

A Diligent Analysis on Dental Education and Manpower in the Southern States and Union Territories of India

N. Divya Lalitha¹, Prabu. D², Bharathwaj. V. V³, Rajmohan⁴,
Sunayana Manipal⁴

¹Postgraduate, ²Professor & Head, ³Senior Lecturer, ⁴Reader,
Department of Public Health Dentistry, SRM Dental College, Chennai

Corresponding Author: N. Divya Lalitha

ABSTRACT

Background: South India is the region incorporating the Indian states of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana and the union territories Pondicherry and Goa. Out of the total 313 dental institutes in India, about 135 colleges are situated in its southern states and union territories. The uneven distribution of institutes between states and union territories has led to lack of proper oral care to people and unemployment among dental graduates. AIM: This study aimed to analyse the current situation of dentistry in the south Indian states and union territories.

Methodology: A thorough literature search was done to retract all the articles relating to Dental education and institutes in south Indian States. Information from the website of Dental Council of India, other state Dental Council, NITI Aayog was retracted. Main databases such as PubMed, Scopus, and Cochrane etc. were also searched to obtain the information.

Results: Most of the dental colleges i.e. about 48 are present in Karnataka. There are more private than government dental colleges in every south Indian state. In Karnataka there are 3413 undergraduate and 1170 postgraduate seats which is the highest. About 60 dental colleges were established during the year 2001-2010. In Goa there is only one dental college present. In Andhra Pradesh and Pondicherry there are no government seats available in the specialities of Pedodontics, Orthodontics, Oral pathology and Public Health Dentistry. In case of Telangana, the dentist population ratio is 1:35158. In the case of Pondicherry, for a population of 0.4% there are about 2.9% of dental colleges present.

Conclusion: A proper distribution of dental manpower for the people in need is the pressing priority now. If all the necessary actions are taken and the oral health burden is reduced, then dentistry will flourish in a country like India.

Keywords: Dentistry, Dentist, Workforce, Education.

INTRODUCTION

Dentistry is a rewarding profession which deals with the assessment, analysis, counteraction and additionally treatment of disorders, issue as well as diseases of the oral cavity, maxillofacial region or potentially the adjoining and related structures and their effect on the human body; provided by a dental surgeon, inside the extent of his/her education, preparation and experiences. ^[1]

The dental training became visible without precedent for India in 1920 when the first dental institute was established in Calcutta. ^[2,3,4] The very first private dental school was built up in the year 1966 before which, India had all government-aided dental colleges. ^[5]

Of late, there are 313 dental colleges in the nation out of which 292 are private and just 40 are controlled by the government. ^[5,6,7] There is a precarious ascent in the quantity of dental universities everywhere throughout the nation. This ascent in dental universities has prompted a higher number of dental professionals. ^[6] Although, this

progressive increment in the quantity of dental professionals is useful for the strengthening the oral conditions of the nation, nonetheless, there is developing number of unemployment among the dental professionals due to very low possibilities of jobs. [5]

In the year 1970, just 8000 dentists graduated from Indian dental institutes, which increased to 30570 in the year 2010 and at present there are about 2,77,379 dental graduates in India totally. [6]

South India is also known as Peninsular India. It is the region incorporating the Indian states of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Telangana and also the union territory of Pondicherry, possessing 19.31% of India's territory (635,780 km² or 245,480 sq. mi). Covering the southern piece of the peninsular Deccan Plateau, South India is limited by the Bay of Bengal in the east, the Arabian Sea in the west and the Indian Ocean in the south. The topography of the district is differing with two mountain ranges - the Western and Eastern Ghats, circumscribing the plateau heartland. [8]

Out of the total of 313 dental institutes in India, about 135 colleges are situated in its southern states. [3] There is a high concentration of dental colleges in the south Indian states due to which there are more number of dental students graduating every year. The need for atleast one dental institute in every district of the south Indian states and union territories is backordered. This uneven distribution of institutes among the states and union territories has led to lack of proper oral care to people and unemployment among dental graduates.

Researches on current situation of dentistry in India are available whereas situation analysis of dentistry in south India is sparse. Hence this study aimed to analyse the current situation of dentistry in the south Indian states and union territories.

