

THE RESEARCH ON INTERNATIONALISATION OF MEDICAL UNIVERSITIES IN GUANGDONG PROVINCE

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ABSTRACT – In the context of economic globalization, international exchanges and cooperation have become the fifth major mission of universities after "talent training, scientific research, social services, cultural inheritance and innovation".(Zhang Haiying, etc. 2021). The fundamental purpose of medical education is to provide high-quality medical and health resources for the society, and medical services are related to everyone's life and health. Especially since 2020, the global outbreak and spread of COVID-19 has had a profound impact on the life and production of all mankind, as well as the global economy, science and technology, education and health, and has also brought people a sense of alarm and reflection.(Yang Yaofang, 2021). Therefore, the internationalisation of medical education has also attracted more and more attention worldwide. (Zhang Haiying, etc. 2021) Guangdong Province, as the most economically developed area in China, how to improve the internationalisation level of medical universities in this province has important theoretical and practical significance. The researcher of this paper adopted "Internationalisation Evaluation Index System of Medical Universities in Guangdong Province"(Song Xuejie, 2022) as research tool and took three medical universities in Guangdong Province as research samples, and collected the relevant index data from each university. Through the establishment of Internationalisation Comprehensive Evaluation Model of Medical Universities in Guangdong Province based on the ideal evaluation criteria, focusing on the nine theme modules of the index system, including "development strategy, organization and management, faculty and staff, students, teaching, scientific research, international exchanges and cooperation, affiliated hospitals as well as services and guarantee", the overall situation of the internationalisation development of these three universities was analyzed, and the advantages and disadvantages were put forward, in order to provide strategies and directions for the sustainable development of the internationalisation of medical universities in Guangdong province in the post-epidemic era.

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INTRODUCTION

Medical universities integrate three functions of medical teaching, scientific research and clinical applications (Wang Yingying, 2022), their educational quality and level will directly determine the development and progress of human health care. In the face of the common effect of multiple health influencing factors and the threat of major infectious diseases (Ouyang Ting, etc. 2021), especially after the global outbreak of COVID-19 in a large scale since 2020, human beings are increasingly concerned about their own health needs, global public health as well as the international cooperation and application of medical technology.

The Chinese government has always attached great importance to the internationalisation of medical higher education and has introduced a series of policies and measures to ensure the steady development of internationalisation. The *Outline of the "Healthy China 2030" Plan* issued in 2016 clearly states that China will implement global health strategy and actively promote international cooperation in the field of population health in an all-round way. The *Opinions on Strengthening the Cooperation between Medical Education and the Implementation of the Excellent Doctor Education and Training Plan 2.0* and the *Guiding Opinions on Accelerating the Innovative Development of Medical Education* issued in 2018 both proposed that medical education should strengthen exchanges and cooperation with international high-level universities and scientific research institutions and cultivate high-level innovative medical talents with international vision. Meanwhile, these policies emphasized

that the Ministry of Education and other departments should provide overall support to relevant universities in terms of international cooperation and exchanges. This also requires that China's medical education and talent training system should be further reformed to meet the demand of the new era. (Zheng Xuesen, etc. 2022) Therefore, the original intention of this paper is to systematically study the internationalisation development of medical universities in Guangdong province in the face of the new era, new situation and new tasks.

PROBLEM STATEMENT

A problem statement is an explanation in research that describes the issue that is in need of study. What problem is the research attempting to address? Having a Problem Statement allows the reader to quickly understand the purpose and intent of the research.

With the development of economic globalization and information technology, the internationalisation of higher education has attracted more and more attention during the last two decades, so the internationalisation of medical universities has also become an inevitable development trend.

Through an extensive literature review, the researcher finds that there are very few studies on the internationalisation of medical education, especially the internationalisation evaluation of medical universities in the field of higher education research in China. Besides, on the basis of in-depth investigation and research, and combined with years of working experience in the field of medical education, the researcher also finds the following major problems during the practical process of internationalisation of medical universities in Guangdong Province:

1. The conflicts between the concept of internationalisation and traditional education methods
2. The lack of internationalized coordinated mechanism
3. The mismatch between the international education system and the actual supporting facilities
4. The incomplete development planning and regulations
5. The generally low foreign language proficiency of teachers and administrators
6. The students' weak awareness of internationalisation
7. Low participation of students in international exchange activities
8. Few international exchange programs for medical majors

Therefore, it is of great theoretical and practical significance to study the internationalisation of medical universities in Guangdong Province. Meanwhile, it also plays a positive role in promoting universities to formulate international development plans, improve the level of international education and teaching, and cultivate high-quality medical talents with international vision and innovative spirit for the medical and health industry of Guangdong and China.

LITERATURE REVIEW

With "internationalisation/higher education/university" as the key words of the title, the author searches CNKI website and finds that there are 10 doctoral dissertations, 105 master dissertations and 1681 journal articles in the database since 2000. The following chart shows the development trend of the researches published by CNKI from 2000 to 2020.

