementation of this policy may impede some students in furthering their study. Other potential reasons, such as lack of competitiveness, economic pressure, also propel young adults to weigh costs over benefits[1,6]. However, the relaxation of the situation may be simply temporary, as employment pressure will again spawn a large number of students to take the National Postgraduate Entrance Examination.

The ratio of different disciplines differs probably in relation to the current employment situation. It is not hard to find that the ratios in clinical medicine, stomatology medicine, TCM and nursing are all at a high level. The ratios in ITCWM, CMM, pharmacy and medicine technicians come next. PHPM and BM enrollment were at the least. The employment situation of clinical medicine, stomatology medicine, TCM and nursing is regarded to better than other subjects and the labor remuneration after employment is relatively high. This might be the reason why these disciplines attract a large number of people. Sometimes the ratio exceeds 100%, probably because these subjects have occupied the enrollment quota of other disciplines. As to BM and PHPM, the number of candidates, meeting the admission line, is far less than the admission quota. The low ratio may result from a narrow employment scope and low income standards. These subjects have no choice but to admit candidates left in the shortlist from other disciplines. Even by doing so it is still difficult to achieve the planned enrollment number. Recently, the rising trend of medical technology perhaps results from surge of lab technicians in demand.

Ratios of CM and TCM both accounted for a large part of the admission number, partly because these two subjects included some secondary disciplines, which were further divided into a variety of subgroups.

### **Advice for Improving the Enrollment**

When researchers are searching for the reasons of low enrollment, national policy and social environment can be adapted to profit these disciplines.

**Seek Extensive Publicity for Disciplines.** Disciplines can be propagated among students through multi-media which possess diverse patterns of information and provide instant communication with tutors. First, submitting the information (recruitment policies and plans, features and advantages of key disciplines) to core periodicals, universities and colleges can provide more detail to the masses [7]. Second, before undergraduates enter for the National Postgraduate Examination, universities and colleges can hold a tutorial meeting. It can arouse students' enthusiasm through introducing the characteristics of different disciplines. And some students will choose a discipline due to a tutor's enormous charisma. Third, there is a great need in attaching importance to school websites. In such a society with advanced information network, students can usually keep abreast of the current information about the quality of staff, teaching methods, cultivation plans and the system of reward. Through both practical and online propaganda, students get chances to know more about every discipline and make more comprehensive decisions. These measures can effectively motivate students' interests, which especially benefits for disciplines with low enrollment.

Setting up the propaganda office is also regarded as an effective measure [7]. For one thing, school authorities can select some eminent professors as the publicity ambassadors whose aim is to make a lecture tour in medical universities and colleges all over the country. For another, the officers are suggested to design a promotional video that presents a rough guide on medical disciplines.

**Implementation of Exemption System.** The exemption system is an important component of the postgraduate enrollment system[8]. This system will not only ensure students enrollments but also improve the quality of students. It is an important way for tutors to guarantee a certain number of students. Generally speaking, students meeting the exemption criterion usually have completed all the required undergraduate courses with satisfactory scores and are possessed with all round qualities[9]. Schools are suggested to strengthen exchanges between medical colleges and universities to promote the exemption policy, so that the excellent students can choose a suitable discipline corresponding with their own interests, and participate as soon as possible into the tutor's scientific research projects. In addition, it is a good idea to set up a research and innovation platform for the excellent students, thus improve their ability of innovation.

**Promotion of the Tutorial System.** In recent years, innovation education for cultivating creative students has become the trend of education reform in our country [7]. The tutorial system makes students come into contact with basic experimental methods ahead of time and gradually form a scientific research thinking mode. When students learn the frontier of science that they can't find in textbooks, their passion for scientific research will keep running high. In the course of interaction with students, tutors can consciously let a few students with great potential participate in their research.

**Setting up Preferential Policies and Expanding the Channels of Employment.** As the key to attracting students, special preferential policies for low-enrollment disciplines are recommended. After the implementation of self-charge system for postgraduate education in 2008, factors such as tuition fees, employment prospects, and whether there is a reward incentive mechanism have been important aspects that influence students' decision [7]. Therefore, schools can formulate policies, such as tuition relief, scholarship, labor subsidies, living allowance, etc. All of these can attract outstanding students to a certain discipline.