METHODOLOGY

Data regarding the dental education institutes and dental manpower were

collected through manual and electronic data searches. Data regarding the total number of institutions, undergraduate and postgraduate seats were retracted from the website of Dental Council of India and other state Dental Council websites. The data regarding the total number of Primary Health Centres, Community Health Centres and population were retracted from NITI Aayog website. A through literature search was done to retract all the articles relating to Dental education and institutes in south Indian States.

Main databases such as PubMed, Scopus, and Cochrane etc. were also searched and information regarding total number of colleges in each south Indian state, undergraduate and postgraduate dental colleges, total number of seats in different specialities of dentistry, government and private distribution of dental institutes in each south Indian states were obtained. Mesh terms such as dentistry, dental education, India were used for the search. Furthermore, verified articles from newspapers were also included to obtain the latest updated news on dentistry in south India.

The details about dentistry in South Indian states from the above mentioned websites and databases were retracted. All the data obtained from the above mentioned sources, were compiled to compare dentistry among different states of south India in the present study. All the dental colleges within the South Indian zone were included in this study.

All the data obtained from the sources were compiled and tabulated to provide an insight about dentistry in South Indian states in the present study.

RESULTS

The present study aimed to analyse the current situation of dentistry in the south Indian states and union territories. Information regarding total number of colleges in each south Indian state, undergraduate and postgraduate dental colleges, total number of seats in different

specialities of dentistry, government and private distribution of dental institutes in each south Indian states were obtained and tabulated to provide an insight about dentistry in South Indian states in the present study.

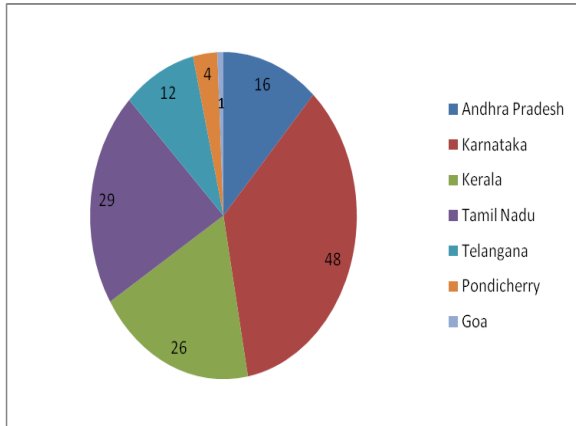


FIGURE 1: DISTRIBUTION OF DENTAL COLLEGES IN SOUTH INDIAN STATES AND UNION TERRITORIES
Source: www.dciindia.gov.in [3]

Figure 1 shows the distribution of dental colleges in South Indian states and union territories. Most of the dental colleges, 48

are present in Karnataka, followed by 29 dental institutes in Tamil Nadu, 26 in Kerala, 16 in Andhra Pradesh, 12 in Telangana, 1 in Goa and 4 in Pondicherry.

Figure 2 shows the distribution of private and government dental colleges in South Indian states and union territories. Out of 48 colleges in Karnataka, 44 are private and 4 are only Government dental colleges. Whereas among the 29 dental institutes in Tamil Nadu, 27 are private and 2 are government. In a total of 26 colleges in Kerala, 20 are private and 6 are government. Only 2 among the 16 colleges in Andhra Pradesh are government and rest 14 are private dental colleges. Out of the total 12 colleges in Telangana, 11 are private and 1 only is Government College and there are 3 private and 1 government dental colleges in Pondicherry. There is only one government aided dental college in Goa and no private colleges.