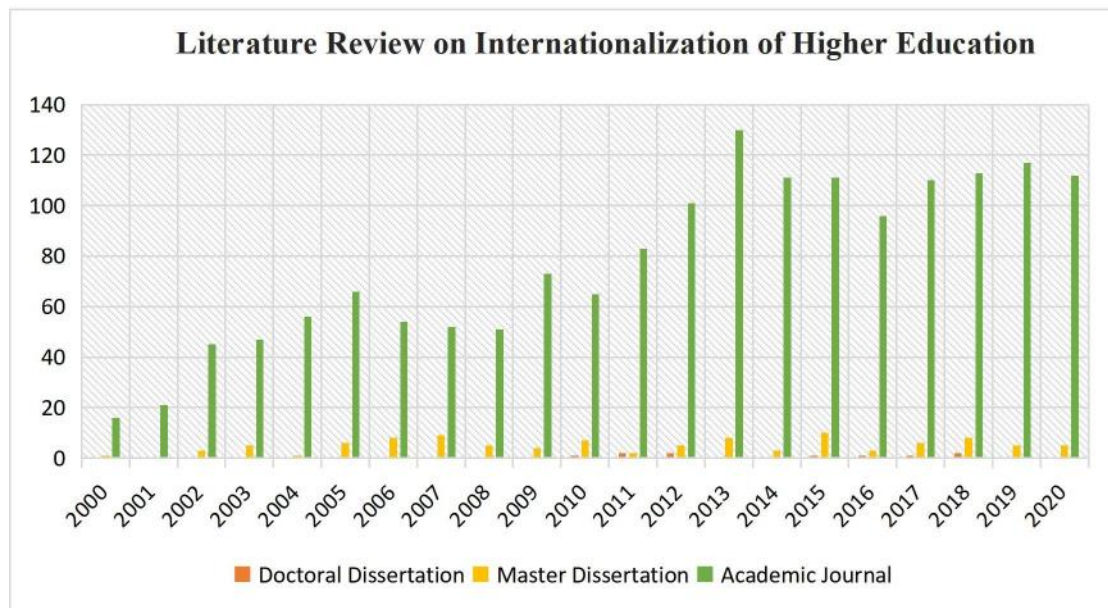


Figure 1. Literature Review on Internationalisation of Higher Education

These articles mainly focus on the connotation, elements and strategy of the internationalisation of higher education.

Review Connotation of Internationalisation of Higher Education

Since 2000, a growing body of academic literature on internationalisation has emerged in the field of higher education (Hudzik 2011; Bedenlier, Kondakci, and Zawacki Richter 2018), which points to significant changes for HEIs. Internationalisation is a subject of research of growing interest in the context of Higher Education studies, mainly due to the impacts of globalization on processes within institutions along the past few decades, as consistently demonstrated by several studies on globalization of Higher Education (Altbach, 2004; Jones et al., 2016; Zajda & Rust, 2016). Knight points out that “an interesting development in the conceptualization of internationalisation has been the division of internationalisation into ‘internationalisation at home’ and ‘cross-border education’”(Knight, 2012).

Chinese scholars began to pay attention to internationalisation of higher education in the late 1980s. Based on the concept of internationalisation of famous foreign scholars and important international educational organizations, most of them understood and defined it by combing China's educational practice with their own educational and cultural perspectives. In 1988, Gong Fang first proposed the concept of "university internationalisation". Since then, different scholars have put forward their own understandings of the connotation of higher education internationalisation from different perspectives.

In conclusion, from definitions by famous scholars and major educational organizations in the world, it can be seen that the internationalisation of higher education has strong regional, cultural and political characteristics, so there exists certain differences in the connotation of higher education internationalisation among scholars with different background. Combined with the points emphasized by different scholars, it can be roughly divided into several categories:

1. “Activity” perspective: it emphasizes the exchanges of educational institutions and international organizations in concrete and visible international exchange activities, such as cooperation between universities, personnel mobility, teaching reforms, academic research exchanges, etc. Arum and Wender are the representatives.
2. “Process” perspective: it emphasizes the process of integrating cross-cultural, global concepts and other components of internationalisation into teaching practice of higher education, represented by Knight.

3. “Adaptation” perspective: It mainly emphasizes that higher education should adapt to the needs of external environment (society, economy, labor market globalization), represented by Van der Wende.
4. “purpose” perspective: it tends to understand of the concept of internationalisation of higher education from the perspective of national, departmental and institutional purposes, represented by Hans De Wit.
5. “Atmosphere” perspective: it mainly emphasizes the change of ideas and attitudes. It believes that the most important thing of internationalisation is that people can establish a global consciousness, have the international vision and create a good international cultural atmosphere in the universities, the representative is Harari.
6. “System” perspective: it emphasizes that internationalisation of higher education is not only to enhance the competitiveness of discipline or create international atmosphere, but a system that interacts with ideas, activities, international investment, organization, teaching subjects, and other comprehensive elements, represented by Butts.

Among the above-mentioned scholars’ understanding on internationalisation of higher education, the most cited one is the view of Knight and Hans De Wit, which is basically consistent with the definition of American Council on Education(ACE, 2012), European Association for International Education(EAIE) and International Association of Universities(IAU), emphasizing the fact that the internationalisation is an intentional process, not a passive experience. It underscores that internationalisation is not a goal in itself, but a means of enhancing quality and excellence of higher education and research.