As is known, the ultimate aim of cultivating talents is to meet the needs of social development. Making the choices wider for employment could naturally attract students and correct the wrong view that it is hard to find a job if you major is basic medicine. It should be noted that postgraduates

majoring in basic medicine also have opportunity to work in hospital. The governments are encouraged to come up with regulations on young postgraduates' employment and keep their faith in future employment.

**Improve the Interdisciplinary Enrollment System.** Besides English and political theory, the Ministry of Education has determined physiology, biochemistry, pathology, diagnostics, medicine and surgery as the standard for evaluation which seriously reduces the interdisciplinary candidates' willingness and confidence. It will also make some outstanding interdisciplinary candidates be eliminated in the first round test – the theory test. In the second round exam, tutors tend to pay excessive attention to the related knowledge of their own field which these candidates unable to fully prepare, and ignore the test of comprehensive quality and innovation capacity. Most of undergraduates majoring in pharmacy and nursing have equipped with the study experience of basic medicine [10]. They are the potential resources for basic medicine. However, the invariability of examination form does not consider their diverse professional backgrounds. To augment enrollments, the government can take initiative to improve the evaluation system and fulfill classification test, and the Ministry of Education could draw up specific test criterion for interdisciplinary students.

### **Implications**

The study has several implications for research. The trends in medical postgraduate enrollment observed in this study provide reference for relevant investigations. It would also be advantageous to conduct cross-national surveys, to study how these outcomes differ across countries with different medical postgraduate enrollment systems.

Regarding implications for practice, the results of this study call for a continuation of efforts to promote a mutual development model of medical disciplines, and for a stronger focus on low ratio disciplines, such as basic medicine. The implementation of the official regulations for basic medicine is recommended.

### **Summary**

The originality of the study is the focus on the current enrollment trends of medical postgraduates in China, and this is the first study to investigate the admission trends in medical postgraduate entrance examination. This research includes large number of representative data from 73 colleges in 27 provinces, municipalities and autonomous regions.

### **Acknowledgment**

We thank Yu Yang, Meng Zheng, Shi-xing Lee and Yi Zhong for their help on data collection.

### **References**

- [1] Information on <http://www.eol.cn/html/ky/report2016/index.shtml>.
- [2] Information on [http://www.moe.edu.cn/srcsite/A01/s7048/201007/t20100729\\_171904.html](http://www.moe.edu.cn/srcsite/A01/s7048/201007/t20100729_171904.html).
- [3] Information on [http://www.gov.cn/xinwen/2015-09/14/content\\_2931251.htm](http://www.gov.cn/xinwen/2015-09/14/content_2931251.htm).
- [4] Information on  
<http://www.moh.gov.cn/qjjys/s3593/201411/fd019826ce734430b3ea91edff5e6cb7.shtml>.
- [5] Information on  
[http://www.moe.edu.cn/publicfiles/business/htmlfiles/moe/moe\\_834/201104/116439.html](http://www.moe.edu.cn/publicfiles/business/htmlfiles/moe/moe_834/201104/116439.html).
- [6] Information on <http://kaoyan.eol.cn/html/ky/2013yzsjbz/index.shtml>.
- [7] J.L. Zhao, Mulla Martin Cu Gesi, Q. Zhang, R. Liu, T. Zhang, Y.H. Lee. The present situation and improvements of medical postgraduates enrollment, *Health Vocational Education*. 33 (2015): 5-6.

- [8] S. Yu, J. Liu, W.Y. Lee. Construction research of "5 +3" clinical medical talents co-cultivation mode, Chinese Hospital Management. 34 (2014) 37-39.
- [9] F.F. Li, F.P. Meng, Q.X. Jin, C.Y. Sun, D. Jin. Analysis of the difficult situation of admissions in Master of basic medicine, Research in Medical Education. 9 (2010) 464-466.
- [10] Z.B. Wang, D.F. Wu, S.H. Liang. The solutions to the difficult enrollment of postgraduate students of basic medical sciences in local medical colleges, Chinese Journal of Medical Education. 36 (2016) 499-502.