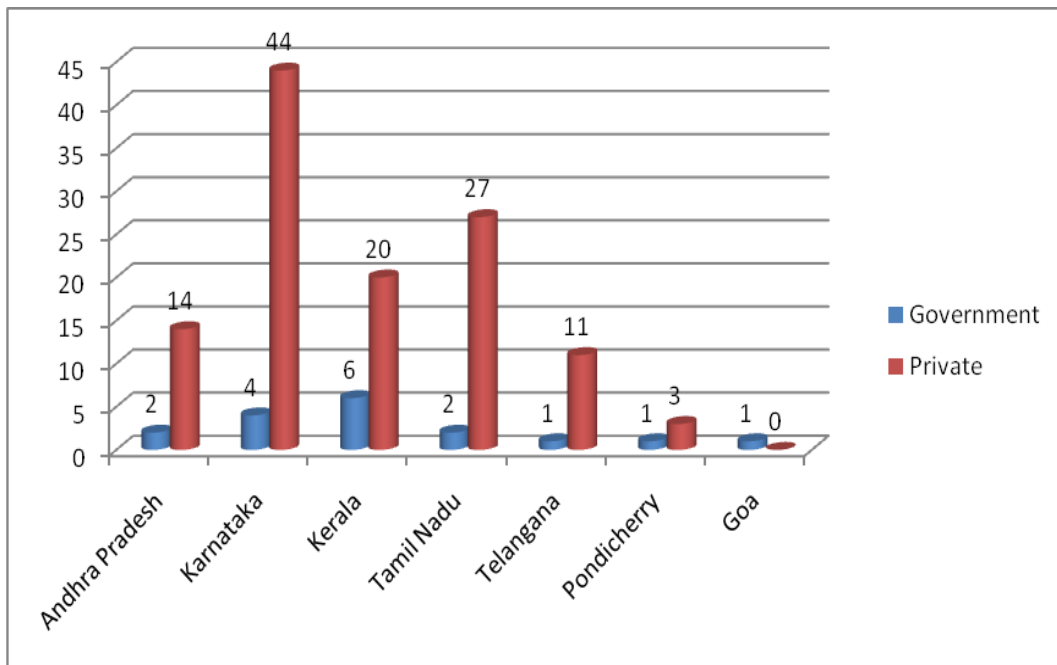


FIGURE 2: DISTRIBUTION OF PRIVATE AND GOVERNMENT DENTAL COLLEGES IN SOUTH INDIAN STATES AND UNION TERRITORIES
Source: www.dciindia.gov.in [3]

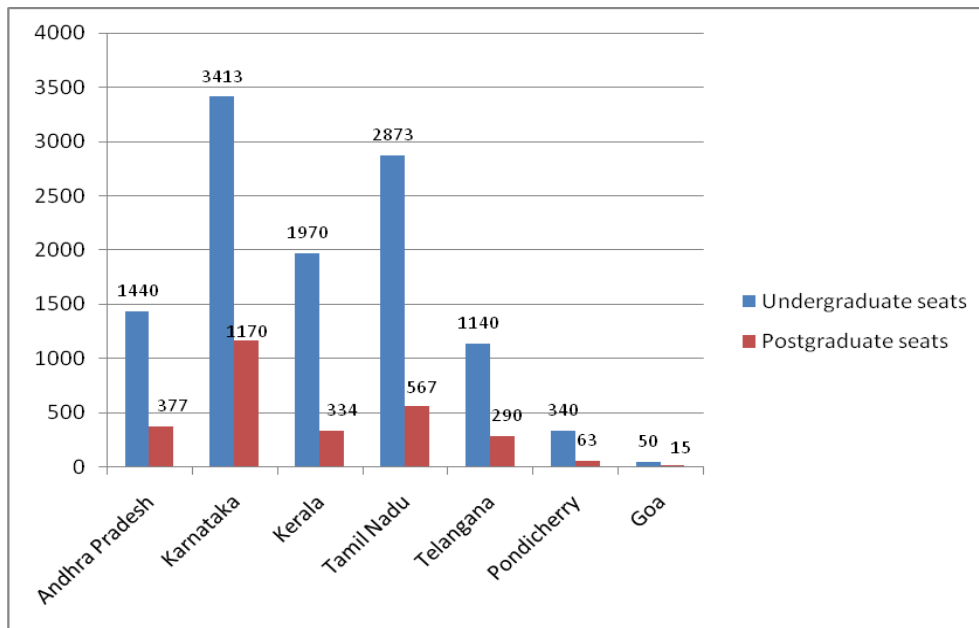


FIGURE 3: DISTRIBUTION OF UNDERGRADUATE AND POSTGRADUATE SEATS IN SOUTH INDIAN STATES AND UNION TERRITORIES

Source: www.dciindia.gov.in [3]

Figure 3 shows the distribution of undergraduate and postgraduate seats in South Indian states and union territories. In the total of 48 colleges in Karnataka there are 3413 undergraduate and 1170 postgraduate seats, whereas among the 29 dental institutes in Tamil Nadu, 2873 undergraduate and 567 postgraduate seats are available. In the 26 colleges in Kerala, 1970 undergraduate and 334 postgraduate seats are present. Among the 16 colleges in Andhra Pradesh there are 1440 undergraduate and 377 postgraduate seats. Out of the total 12 colleges in Telangana, there are 1140 undergraduate and 290 postgraduate seats, in Pondicherry among the 4 dental colleges there are 340 undergraduate and 63 post graduate seats and in Goa there are 50 undergraduate and 15 post graduate seats.