The Elements of Internationalisation of Higher Education

From the study of the connotation of internationalisation of higher education, it can be found that its constituent elements play a vital role in understanding the concept. Since different countries and universities have different understandings of the internationalisation of higher education, the definition of the elements of internationalisation is also different. According to the American Council on Education(ACE), internationalisation of higher education includes four aspects: institutional support, academic requirements, program activities, policies and opportunities for faculty and staff and international students.(Lu Genshu, Kang Hui, 2014)

The summary and statistical report on the development of higher education in the United States presented by ACE in 2000 covered the following contents of internationalisation: foreign language learning for local university students, education for overseas students (including visiting scholars), internationalisation of university courses, admission requirements for the internationalisation background of students, the educational exchange activities of HEIs (including the education of foreign students and visits by scholars), the support and funding of the government and other social organizations for the internationalisation of higher education, the labor market's demand for international talents, etc. (Zhang Qin, Zhu Liying, 2007)

The elements of the internationalisation of higher education are constantly expanding with the development of the times. However, the key elements are relatively fixed. A deep understanding of these elements is very important for grasping the correct development direction of internationalisation of higher education. The foreign scholars such as Davies and Van der Wende, etc. emphasized the linkage mechanism among various elements during studying the internationalisation of higher education, which is conducive to the design of related systems in the internationalisation process. The research of Chinese scholars mainly focuses on the specific modules involved in the process of internationalisation. Taking modules as the research base is helpful to clearly evaluate various links of the internationalisation process.

The Strategy of Internationalization of Higher Education

As the developing trend of higher education, internationalization is an important way to enhance the international competitiveness of disciplines. The strategy of internationalization vary for colleges and universities with different levels and types. Today, under the background of economic globalization

and facing the fierce competition in the international education market, it seems more important for every HEIs to establish an appropriate strategy.

As for the internationalization strategy of higher education, International Association of Universities (IAU) points out that "internationalization needs to serve societal needs, rather than focusing solely on economic rationales and returns. Although globalization affects all institutions, HEIs experience different pressures; they exist in different contexts, and have different needs. Therefore, there is no "one size fits all" model or approach for internationalization, rather, each HEI must find its own way of internationalizing. At the same time, all HEIs can benefit from the best thinking and good practice from other institutions around the world." (IAU website)

The organization structure strategy of internationalization activities was proposed by scholar Neave G. in 2001 on the basis of the case study of HEIs, he built the "task decomposition, strategic planning and management model", and divided organization structure strategy of the internationalization of higher education into two modes: "central" mode and "non-central" mode. The following organization structure strategy model of the internationalization of higher education are all built on this basis. (Wang Weiwei, 2018)

Knight states that the internationalization strategies include "international cooperation and development projects; institutional agreements and networks; the international/intercultural dimension of the teaching/learning process, curriculum and research; campus-based extracurricular clubs and activities; mobility of academics through exchange, fieldwork, sabbaticals and consultancy work; recruitment of international students; student exchange programs and semesters abroad; joint/double-degree programs; twinning partnerships; branch campuses, etc. Internationalization strategies apply to both campus-based activities and cross-border initiatives. (Knight, 2010)

Van der Wende illustrates that internationalization was seen as a strategy that affected higher education institutions or systems over the last two decades. A broadening of the range of activities associated with internationalization has taken place from an almost exclusive focus on individual mobility to more elaborate strategies encompassing curriculum development, research cooperation, staff development, and quality enhancement. (Van der Wende, 2013)

Lu Jiangbin and Xu Dongyang advocate fully guaranteeing the independent management and academic freedom of universities to create a good internal atmosphere and environment for the development of internationalization, and accelerating the faculty's internationalization construction through vigorous introduction and self-cultivation, expanding the training scale of international students, and actively carrying out various forms of substantive international scientific research cooperation, so as to promote the healthy and rapid development of the internationalization of universities in our country. (Lu Jiangbin, Xu Dongyang, 2010)

To sum up, the research on internationalization of higher education in developed countries has been going on for a long time, a lot of fruitful research achievements and leading figures with great influence in this field appeared, such as Philip Altbach's Center-Periphery Theory, Peter Scott's Globalization Theory, Jane Knight and Hans de Wit's Rationale and Strategy Theory, Jane Knight's Motivation Theory and John Hudzik's theory on comprehensive internationalization, etc., which has been widely cited by scholars from different countries. In addition, the direct participation of some international organizations and institutions is also an important force in promoting the development of higher education internationalization, such as UNESCO, OECD, IAU, APAIE, EAIE and so on. These organizations not only provide decision-making consultations and services for governments, but also directly provide benchmarks or paradigms for the internationalization of universities, which has greatly promoted the development of higher education internationalization worldwide. Besides, some highly influential university rankings in the world, such as QS World University Rankings, Times Higher Education World University Rankings, Best University Rankings by U.S. News & World Report, and World University Academic Rankings by Shanghai Jiao Tong University, etc., have regarded internationalization as an important indicator with a high weight, which undoubtedly has a significant impact on the rapid development of the internationalization of higher education.

Since the 1990s, Chinese scholars have understood and redefined internationalization of higher education on the basis of the research achievements of foreign well-known scholars and the successful experiences of the important international organizations, combining with China's higher education

practice, which is of great help to accurately grasp the essence and connotation of the internationalization of higher education. At the same time, Chinese scholars have continuously deepened and expanded their research on the content, form, strategy and development trend of the internationalization of higher education and have got some research achievements. However, there still exists some limitations and deficiencies, such as there is a large number of studies, but lack of systematic and innovative research results; there are more theoretical researches, but less practical cases, etc., which need to be improved and innovated in the current and future research so as to produce higher-quality research results. Furthermore, the deep-going study on the definition, connotation, composition and strategy of university internationalization also has great reference significance for the future study about internationalization evaluation index system, which is also the original intentions of this study.

METHODOLOGY

Research Design

1. On the basis of the literature review of internationalization theories, the researcher adopted the statistical scale “Internationalization Evaluation Index System of Medical Universities in Guangdong Province” from the paper *Construction of Internationalization Evaluation Index System of Medical Universities in Guangdong Province* (Song Xuejie, 2022) , took three medical universities in Guangdong Province as research samples, and collected the relevant index data of 2019 and 2021 from each university.

