

Dental Education in India and Japan: Implications for U.S. Dental Programs for Foreign-Trained Dentists

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Abstract: An understanding of international dental education systems is critical for the education of foreign-trained dentists in U.S. dental programs. However, there is little information on this topic. This article provides information regarding 1) dental history, 2) dental school system, 3) curriculum/examination at dental school, and 4) dental licensure in India and Japan. There are 185 dental schools in India and twenty-nine in Japan. The number of first-year dental students is 12,872 and 2,647 in India and Japan, respectively. A five-year dental education, which includes 4,035 curriculum hours, leads to the B.D.S. degree in India, whereas a six-year dental education program, which includes 5,060 curriculum hours, leads to the D.D.S. degree in Japan. No undergraduate pre-dental study is needed prior to entry into dental school in both countries. In India, the entrance examination is extremely competitive; however, there is no nationwide licensure examination. In Japan, dental schools use more sophisticated dental materials and equipment in the clinical phases of the curriculum than in India, but there is no clinical examination at the time of graduation. Several implications for U.S. dental programs for foreign-trained dentists with respect to screening applicants and curriculum development are discussed.

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Foreign dental school graduates who wish to practice in the United States must be approved by the state board of dentistry or examiners for licensure in the state in which they wish to practice. In most cases, foreign dental graduates are required to have a U.S.-granted doctor of dental surgery degree (D.D.S. or D.M.D.). Limited opportunities exist in accredited dental schools for appropriately qualified foreign dental graduate candidates to be admitted with advanced standing to the second or third year of the dental degree program.

The University of California, San Francisco (UCSF) School of Dentistry offers an international dentist program (IDP) for foreign dental school graduates. The IDP is a two-year (eight-quarter) program that begins in June of each year and culminates in a D.D.S. degree. The program has admitted sixteen or more foreign-trained dentists yearly since 2000. These students matriculate into the existing third-year curriculum including didactic courses and clinical rotations and, during their second IDP year, are fully integrated into UCSF's senior year com-

prehensive care clinical programs. There are twenty-two IDP students in the class of 2005; thirteen of them are from the Republic of India, and four are from East Asian countries such as China, Taiwan, and Japan. Faculty members are enthusiastic about educating these future U.S. clinicians, but have expressed a desire for more background information regarding the dental education that these IDP students obtained in their own countries. Nationwide, distribution of an IDP or similar program differs from state to state. All five California dental schools offer the program, while the program is offered in twenty-four other dental schools throughout the United States. Class size ranges from two to 100.¹

There are two reports of current international dental education systems available; however, these articles do not provide information on U.S. dental education for foreign-trained dentists.^{2,3} IDP students, UCSF faculty members, and program directors realize the need for this information. To address this gap in knowledge, this article summarizes the dental education systems in India and Japan and then discusses implications for curriculum development in U.S. dental programs for foreign-trained dentists. Our review of dental education in India and Japan will address the following topics: history of dental practice and dental education in each country, structure of dental education and entrance examinations, the dental school curriculum, and dental licensure and dental practice.

History of Dentistry and Dental Education in India and Japan

The history of India as an advanced civilization goes back 5,000 years. Dentistry in some form has been practiced since the era of the Indus valley civilization. Ancient medical literatures such as the Ayurveda and Susrutasamhita described treatments of diseases of the oral cavity and emphasized the importance of tongue hygiene. The first dental colleges and hospitals in India were opened in 1883. Dr. Rafuddin Ahmed established the first official, fully functional, autonomous dental institution in Calcutta in 1920. This institution offered a diploma of licentiate in dental science (L.D.Sc.) upon successful completion of a two-year program. In 1926, the duration of the institution's program of study in-

creased to three years for the L.D.Sc. and to a four-year program for a bachelor of dental surgery degree (B.D.S.) in 1935. The Indian Dental Association was founded immediately after India gained independence in 1947.^{4,5}