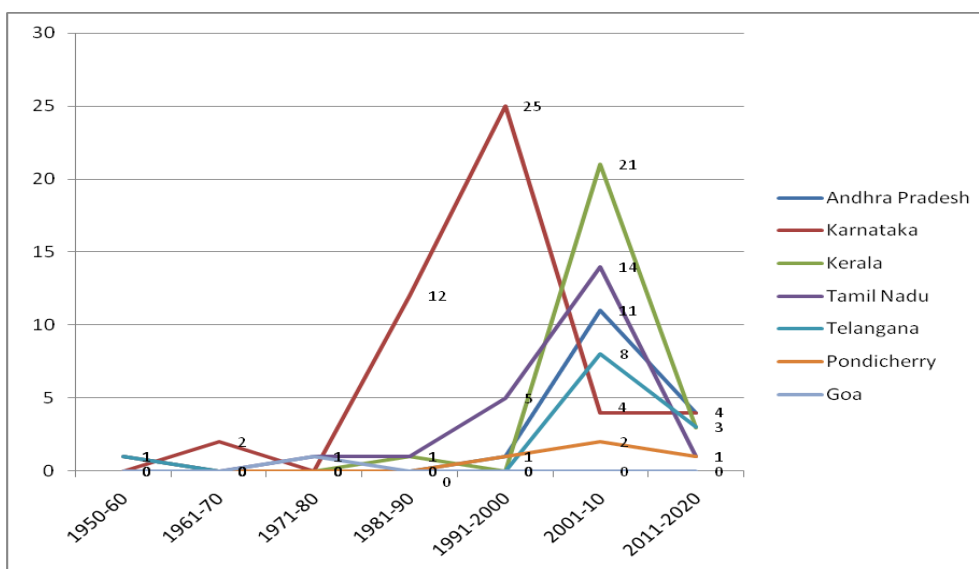


FIGURE 4: TRENDS IN ESTABLISHMENT OF DENTAL COLLEGES IN SOUTH INDIAN STATES AND UNION TERRITORIES

Source: www.dciindia.gov.in [3]

Figure 4 shows the trends in establishment of dental colleges in south Indian states and union territories. It shows that in 1950-60, 1 college each in Kerala, Tamil Nadu and Telangana

were established. The highest numbers of dental colleges, about 25 colleges were established in Karnataka in the year 1991-2000. In Kerala during the period of 2001-2010, 21 dental colleges were established. In Tamil Nadu, 14 colleges were established in the period of 2001-2010.