Table 1. Internationalization Evaluation Index System of Medical Universities in Guangdong Province

First-level Index	Second-level Index	Third-level Index
Internationalization of Development Strategy (0.2903)	Development strategy (0.1375)	Whether there is a clear international medium and long term development plan, annual work plan and implementation plan (0.1375)
		Funds for faculty and staff to study abroad, participate in conferences, etc. (0.0544)
	Financial support (0.1528)	Funds for Chinese students studying abroad, competitions, and cultural exchanges (0.0235)
		Funds for scholarships, competitions, and cultural exchanges for international students (0.0088)
Internationalization of Organization & Management (0.0991)	Organization (0.0458)	International research project funding (0.0544)
		Expenditures for hiring foreign teachers (0.0117)
		Establish organizations or departments such as the Internationalization Working Committee/Leading Group to be responsible for the formulation, implementation and guarantee of the international development plans (0.0233)
		Set up an international specialized management organization and full-time staff (0.0225)

Faculty Internationalization (0.1409)	Management mechanism (0.0533)	Have sound rules and regulations related to international exchanges and cooperation (0.0310) Whether the assessment system of each school/department contains international indicators (0.0223)
	Faculty exchange (0.0405)	The number and proportion of faculty and staff studying and exchanging overseas (3 months and above) (0.0229) The number and proportion of faculty and staff studying and exchanging overseas (within 3 months) (0.0176)
	Overseas education experience and international participation of full-time teachers (0.0405)	The number and proportion of full-time teachers with more than 1 year overseas study/work experience (0.0135) The number and proportion of full-time teachers teaching in English (0.0230) The number and proportion of full-time teachers holding positions in international organizations/academic associations/international academic journals (0.0040)
	Teachers' evaluation (0.0420)	Whether the teacher evaluation and incentive mechanism reflect the emphasis on the background and experience of international exchanges and cooperation (0.0420)
	Foreign teachers (0.0097)	The number and proportion of foreign language teachers (0.0031) The number and proportion of professional foreign teachers (0.0066)
	Overseas high-level talents (0.0082)	The number and proportion of overseas high-level experts (0.0082)
	Student Internationalization (0.0991)	Student exchange abroad (0.0661)
International students (0.0330)		The number and proportion of international students (non-degree students) (0.0126) The number of non-foreign language majors taught in foreign languages (0.0197)
Discipline internationalization (0.0352)		The number of majors accredited by foreign or international certification organizations (0.0155)
Teaching Internationalization (0.0704)	Course internationalization (0.0352)	The number of online courses developed in cooperation with foreign universities (0.0153) The number of non-foreign language courses taught in foreign languages (0.0199)
	Incentive mechanism (0.0175)	Whether to establish an evaluation and incentive mechanism to encourage international academic cooperation (0.0175)
Internationalization of Scientific Research (0.0542)	Research platform (0.0071)	Laboratories/research centers/international scientific and technological cooperation bases established jointly with foreign universities or institutes (0.0071)
	Research Project (0.0162)	The number of international science and technology cooperation projects at provincial level and above (0.0105) The number of International scientific research projects invested by foreign funds (0.0020)

		The number of foreign science and technology patents obtained (0.0037)
	International conference (0.0042)	The number of organizing international conferences (0.0042)

International Exchange & Cooperation (0.1924)	Paper publication (0.0092)	The number and proportion of papers jointly published with scholars from foreign countries (0.0092)
	Foreign-related education projects (0.0912)	Sino-foreign cooperative education institutions/projects approved by the Ministry of Education (0.0507)
		Establishment and running of overseas campus (0.0082)
		Double degree programs cooperated with foreign universities (0.0323)
	University Alliance (0.0159)	Join international university alliances or organizations (0.0159)
	Partners (0.0812)	The number of international cooperation agreements within the validity period of the current year (0.0812)
Internationalization of Affiliated Hospital (0.0151)	Overseas visits (0.0041)	The number of overseas visiting groups received in the current year (0.0041)
	International Medical Service Capabilities (0.0095)	The distribution of hospital departments, diagnosis and treatment procedures are marked and translated in foreign languages (0.0029)
		Set up international medical center (ward) (0.0014)
		The number and proportion of medical staff going to foreign hospitals or scientific research institutions for further training (0.0018)
	Clinical Practice (0.0056)	The number and proportion of medical staff with good English communication skills (0.0029)
		The number of foreigners diagnosed and treated in the current year (0.0005)
The number and proportion of clinical teaching staff with overseas education/work experience (0.0056)		
Internationalization of Service & Guarantee (0.0386)	Library (0.0035)	The number of foreign-language books and periodicals in the library (including electronic periodicals) (0.0035)
	Information Technology (0.0351)	Official website with multi-language version (0.0088)
		Student information and service management system in Chinese and English (0.0088)
		Sharing distance courses and teaching resources with foreign universities (0.0175)

2. The researcher extracted the maximum value from the six groups of data corresponding to each index one by one to form an ideal comprehensive evaluation criterion (University D), which was identified as the highest level of internationalization development, that is, 100 points. Taking this criterion as reference, focusing on the nine theme modules of the index system, including "development strategy, organization and management, faculty and staff, students, teaching, scientific research, international exchanges and cooperation, affiliated hospitals as well as services and guarantee", the researcher compared the data of three medical universities with the ideal data to calculate final score for each university. Then the current situation of internationalization development of medical universities in Guangdong Province was explored comprehensively.