Japan historically resisted outside influences and frequently closed itself off to foreigners. The United States forcibly opened Japan to foreign markets in 1853 when Commodore Perry sailed his fleet into Tokyo Bay. Western medicine and science were introduced in 1868 when the new Meiji government took office; however, dental education was neglected by the new regime. Japanese dental education originated in the private sector, when Dr. Kisai Takayama recognized the need and established the Tokyo Dental College, the first dental school in Japan, in 1890. Japan's surrender to the Allies in 1945 resulted in its occupation by the United States until 1952. As a result, American medicine and dentistry were introduced to Japan. The number of dental schools increased to meet the needs of patients, and standards of dental education were raised to the level of Western industrialized countries.^{2,4,6}

Dental School Systems and Entrance Examinations

The Dental Council of India (DCI) was established as a result of the Dentist Act of 1948, which was intended to regulate dental practice and promote scientific advances. DCI is still the premier governing body of dental education in India. Its responsibilities include the regulation of dental education, profession, and ethics and liaising with the government to obtain administrative approval for dental college and higher educational courses. Dental schools in India fall into one of three major categories: a) government dental school as a part of a government university, b) private dental school affiliated with a government university, and c) private dental school as part of a private university. There are currently 185 dental schools in India. Of these, thirty-one belong to Type A and 154 to Types B and C. In 2003, total enrollment in India for all three categories of dental school was 12,872. Of these, 1,527 students enrolled in Type A schools, and 11,345 enrolled in Types B and C dental schools. Type B dental schools were more predominant than Type C. The duration of the dental school program is five years, of which four years are devoted to didactic and labo-

ratory course work and one year to compulsory internship rotation. Dental school graduates in India are awarded a bachelor of dental surgery degree (B.D.S.).

In India, dental school candidates must meet certain minimum requirements to take the entrance examination. All candidates applying to dental school must be at least seventeen years old at the time of admission or before December 31 of the same year of admission. Dental schools in India admit two classes per year, which begin their education in April and October; consequently, schools must make quick admissions decisions twice a year. Class size varies from ten to 100. Applicants must have successfully completed two years of higher secondary schooling or the equivalent in the areas of physics, chemistry, and biology (botany and zoology). Applicants must have received aggregate marks higher than 50 percent in the above subjects in qualifying examinations at a higher secondary school.⁷ According to the Ministry of Social Justice and Empowerment in India, Scheduled Castes are defined as extreme social, education, and economic backwardness arising out of the traditional practice of untouchability. Scheduled Tribes are defined as indications of primitive traits, distinctive culture, geographical isolation, shyness of contact with the community at large, and backwardness.⁸ Potential students qualifying as members of Scheduled Castes and Scheduled Tribes, which are considered underserved populations, must have received aggregate marks higher than 40 percent in the above subjects in qualifying examinations at a higher secondary school. Admission to some dental schools is also based upon a quota for each caste system.

Students meeting the minimum application requirements may take the entrance examination to dental school. Applicants to Type A dental schools can take both nationwide and statewide entrance examinations. Applicants to Type B dental schools must take only statewide entrance examinations. Applicants to Type C dental schools must take tests provided by the individual dental school. Both nationwide and statewide entrance examinations consist of multiple-choice questions covering physics, chemistry, and biology (botany and zoology). Nationwide and statewide entrance examinations require one and two days, respectively. More than 100,000 applicants compete for entrance to Type A dental schools each year, but only a very small number (1,527 in Year 2003) gain admittance. Thus, the admission process is extremely competitive. There is

no data available for Types B and C dental schools for the number of entrance versus application.

In Japan, the Ministry of Education, Culture, Sports, Science, and Technology supervises all dental schools for accreditation. Dental schools in Japan are separated into three types: governmental, local public, and private. In 2005, there are twenty-nine dental schools in Japan; eleven are governmental, one is local public, and seventeen are private. Local public is a dental school that is operated by prefecture, similar to a state school in the United States. In 2001, first-year dental students in governmental, local public, and private dental schools numbered 605, 95, and 1,947, respectively, for a total of 2,647 students in all dental schools. Dental education in Japan consists of a six-year program, including two years of predentistry (liberal arts and science) and four years of professional subjects (dentistry). Dental school graduates in Japan are awarded a doctor of dental surgery degree (D.D.S. or D.M.D.).⁹