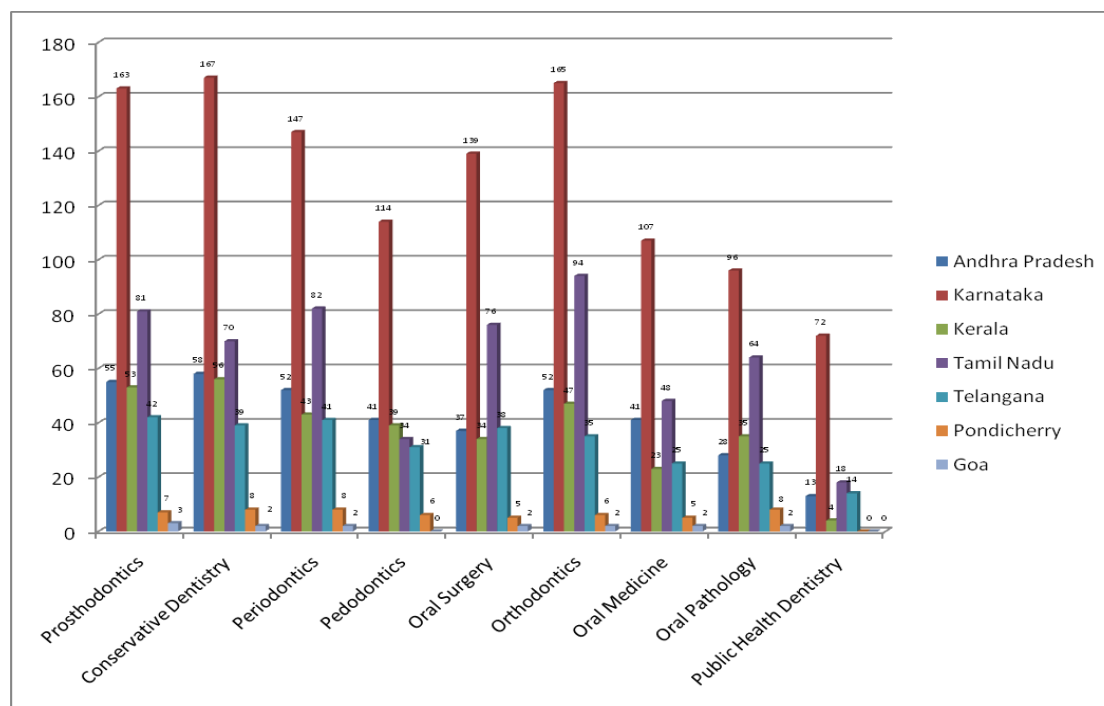


FIGURE 5: SPECIALITY WISE DISTRIBUTION OF POSTGRADUATE SEATS IN SOUTH INDIAN STATES AND UNION TERRITORIES

Source: www.dciindia.gov.in [3]

Figure 5 shows the speciality wise distribution of postgraduate seats in south Indian states and union territories. The highest number of postgraduate seats in every dental speciality is in Karnataka followed by the seats in Tamil Nadu. There are no seats available in the department of Pedodontics and Public Health Dentistry in case of Goa.

TABLE 1: SPECIALITY WISE DISTRIBUTION OF GOVERNMENT AND PRIVATE POSTGRADUATE SEATS IN SOUTH INDIAN STATES AND UNION TERRITORIES

Departments	Sector	Andhra pradesh	Karnataka	Kerala	Tamil nadu	Telangana	Pondicherry	Goa
Prosthodontics	Government	2	3	10	10	3	2	3
	Private	53	160	43	71	39	5	0
Conservative Dentistry	Government	3	3	9	10	3	2	2
	Private	55	164	47	60	36	6	0
Periodontics	Government	6	3	8	12	3	2	2
	Private	46	144	35	70	38	6	0
Pedodontics	Government	0	3	7	5	3	0	0
	Private	41	111	32	29	28	6	0
Oral Surgery	Government	6	3	12	12	3	2	2
	Private	31	136	22	64	35	3	0
Orthodontics	Government	0	3	8	12	3	0	2
	Private	52	162	39	82	32	6	0
Oral Medicine	Government	3	3	7	8	3	2	2
	Private	38	104	16	40	22	3	0
Oral Pathology	Government	0	1	8	7	3	3	2
	Private	28	95	27	57	22	5	0
Public Health Dentistry	Government	0	3	2	3	0	0	0
	Private	13	69	2	15	14	0	0
Grand total		377	1170	334	567	290	63	15

Source: www.dciindia.gov.in [3]

Table 1 shows speciality wise distribution of government and private postgraduate seats in South Indian states and union territories. It shows that in Andhra Pradesh and Pondicherry there are no government seats available in the specialities of Pedodontics, Orthodontics, Oral pathology and Public Health Dentistry. The highest number of seats is present in the speciality of Conservative Dentistry (164) in private colleges of Karnataka. In the state of Telangana and Goa, there are no Public Health Dentistry seats available in government as well as private.