Population and Sampling

The samples refer to the three medical universities in Guangdong Province: Guangdong Medical University (GDMU), Guangzhou Medical University (GMU) and Guangdong Pharmaceutical University (GDPU). Of the three universities involved in this study, two are located in Guangzhou, the capital city of Guangdong Province, China. And only Guangdong Medical University is located in Zhanjiang, a coastal city in western Guangdong, China.

Data Collection

According to the 50 indexes of “Internationalization Evaluation Index System of Medical Universities in Guangdong Province”, the researcher collected two years' data from each university in 2019 and 2021. The data of 2019 represents the internationalization level of each university before the COVID-19 epidemic, and the data of 2021 represents the internationalization level of each university after the COVID-19 epidemic, so that we can understand not only the internationalization level of medical universities in Guangdong Province under normal conditions, but also the impact of the epidemic on the internationalization of each university.

Measurement/Trustworthiness

Data Preprocessing

Considering the privacy of the data of each university, the researcher named the three sample universities as University A, University B and University C. Besides, the researcher preprocessed the data of 50 evaluation indexes involved in the statistical scale in the following ways:

- (1) The index data that answers "yes" and "no" are represented by numbers "1" and "0" respectively, such as the index data of items 1, 7, 9, 10, 16, 48, 49 and 50.
- (2) The 8th, 11th, 12th, 13th, 15th, 17th, 20th, 21st, 43rd, 44th and 46th index data are collected simultaneously with absolute data and relative data. Considering the differences of the total number of faculty and students in each university, the absolute data cannot objectively reflect the internationalization development level of each university. However, it is more scientific and accurate to use the relative data (i.e. percentage data), such as the proportion of specialized staff engaged in international work in the administrative staff of the whole university, and the proportion of faculty members who have researched and exchanged abroad for more than three months or less in the total staff, and so on. Meanwhile, considering that the percentage data may be too small, which will bring certain interference to the accuracy of calculation, so the researcher uses “k” of the percentage data “k%” to represent the corresponding percentage data.
- (3) Except for the above two types of index data, the remaining data were directly presented by the original data for further analysis and modeling.

Construction of evaluation criteria (Ideal medical university D for internationalisation)

As shown in the following TABLE (TABLE 2), the researcher used three processing methods to substitute the data of 2019 and 2021 of the three sample universities into the “Internationalization Evaluation Index System of Medical Universities in Guangdong Province”. In order to conduct scientific evaluation on the three universities, the author selected the maximum value from the six groups of data of each index one by one, and constructed a virtual ideal university D based on the 50 maximum index data. If columns 3 to 8 in the following Table are denoted as x_{ki} ($k=1, 2, L, 50; i=1, 2L 6$) then the following formula can be obtained:

$$x_k^D = \max_{1 \leq i \leq 6} \{x_{ki}\} (k=1, 2, L, 50; k \neq 35, 36.) \quad (1)$$

$$x_{35}^D = x_{36}^D = 1$$

After preliminary processing, the index data of the three sampler universities and the ideal evaluation criteria (University D) were presented as follows:

Table2. Evaluation Index and Weight of Sample Universities and Ideal Evaluation Criteria

Indek (k) Weight(Q)	University A	University B	University C	Ideal University D
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		A-2019	A-2021	B-2019	B-2021	C-2019	C-2021	D
		(x_{k1})	(x_{k2})	(x_{k3})	(x_{k4})	(x_{k5})	(x_{k6})	(x_k^D)
1	0.1375	1	1	1	1	1	1	1
2	0.0544	29.078 3	0	23	20	205	146.4	205
3	0.0235	0	4	14	15	86	30	86
4	0.0088	0	0	14	20	139.72	65	139.72
5	0.0544	0	0	280	480	108	1335	1335
6	0.0117	120	167	40	45	144.8	705.3	705.3
7	0.0233	1	1	1	1	0	0	1
8	0.0225	2.25	1.85	5.56	6.5	4	4.42	6.5
9	0.031	1	1	1	1	0	0	1
10	0.0223	1	1	0	1	1	1	1
11	0.0229	2.26	1.22	1.39	1.1	9.67	0.11	9.67
12	0.0176	10.75	0.07	6.09	0.11	8.4	0.66	10.75
13	0.0135	5.13	13.53	1.1	12.5	25.1	23.6	25.1
14	0.023	0	0	9.1	8.98	39.6	35.3	39.6
15	0.004	0.13	0	0	0.07	2.3	2.05	2.3
16	0.042	1	1	1	1	1	1	1
17	0.0031	1.28	0.63	0.2	0.15	0.46	0.21	1.28
18	0.0066	0	0	0.06	0	0.69	3.29	3.29
19	0.0082	0	0	0	0	0	0	1
20	0.0322	0.16	0.26	0.57	0.65	0.8	0.15	0.8
21	0.0339	0.19	0.03	0.28	0.3	0.51	0.008	0.51
22	0.0204	0	0	0.8	0.71	2.11	2.82	2.82
23	0.0126	0	0	0.28	0.25	0	0	0.28
24	0.0197	0	0	0	0	2	2	2
25	0.0155	0	0	0	0	0	3	3
26	0.0153	0	0	3	6	0	0	6
27	0.0199	0	0	0	0	42	42	42
28	0.0175	0	0	1	1	1	1	1
29	0.0071	0	0	3	5	2	3	5
30	0.0105	0	0	1	0	4	7	7
31	0.002	1	1	0	0	1	0	1
32	0.0037	0	1	1	0	1	0	1