All candidates applying to dental school in Japan must be at least seventeen years of age at the time of admission and must graduate from high school before starting dental school. Dental schools begin in April, and candidates must submit their applications in January. The entrance examination system differs for governmental, local public, and private schools. Applicants to governmental schools go through a two-stage examination process. First, they take a nationwide, multiple-choice examination covering six or more subjects, including physics, chemistry, and biology; social studies; mathematics; Japanese; and English. Second, applicants must take a school-based written examination covering physics, chemistry, and biology as well as mathematics and English for each specific school they apply to. Applicants to private schools take tests provided by the individual dental school. Currently, there are two types of entrance examinations conducted by private schools. One is a general entrance examination; the other is an entrance examination upon recommendation by a high school principal. In the general entrance examination, applicants take school-based written examinations in three or four subjects, including physics, chemistry, and biology; mathematics; and English. These applicants to private schools are also required to take a dental aptitude test, have an interview, and submit an updated medical history. The entrance examination upon recommendation by a high school principal is responsible for up to two-thirds of first-year admissions in each private school.

Applicants taking the entrance examination upon recommendation must submit a high grade point average in high school, an official recommendation from the principal of the high school, and an applicant essay. The school interviews selected applicants.

In Japan, the average first-year tuition and fees are US\$85,000 (10,170,000 Japanese yen) for private dental schools and US\$9,200 (1,100,000 Japanese yen) for governmental and local public dental schools. In India, although there is no hard data available, tuition and fees are lower in Type A than Type B and C dental schools. The gross domestic product (GDP) per capita in 2003 was US\$2,900 in India and US\$28,000 in Japan (US\$1.00 = 47 Indian rupees = 120 Japanese yen).²

Dental School Curriculum in India and Japan

Table 1 shows curriculum hours for each subject in India and Japan. The dental school curriculum in India, regulated by the DCI, consists of four years of didactic and laboratory course work study and one year of compulsory internship rotation. Didactic and laboratory coursework and technical training in the laboratory occur during Years 1-3. Fourth-year dental students spend 80 percent of their time in direct, in-clinic patient care and 20 percent of their time in didactic study. Fifth-year dental students par-

Table 1. Curriculum hours for each subject in India and Japan

Subject	India			Japan		
	Didactic	Practical	Total	Didactic	Practical	Total
1 General & Oral Anatomy, Physiology, Biochemistry & Histology	185	290	475	360*	239	599
2 Dental Materials and Laboratory Work	35	30	65	113	45	158
3 General and Oral Pharmacology	40	20	60	68	36	104
4 General & Oral Pathology and Microbiology	125	210	335	135	90	225
5 General Medicine	40	-	40	45	-	45
6 General Surgery	40	-	40	45	-	45
7 Pedodontics	40	50	90	45	23	68
8 Conservative Dentistry, Endodontics & Periodontics	115	295	410	158†	135	293
9 Orthodontics	40	30	70	45	23	68
10 Oral Surgery, Local & General Anesthesia	60	70	130	158	-	158
11 Prosthodontics & Crown & Bridge	100	360	460	203	135	338
12 Oral & Maxillofacial Radiology and Oral Medicine	40	-	40	45	-	45
13 Oral Health	30	100	130	68	45	113
14 Other Dental Educational Courses‡	-	-	-	743	15	758
15 General Educational Courses§	-	-	-	698	90	788
16 Clinical Training for Patient_¶	-	1690	1690	-	1260 [¶]	1260
Total	890	3145	4035	2925	2135	5060

* Includes Embryology

† Includes General Patient Care

‡ Includes Introduction to Dental Science, Forensic Dentistry, Oral Diagnosis, Stognathic Dysfunction, Medical & Health Statistic, Dietetics, Related Clinical Medicine, Clinical Psychology, etc.

§ Includes Biology, Chemistry, Physics, Mathematics, Genetics, English, Germany, Economy, History, Ethics, Aesthetics, Legal Studies, Philosophy, Psychology, Computer Science, etc.

_ Includes patient care and grand round for subject numbers from 5 to 12.

¶ Includes Stomatognathic Dysfunction, Preventive Dentistry, Clinical Pharmacology, Clinical Laboratory Medicine, Clinic Maintenance, etc.