TABLE 2: GEOGRAPHICAL PATTERN AND DISTRIBUTION OF DENTAL INSTITUTES IN SOUTH INDIAN STATES

STATE	AREA (sq km)	POPULATION	NO. OF COLLEGES	PERCENTAGE DISTRIBUTION OF COLLEGES IN SOUTH INDIAN STATES	UNDER GRADUATE COLLEGES	POST GRADUATE COLLEGES
ANDHRA PRADESH	162,970	84,665,533	16	11.7%	2	14
KARNATAKA	197,791	69,371,567	48	35.2%	8	40
KERALA	38,852	34,742,592	26	19.1%	7	19
TAMIL NADU	130,060	81,565,834	29	21.3%	7	22
TELANGANA	112,077	35,193,978	12	8.8%	2	10
PONDICHERRY	490	1,244,464	4	2.9%	1	3
GOA	3,702	1,457,723	1	0.7%	0	1
GRAND TOTAL	483,134	32,136,119	136	100%	27	109

Table 2 shows geographical pattern and distribution of dental institutes in south Indian states and union territories. It shows that highest percentage of college distribution is present in Karnataka (35.5%), followed by in Tamil Nadu (21.4%). The lowest percentage distribution of dental institution is in Pondicherry (2.9%) and Goa (0.7%).

TABLE 3: DENTIST POPULATION RATIO OF SOUTH INDIAN STATES AND UNION TERRITORIES

STATE	AREA (sq km)	TOTAL NO. OF COLLEGES	POPULATION (2020)	TOTAL NUMBER OF DENTISTS (2020)	DENTIST POPULATION RATIO
DENTIST POPULATION RATIO OF ANDHRA PRADESH	162,970	16	84,665,533	21355	1:3965
DENTIST POPULATION RATIO OF KARNATAKA	197,791	48	69,371,567	43876	1:1581
DENTIST POPULATION RATIO OF KERALA	38,852	26	34,742,592	21226	1:1637
DENTIST POPULATION RATIO OF TAMIL NADU	130,060	29	81,565,834	26437	1:3085
DENTIST POPULATION RATIO OF TELANGANA	112,077	12	35,193,978	1001	1:35158
DENTIST POPULATION RATIO OF PONDICHERRY	490	4	1,244,464	723	1:1721
DENTIST POPULATION RATIO OF GOA	3,702	1	1,457,723	1359	1:1073
GRAND TOTAL	483,134	136	308,241,691	115,977	1:2657

Table 3 shows the dentist population ratio of south Indian states and union territories. In case of Telangana, the dentist population ratio is 1:35158. In Andhra Pradesh, the dentist population ratio is 1:3965. In Tamil Nadu, the dentist population ratio is 1:3085. In case of Kerala it is 1:1637, Karnataka it is 1:15181 and in Pondicherry it is 1:1721. In case of Goa, the dentist population ratio is 1:1073.