33	0.0042	1	2	3	18	2	1	18
34	0.0092	9	11	21	32	172	185	185
35	0.0507	0	0	0	0	0	0	1
36	0.0082	0	0	0	0	0	0	1
37	0.0323	1	2	2	2	3	3	3
38	0.0159	2	3	2	4	1	0	4
39	0.0812	21	24	28	30	16	18	30
40	0.0041	8	0	40	2	17	2	40
41	0.0029	1	1	1	1	1	1	1
42	0.0014	11	22	0	0	0	0	22
43	0.0029	3.6	4	0	0	0	0	4
44	0.0018	3.6	0	1.9	0	30	31	31
45	0.0005	21	14	8	4	33	5	33
46	0.0056	2.6	2.6	5	6.5	1.3	1.2	6.5
47	0.0035	10.1844	10.4594	180	185	5.3337	5.3664	185
48	0.0088	0	0	0	0	1	1	1
49	0.0088	0	0	1	1	1	1	1
50	0.0175	0	0	1	1	1	1	1

The comprehensive evaluation model (Formula (3)) established in this paper gave a score of 100 points to the ideal university D, and other objects to be evaluated can obtain the corresponding comprehensive evaluation scores by comparing with university

Data Standardization Processing

Due to the large difference in the order of magnitude of the data of different indexes, the impact of the evaluation indexes on the comprehensive score will be directly affected, resulting in the loss of objectivity and scientificity of the evaluation model. Therefore, the researcher adopted the following methods to standardize the data.

Taking University D as a reference, the researcher compared the data of each index of the three sample universities in 2019 and 2021 with the ideal data of the evaluation index (the index data of University D), so as to obtain the evaluation scores of the objects to be evaluated under this index. Considering that the final score of each university is in the form of a hundred point system, the data were multiplied by 100 after standardization. The specific transformation formula is as follows:

$$\%_{ki} = \frac{x_{ki}}{x_k^D} \times 100 \quad (k = 1, 2, L, \dots, 50; \quad i = 1, 2, L, \dots, 6.) \quad (2)$$

After standardized processing, the scores of each sample university under each evaluation index are shown in the following table:

Table 3. The Standardized Data of Three Sample Universities

Index No.	Index Weight	UA-2019	UA-2021	UB-2019	UB-2021	UC-2019	UC-2021
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1	0.1375	100	100	100	100	100	100
2	0.0544	14.18453659	0	11.2195122	9.756097561	100	71.41463415
3	0.0235	0	4.651162791	16.27906977	17.44186047	100	34.88372093
4	0.0088	0	0	10.02004008	14.31434297	100	46.52161466
5	0.0544	0	0	20.97378277	35.95505618	8.08988764	100
6	0.0117	17.01403658	23.67786757	5.671345527	6.380263718	20.53027081	100
7	0.0233	100	100	100	100	0	0
8	0.0225	34.61538462	28.46153846	85.53846154	100	61.53846154	68
9	0.031	100	100	100	100	0	0
10	0.0223	100	100	0	100	100	100
11	0.0229	23.37125129	12.61633919	14.37435367	11.3753878	100	1.13753878
12	0.0176	100	0.651162791	56.65116279	1.023255814	78.13953488	6.139534884
13	0.0135	20.43824701	53.90438247	4.38247012	49.80079681	100	94.02390438
14	0.023	0	0	22.97979798	22.67676768	100	89.14141414
15	0.004	5.652173913	0	0	3.043478261	100	89.13043478
16	0.042	100	100	100	100	100	100
17	0.0031	100	49.21875	15.625	11.71875	35.9375	16.40625
18	0.0066	0	0	1.823708207	0	20.97264438	100
19	0.0082	0	0	0	0	0	0
20	0.0322	20	32.5	71.25	81.25	100	18.75
21	0.0339	37.25490196	5.882352941	54.90196078	58.82352941	100	1.568627451
22	0.0204	0	0	28.36879433	25.17730496	74.82269504	100
23	0.0126	0	0	100	89.28571429	0	0
24	0.0197	0	0	0	0	100	100
25	0.0155	0	0	0	0	0	100
26	0.0153	0	0	50	100	0	0
27	0.0199	0	0	0	0	100	100
28	0.0175	0	0	100	100	100	100
29	0.0071	0	0	60	100	40	60
30	0.0105	0	0	14.28571429	0	57.14285714	100
31	0.002	100	100	0	0	100	0
32	0.0037	0	100	100	0	100	0
33	0.0042	5.555555556	11.11111111	16.66666667	100	11.11111111	5.555555556
34	0.0092	4.864864865	5.945945946	11.35135135	17.2972973	92.97297297	100

35	0.0507	0	0	0	0	0	0
36	0.0082	0	0	0	0	0	0
37	0.0323	33.33333333 3	66.66666667	66.66666667	66.66666667	100	100
38	0.0159	50	75	50	100	25	0
39	0.0812	70	80	93.33333333	100	53.33333333	60
40	0.0041	20	0	100	5	42.5	5
41	0.0029	100	100	100	100	100	100
42	0.0014	50	100	0	0	0	0
43	0.0029	90	100	0	0	0	0
44	0.0018	11.6129032 3	0	6.129032258	0	96.77419355	100
45	0.0005	63.6363636 4	42.42424242	24.24242424	12.12121212	100	15.15151515
46	0.0056	40	40	76.92307692	100	20	18.46153846
47	0.0035	5.50508108 1	5.65372973	97.2972973	100	2.883081081	2.900756757
48	0.0088	0	0	0	0	100	100
49	0.0088	0	0	100	100	100	100
50	0.0175	0	0	100	100	100	100