Sources: B.D.S. course regulations. New Delhi: Dental Council of India, June 1983. Kanagawa Dental College campus guide 2004. Yokosuka: Kanagawa Dental College, April 2004.

ticipate exclusively in patient care.⁷ All dental school curriculum in Japan is six years in duration. The curriculum used in this study was Kanagawa Dental Collage (KDC), which is a private dental school established in 1964. Japanese dental students engage in didactic and laboratory coursework in the first four years. Fifth-year dental students spend 80 percent of their time in direct, in-clinic patient care and 20 percent of their time in didactic study. Sixth-year dental students participate exclusively in patient care and prepare for the nationwide dental licensure examination, the National Examination for Dentists (NED), described below.

As shown in Table 1, dental school curricula in India and Japan are similar. However, a careful comparison must take into account the actual quality of course content. Our collective experience indicates that curriculum content is similar in the two countries, but the quality of education is quite different, resulting in a difference of standard of care between the two countries. For example, implant and laser dentistry are taught in dental schools in Japan, but not in India. In India, most students learn about provisional removable partial denture in the undergraduate program, but crown/bridge and casting are usually taught clinically at the postgraduate level in India. Composite resin restoration is the standard of care in Japan, while amalgam is the standard of care for posterior teeth in India. Japanese dentistry excels in research in all areas of dental science and contributes to the global body of dental research.¹⁰ Graduates from dental schools in India report variations in curriculum emphasis and resulting standard of care among dental schools. For instance, office bleaching is a part of the curriculum in some schools in India. Both Indian and Japanese dentists employ two handpiece systems using either compressed air or electricity with cable wire. The former is popular in the United States; the latter is popular in some parts of Europe such as Germany. These differences in systems are confusing for dentists from India and Japan when they are in the United States. Consequently, some foreign-trained dentists have had difficulty using handpieces during clinical admission examinations.

Table 2 lists each area of study at the various levels of dental education in India, along with the maximum score attainable at the professional examinations (PE). Indian dental schools do not require a final qualifying exam at the end of the course of study. However, several examinations are administered at

the end of each year. For example, as shown in Table 2, Years 1, 2, and 3 require three, three, and four year-end examinations respectively. There are three examinations in the middle of Year 4 and four examinations at the end of Year 4. There are no examinations in Year 5.¹¹

Examinations in dental schools in India are very important because they are requirements for dental school graduation and dental licensure. The maximum score for an examination is 200, and a minimum passing score of 50 percent is necessary for each part of the examination. As shown in Table 3, there are guidelines for examination.⁷ For example, a first-year student taking “Material Used in Dentistry” (PE: Year 1, category 3) engages in theory and practical/clinical study. The examination guidelines for theory stipulate a written examination, oral examination, and an internal assessment. The written examination consists of multiple-choice questions, essay questions, and short answers. The oral exam is a fifteen- to thirty-minute, one-on-one interview between an examiner and the student. Both the written and oral examinations are defined as university examinations, which mean that the questions are formulated at the national level by high-ranking professors. This system is similar to that used for the U.S. National Board Dental Examination. The practical/clinical section consists of both a university examination and an internal assessment. The university examination is similar to a U.S. state board examination for clinical skill evaluation. The internal assessment is similar to the university examination, but a professor of the dental school to which the student belongs conducts the evaluation.

Examinations in Japanese dental schools are necessary to proceed to the consecutive phase of dental education; however, unlike in India, in Japan these examinations are not required for dental licensure. Midterm or final exams in the middle or at the end of the course of study are required and are conducted by a course director such as a department chair or professor. Currently, many dental education reforms are under way in Japan. For example, a new nationwide examination is being developed for dental students. This examination is intended for testing students before they begin their clinical rotations as student dentists under faculty supervision. Though specific qualifications and screening standards are still under development, the exam will be conducted in a computer-based format and is likely to be similar to Part I of the U.S. National Board Dental Ex-

amination. Dental schools in Japan are additionally developing syllabi and objective methods to evaluate student performance. The desirability and feasi-

bility of using objective structured clinical examinations (OSCE) is a current topic of discussion in Japanese dental education.¹²⁻¹⁶