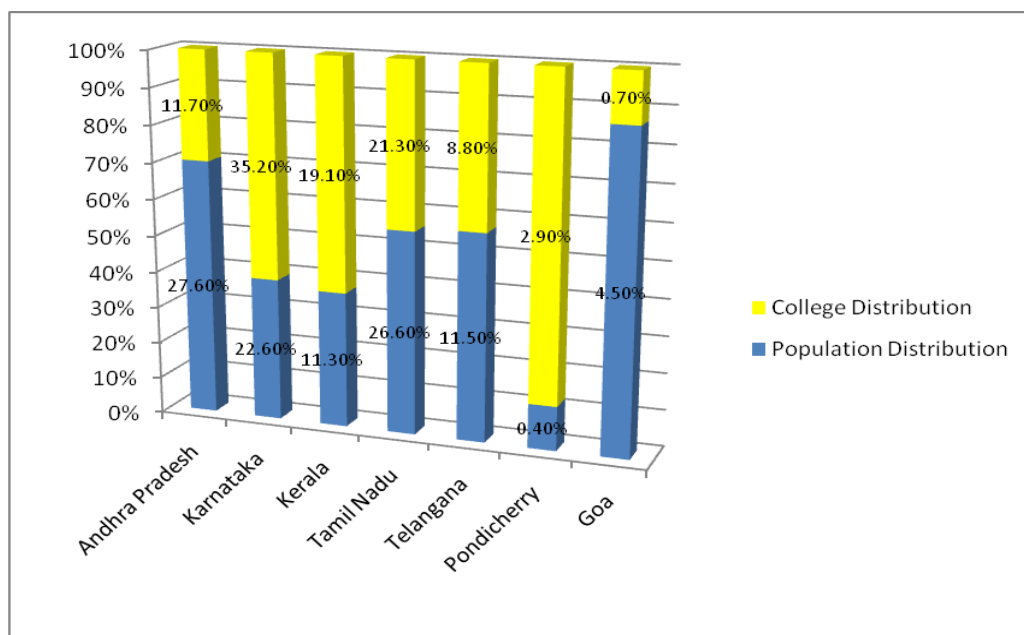


FIGURE 6: COMPARATIVE ANALYSIS OF DENTAL INSTITUTES VERSUS POPULATION SOUTH INDIAN STATES AND UNION TERRITORIES

Figure 6 shows the comparative analysis of dental institutes versus population south Indian states and union territories. In the case of Pondicherry, for a population of 0.4% there are about 2.9% of dental colleges present. In Tamil Nadu, for a population of 26.6% there are about 21.4% of dental colleges.

TABLE 4: TOTAL NUMBER OF PRIMARY HEALTH CENTRES AND COMMUNITY HEALTH CENTRES IN SOUTH INDIAN STATES AND UNION TERRITORIES

STATE	POPULATION (2020)	TOTAL NUMBER OF PRIMARY HEALTH CENTERS	TOTAL NUMBER OF COMMUNITY HEALTH CENTERS	PHC TO POPULATION RATIO	CHC TO POPULATION RATIO
ANDHRA PRADESH	84,665,533	1069	179	1:79,200	1:4,72,991
KARNATAKA	69,371,567	2353	206	1:29,482	1:3,36,755
KERALA	34,742,592	827	222	1:42,010	1:1,56,498
TAMIL NADU	81,565,834	1372	385	1:59,450	1:2,11,859
TELANGANA	35,193,978	668	114	1:52,685	1:308719
PONDICHERRY	1,244,464	24	3	1:51,852	1:4,14,821
GOA	1,457,723	21	4	1:69,415	1:3,64,430
GRAND TOTAL	306,78,396	6313	1109	-	-

Source: Niti.gov.in.^[9]

Table 4 shows the total number of Primary Health Centres and Community Health Centres in south Indian states and union territories. It shows that in Karnataka 2353 Primary Health Centres and 206 Community Health Centres. There are 1372 Primary Health Centres and 385 Community Health Centres in Tamil Nadu. 827 Primary Health Centres and 222 Community Health Centres present in Kerala and totally 1069 Primary Health Centres and 179 Community Health Centres in Andhra Pradesh. There are 668 Primary Health Centres and 114 Community Health Centres in Telangana. 24 Primary Health Centres and 3 Community Health centres are present in Pondicherry. In Goa there are 21 Primary Health Centres and 4 Community Health centres present.