Establishment of “Internationalization Comprehensive Evaluation Model of Medical Universities in Guangdong Province” Based on Ideal Standards

After each evaluation index data is standardized, it can be brought into the following comprehensive evaluation model for calculation, and the result obtained is the comprehensive evaluation score of this object under the currently constructed evaluation system:

$$Score = \sum_{k=1}^{50} \%_k \cdot \omega_k \quad (3)$$

For example, in order to calculate the score of University A in 2019, it is only necessary to replace the data..%_k in the evaluation model with the data %_{k1} in Table 2:

$$Score_A2019 = \sum_{k=1}^{50} \%_{k1} \cdot \omega_k = 40.993$$

RESULTS

The researcher substituted the standardized index data of each sample university in 2019 and 2021 into the "Internationalization Comprehensive Evaluation Model of Medical Universities in Guangdong Province" for calculation, and obtained the comprehensive evaluation scores of each university before and after the epidemic, the details were shown in the following table.

Table 4. Scores of Third-level Indexes of Sample Universities

Index No.	UA-2019	UA-2021	UB-2019	UB-2021	UC-2019	UC-2021
1	13.75	13.75	13.75	13.75	13.75	13.75
2	0.77163879	0	0.610341463	0.530731707	5.44	3.884956098

3	0	0.109302326	0.38255814	0.409883721	2.35	0.819767442
4	0	0	0.088176353	0.125966218	0.88	0.409390209
5	0	0	1.140973783	1.955955056	0.440089888	5.44
6	0.199064228	0.277031051	0.066354743	0.074649085	0.240204168	1.17
7	2.33	2.33	2.33	2.33	0	0
8	0.778846154	0.640384615	1.924615385	2.25	1.384615385	1.53
9	3.1	3.1	3.1	3.1	0	0
10	2.23	2.23	0	2.23	2.23	2.23
11	0.535201655	0.288914168	0.329172699	0.260496381	2.29	0.026049638
12	1.76	0.011460465	0.997060465	0.018009302	1.375255814	0.108055814
13	0.275916335	0.727709163	0.059163347	0.672310757	1.35	1.269322709
14	0	0	0.528535354	0.521565657	2.3	2.050252525
15	0.022608696	0	0	0.012173913	0.4	0.356521739
16	4.2	4.2	4.2	4.2	4.2	4.2
17	0.31	0.152578125	0.0484375	0.036328125	0.11140625	0.050859375
18	0	0	0.012036474	0	0.138419453	0.66
19	0	0	0	0	0	0
20	0.644	1.0465	2.29425	2.61625	3.22	0.60375
21	1.262941176	0.199411765	1.861176471	1.994117647	3.39	0.053176471
22	0	0	0.578723404	0.513617021	1.526382979	2.04
23	0	0	1.26	1.125	0	0
24	0	0	0	0	1.97	1.97
25	0	0	0	0	0	1.55
26	0	0	0.765	1.53	0	0
27	0	0	0	0	1.99	1.99
28	0	0	1.75	1.75	1.75	1.75
29	0	0	0.426	0.71	0.284	0.426
30	0	0	0.15	0	0.6	1.05
31	0.2	0.2	0	0	0.2	0
32	0	0.37	0.37	0	0.37	0
33	0.023333333	0.046666667	0.07	0.42	0.046666667	0.023333333
34	0.044756757	0.054702703	0.104432432	0.159135135	0.855351351	0.92
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	1.076666667	2.153333333	2.153333333	2.153333333	3.23	3.23
38	0.795	1.1925	0.795	1.59	0.3975	0
39	5.684	6.496	7.578666667	8.12	4.330666667	4.872
40	0.082	0	0.41	0.0205	0.17425	0.0205

41	0.29	0.29	0.29	0.29	0.29	0.29
42	0.07	0.14	0	0	0	0
43	0.261	0.29	0	0	0	0
44	0.020903226	0	0.011032258	0	0.174193548	0.18
45	0.031818182	0.021212121	0.012121212	0.006060606	0.05	0.007575758
46	0.224	0.224	0.430769231	0.56	0.112	0.103384615
47	0.019267784	0.019788054	0.340540541	0.35	0.010090784	0.010152649
48	0	0	0	0	0.88	0.88
49	0	0	0.88	0.88	0.88	0.88
50	0	0	1.75	1.75	1.75	1.75
TOT AL	40.99296298	40.56149456	53.84847125	59.01608367	67.36109295	62.55504837
	40.99	40.56	53.85	59.02	67.36	62.56

According to the calculation, the comprehensive evaluation score of internationalization of University A is 40.99 in 2019 and 40.56 in 2021. The comprehensive evaluation score of internationalization of University B is 53.85 in 2019 and 59.02 in 2021. The comprehensive evaluation score of internationalization of University C is 67.36 in 2019 and 62.56 in 2021.