Table 2. Specifications of categories in the professional examination in India

Year	Category	Description of Subjects	Professional Examination (PE) Score	
			Each Subject	Total
1	1	Human Anatomy, Embryology and Histology	200	600
	2	Human Physiology and Bio-Chemistry	200	
	3	Materials Used in Dentistry	200	
2	1	Human Oral Anatomy, Physiology, and Histology and Tooth Morphology	200	600
	2	General Pathology and Microbiology	200	
	3	General and Dental Pharmacology and Therapeutics Preclinical Prosthodontics Preclinical Conservative Dentistry	200	
3	1	Oral Pathology and Oral Microbiology	200	800
	2	General Medicine	200	
	3	General Surgery	200	
	4	Preventive and Community Dentistry	200	
4	Part 1 (1-6 month)			1400
	Paper 1	Orthodontics and Dentofacial Orthopaedics	200	
	Paper 2	Oral Medicine, Diagnosis, and Radiology	200	
	Paper 3	Paedodontics	200	
	Part 2 (7-12 month)			
	Paper 1	Conservative Dentistry and Endodontics	200	
	Paper 2	Periodontics	200	
	Paper 3	Oral Surgery	200	
Paper 4	Prosthodontics and Crown and Bridge	200		

Sources: B.D.S. course regulations. New Delhi: Dental Council of India, June 1983. Regulations for the Bachelor of Dental Surgery degree course. Chennai: The Tamil Nadu Dr. M.G.R. Medical University Chennai, June 1983.

Table 3. Breakdown of 200 scores in each category in Professional Examination (PE) in India

Various of Examinations (made by)	Part of Examinations			
	Theory		Practical/Clinical	
	(Test Style)	Score	Score	
University examination (nationwide professors)	Written	(Multiple-choice question)	15	75
		(Essay)	15	
		(Short answer)	20	
	Orals	(One-on-one interview)	25	
Internal assessment (each dental school faculty)			25	25

Score total: 200

Source: B.D.S. course regulations. New Delhi: Dental Council of India, June 1983.

Dental License and Dental Practice

India does not employ a uniform, nationwide dental licensure examination such as the NBDE in the United States. At the time of graduation, all students in Indian dental schools receive both a B.D.S. diploma from the university and a certificate of successful completion of the five-year curriculum from the dental school together with state-approved dental licensure. "Successful completion" of the five-year curriculum implies that the dental students have passed professional examinations at the end of each of their four years. In this sense, professional examinations, which include both theory and practical/clinical elements, comprise the dental licensure examination in India. In addition, dental school graduates must register with state and national governments by submitting the aforementioned certificate and applicable fees. The state government issues dental licenses and regulates dental practice through state law. The Ministries of Health and Education in India supervise the state government in this regard.

In Japan, sixth-year students are eligible to take the nationwide dental licensure examination, which is given annually in March. The Ministry of Health, Labor, and Welfare conducts the nationwide dental licensure examination, the National Examination for Dentists (NED). NED is a multiple-choice, two-day written test based on the knowledge and techniques required for the practice of dentistry in Japan. NED results are reported on a pass/fail basis and include the approximate percentage of points achieved. A minimum score of about 60 percent is required to pass. Moreover, there are questions in the exam identified as compulsory, and it is necessary to achieve an 80 percent score on these questions in order to pass the exam. Compulsory questions include all fields of dentistry including ethics. The NED is the only test that candidates for dental licensure in Japan must take. Appointed experts prepare the examinations annually. There are no additional written, restorative, or clinical tests or interviews at the federal or state level in Japan. In March 2004, 2,960 Japanese dental students took the NED, with a 74.2 percent pass rate (2,197 students). After passing the NED, a dentist is eligible to practice anywhere in Japan, and no renewal of licensure is required. As of 2006, however, a mandatory internship in a postgraduate clinical training course will be required for

Japanese dentists. The Japanese systems differs from that of the United States in that eligibility for licensure in Japan is based on a single, all-important test, while licensure in the United States is based on multiple examinations such as the National Board Dental Examination and state or regional board clinical examinations.^{2,17}

Implications and Conclusion

There is a significant increase in inquiries and applications from foreign-trained dentists interested in pursuing U.S. predoctoral dental education for various reasons. U.S. dental institutions are constantly evaluating and developing the curriculum in relation to the education of foreign-trained dentists. This article has attempted to address the issue. To acquire the information reported here was more difficult than we imagined. Especially, it was very difficult for us to find recent references on dental education in India. This problem with the shortage of recent references was partially resolved by using the collective experiences of the authors. Therefore, it should be noted that any qualitative comments are purely our opinions based on our personal information.

As differences in dental education among international dentists emerge, U.S. dental education programs for foreign-trained dentists will be in a position to respond accordingly. This comparison between Indian and Japanese dental schools indicates that Indian dentists may need additional education and clinical training in the use of composite materials in posterior teeth. Japanese dentists may need remedial education and clinical training in the use of amalgam material. The preference for the reliance on the specific biomaterials has its historical and cultural determinants. Factory pollution and fear of ill effects of mercury fillings have promoted the use of composite materials in Japan. High costs of imported composite materials and traditions have promoted the continued use of amalgam materials in India. U.S. practice preferences and restorative materials became both a gold standard and a treatment option for the economically privileged in other countries. In India, most students learn about provisional removable partial denture in the undergraduate program, but crown/bridge and casting are usually clinically taught at the postgraduate level. This is significant and intriguing. Indian dentists may need additional education and clinical training in crown/

bridge and casting. History and culture should be taken into consideration in designing U.S. dental education programs for foreign trained dentists so that the IDP addresses the specific educational needs of these individuals.

As indicated in Table 4, which summarizes dental education systems in both nations, dental graduates from India and Japan are not educated to a set standard for all schools. Dental license in a foreign country is not a predictor of successful performance in U.S. programs. Therefore, it is important for U.S. dental education programs for foreign-trained dentists to precisely assess minimum application criteria of each applicant. For example, it will be helpful to conduct didactic and technical examinations during the selection process and assess the candidates' experience with dental materials and operatory equipment. Some added experience in clinical dentistry is desirable for applicants prior to being selected for U.S. international programs, because this provides students and faculty with a less stressful transfer into the culture of dental education

in the United States. For example, foreign dentists can work in U.S. dental offices as technicians or assistants, or they can continue to work in their country as dentists to augment their experiences. Foreign dental school graduates have such a varied background that it is essential for U.S. dental schools to be familiar with the differences in dental education in other nations such as India and Japan. As a result of good understanding, an IDP class should be selected with similar level of skills, experience, material, and device training. This would permit a more homogenous curriculum.

This article has reported the impressions of IDP participants regarding dental education in the Republic of India and Japan and discussed implications for curriculum development in U.S. dental programs for foreign-trained dentists. Readers would benefit from a better understanding of how to evaluate the application credentials of individuals from India and Japan. Furthermore, continued comparison of dental education systems in other countries will generate a useful database. While India represents large popu-

Table 4. Overview of dental education systems in India and Japan

	India	Japan
Geography	3,287,590 sq km (one-third the size of the U.S.)	377,835 sq km (slightly smaller than California)
Population	1,049,700,118 (July 2003 est.)	127,214,499 (July 2003 est.)
GDP per capita	\$2,900 (2003 est.)	\$28,000 (2003 est.)
Number of dental schools	185	29
Number of first-year dental students	12,872 (2003 est.)	2,647 (2001 est.)
Month of the new academic year starts	April/October (two classes in a year)	April
Duration of dental education (years)	5	6
Degree awarded	Bachelor of Dental Surgery (B.D.S.)	Doctor of Dental Surgery (D.D.S. or D.M.D)
Curriculum hours:		
Didactic	890	2,925
Practical/ Clinical	3,145	2,135
Total	4,035	5,060
Curriculum outline: Years 1-4	—didactic study and technical training in laboratory—	
Year 5	clinical training as an internship rotation	patient care (80%) and didactic study (20%)
Year 6	N/A	patient care and National Examination preparation
Materials and devices used	Traditional	Advanced
Requirement for dental licensure	No nationwide licensure examination (B.D.S. diploma and approval of dental license from the state government for successful completion of five-year curriculum)	National Examination for Dentists (similar to U.S. NBDE I & II) No technical examination (no U.S. state board-type exam) Mandatory internship will start in 2006.

lations, scores of other countries have dentists that apply for advanced standing programs in U.S. dental schools. These include both Eastern and Western European countries as well as countries in Central and South America. Future studies may enhance understanding of international trends in dental education and dental research.

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