From the evaluation results, it is not difficult to find the following characteristics and difficulties exist in the internationalization development of the three medical universities in Guangdong Province:

1. The universities have increasingly strengthened their awareness of internationalization, and have set up special administrative organization and full-time staff for internationalization. Besides, they all have clear development plan and relatively sound management mechanism. The universities attach more importance to internationalization year by year, They have adopted various ways to improve their internationalization level, such as sending teachers and students abroad for professional training, expanding the enrollment of international students, introducing international talents, integrating the curriculum with international standard and holding international academic conference, etc. The funds invested in international scientific research and the recruitment of foreign experts and teachers have increased significantly. However, according to the world university rankings, it can be found that there is still a gap between the medical universities in Guangdong Province and the world-class medical universities in some extent, and the degree of internationalization in teaching staff, talent cultivation, teaching methods and courses, scientific research, etc. still needs to be further strengthened.
2. The degree of internationalization development of the universities is unbalanced, and there are certain differences. On the whole, the internationalization level of University C is relatively high, and it has significant advantages in staffing, financial support, mobility of teachers and students, teaching and research, as well as international students; Under the epidemic situation, University B has shown a counter trend growth in the aspects of cooperating with foreign universities to carry out online courses, international students and Chinese students going abroad, with a good momentum of development; University A is relatively weak in terms of funding investment, English teaching proficiency of faculty, training of international students, internationalization of majors and courses, international research cooperation, etc., and its overall development level of internationalization is low.
3. The internationalization degree of all universities in the aspects of the introduction of overseas high-level experts, the internationalization of majors and courses, international research projects, foreign-related education projects, international medical services and external publicity is generally low and some shortcomings exist. In particular, the Chinese-foreign cooperative school-running

programs approved by the Ministry of Education of China, which account for a large proportion in the internationalization evaluation, have not been carried out by the three sample universities.

4. Due to the impact of the epidemic, the number of teachers and students going abroad for long/short-term exchange or training, as well as overseas visiting groups showed a precipitous decline. However, all universities attach great importance to the internationalization of full-time teachers, so that the number of teachers with overseas learning or working experience introduced or trained by these universities in 2021 has increased significantly compared with 2019.

DISCUSSION

In the face of the new challenges brought by the global outbreak of COVID-19 to medical education, combined with the new tasks and new requirements for the internationalization of medical education put forward by China's education opening up policy and "Healthy China" strategy in the new era, the researcher believes that it is very timely and necessary to adopt a scientific internationalization evaluation index system to conduct a comprehensive study on the internationalization of medical universities, especially for the medical universities located in Guangdong Province. Through this research, the medical universities in Guangdong Province can clearly understand their own level of internationalization development, identify the gaps and existing problems, which are conducive to making up for the deficiencies to better promote the rapid and sustainable development of internationalization. It can be said that the research on the internationalization of medical universities in Guangdong Province is not only a theoretical research in the field of higher education, but also a systematic practical research on the internationalization development of colleges and universities. The evaluation results of internationalization in this study are consistent with the latest report of US News Rankings on the overall development level of these universities, as well as the actual development situation of the universities. Thus, it can be concluded that the internationalization development level of a university is positively correlated with the overall development level of the university, and the development of internationalization will greatly promote the comprehensive development of teaching, scientific research and talent training of the university.

CONCLUSION AND IMPLICATIONS

Through the establishment of an idealized comprehensive evaluation model, this paper comprehensively evaluates and analyzes the internationalization level of three medical universities in Guangdong Province, and has a clear understanding of the development status, characteristics and dilemmas of each university. Affected by the COVID-19 epidemic, the internationalization development level of University C in 2021 decreased by 7% compared with that in 2019. However, the development level of University B in 2021 increased by 9% compared with that in 2019, and the development level of University A remained the same in two years.

In general, the overall internationalization level of the three sample universities needs to be further improved. Based on the scores of various evaluation indexes of each university, the researcher put forward the following solutions and development strategies so as to promote the rapid development of the internationalization of medical universities in Guangdong Province.

First, medical universities in Guangdong province should highlight their own specialty and location advantages, further establish their own international university-running characteristics, increase publicity to the outside world, so as to enhance their international visibility and influence.

Second, there are many factors that affect the internationalization of a university, involving teaching, scientific research, personnel, finance, logistics, and secondary teaching and research institutions, etc.. Therefore, the medical universities should enhance the awareness of internationalization, strengthen the linkage and collaboration between different departments, especially establish the internationalization evaluation mechanism for secondary schools to stimulate their initiative for internationalization development, actively interact with overseas high-level universities, introduce high-quality teaching resources and methods, and carry out various projects such as students' joint cultivation, scientific research cooperation between professors as well as high-level international

academic conferences in key disciplines and so on, so as to promote the overall internationalization of the university to a higher level in a rapid and effective way.

Third, the universities should focus on strengthening the construction of Chinese-foreign cooperative school-running programs, integrate high-quality teaching resources at home and abroad, comprehensively improve the management and teaching internationalization level of the administrators and teachers.

Fourth, the universities should comprehensively expand online and offline international exchange and cooperation programs, provide high-quality platforms for students to broaden their international vision, enrich their professional knowledge and improve their English proficiency, so as to further promote the internationalization level of talent cultivation.

Fifth, the universities should make use of their regional advantages to build a high-quality brand of medical education for international students in China by means of actively expanding the recruitment channels for international students, increasing publicity, strengthening exchanges and cooperation with the universities in countries along the "Belt and Road", and attracting more outstanding international students to study for medical degrees in Guangdong Province.

It is believed that in the post-epidemic era, relying on their own university-running characteristics and advantages, and implementing internationalization strategy, the international exchange and cooperation of medical universities in Guangdong Province will surely achieve more brilliant results.

DATA AVAILABILITY DECLARATION

The original contributions encompassed within this study are comprehensively documented in the article and accompanying supplementary materials. Should additional inquiries or data-related requests arise, kindly direct them to the attention of the corresponding author.

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CONFLICT OF INTEREST

The authors herein assert that the research undertaken was executed without the influence of any commercial or financial affiliations, which may be perceived as potential conflicts of interest.

PUBLISHER'S NOTE

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