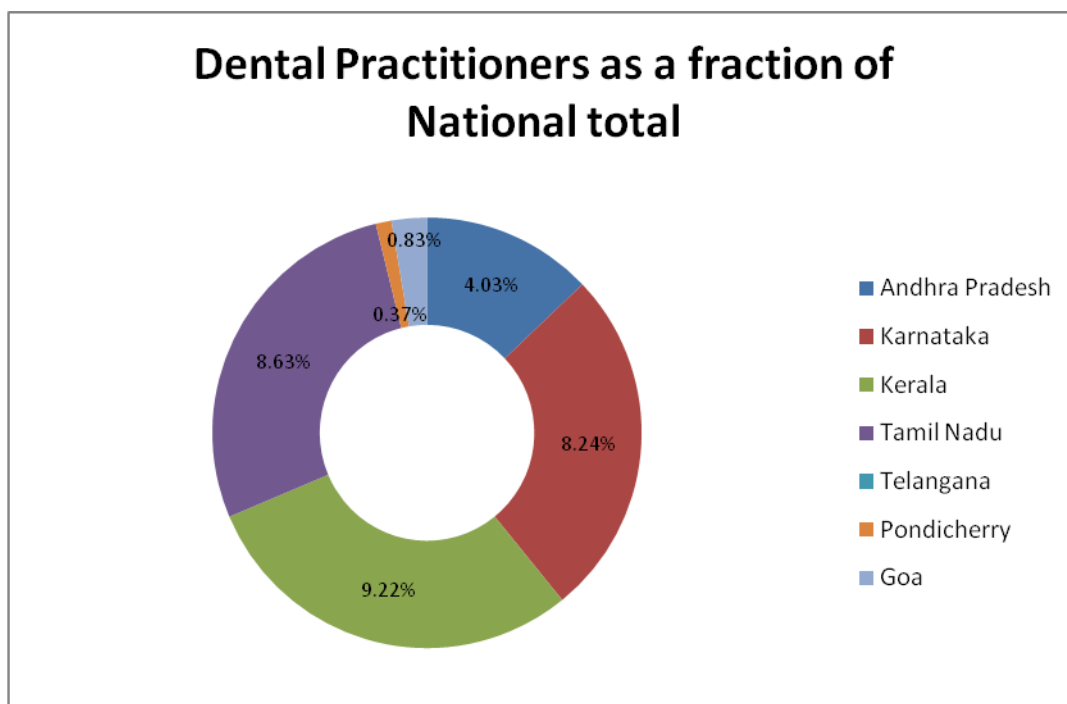


FIGURE 7: PERCENTAGE DISTRIBUTION OF DENTAL PRACTITIONERS WORKFORCE AS FRACTION OF NATIONAL TOTAL IN SOUTH INDIAN STATES AND UNION TERRITORIES
Source: The health workforce in India. www. Who.int. ^[10]

Figure 7 shows the percentage distribution of dental practitioner's workforce as fraction of National total in south Indian states and union territories. It shows that about 9.22% of dental practitioners work in Kerala, 8.63% work in Tamil Nadu, followed by 8.24% in Karnataka, 0.83% in Goa and only 0.37% work in Pondicherry.

DISCUSSION

India is one of the antiquated nations on the planet; with a population much or less of 1.35 billion spread more than 29 states and union territories which are dissimilar in cultural, social, and ecological aspects, also in their caste, ideology, and religion, with differentiating community needs in both the rural and urban structures. The dental training and education in India works inside a huge, different, and complex volley of system. This division has been developing quickly with new universities including thousands of alumni graduating each year. ^[11]

The southern states of India, occupying an area of about 642,240 sq. km are one among the largest part of India.

Dental education institutes tend to be concentrated more in the southern region of India, about 135 dental colleges are present here. This study analyses the current situation of dentistry in the south Indian states and union territories.

In the present study, the results show that most of the dental colleges, 48 are present in Karnataka, followed by 29 dental institutes in Tamil Nadu, 26 in Kerala, 16 in Andhra Pradesh, 12 in Telangana, 1 in Goa and 4 in Pondicherry. Out of 48 colleges in Karnataka, 44 are private and 4 are only Government dental colleges. Whereas among the 29 dental institutes in Tamil Nadu, 27 are private and 2 are government. In a total of 26 colleges in Kerala, 20 are private and 6 are government. Only 2 among the 16 colleges in Andhra Pradesh are government and rest 14 are private dental colleges. One government dental college is present in Goa. Out of the total 12 colleges in Telangana, 11 are private and 1 only is Government College and there are 3 private and 1 government dental colleges in Pondicherry. The reason behind the mushrooming of private dental colleges might be due to government paving entry

way to the private sector in case of education system in the year 1980-1990s. [12]

In this study, the results shows that in the total of 48 colleges in Karnataka there are 3413 undergraduate and 1170 postgraduate seats, whereas among the 29 dental institutes in Tamil Nadu, 2873 undergraduate and 567 postgraduate seats are available. In the 26 colleges in Kerala, 1970 undergraduate and 334 postgraduate seats are present. Among the 16 colleges in Andhra Pradesh there are 1440 undergraduate and 377 postgraduate seats. Out of the total 12 colleges in Telangana, there are 1140 undergraduate and 290 postgraduate seats, in Goa there are 50 undergraduate and 15 postgraduate seats, and in Pondicherry among the 4 dental colleges there are 340 undergraduate and 63 post graduate seats. These findings project the scenario of postgraduate seats being way lesser than the undergraduate seats in all the south Indian states. The reason for this could be attributed to the policy of the Indian Government wanting more general dentists who can manage and treat patients in rural areas also and not just specialists. Maybe they want more Foot Soldiers than Generals.

Analysing the trends in establishment of dental colleges in the south Indian states, in 1950-60, 1 college each in Kerala, Tamil Nadu and Telangana were only established. Whereas the highest numbers of dental colleges, about 25 colleges were established in Karnataka in the year 1991-2000. In Kerala during the period of 2001-2010, 21 dental colleges were established. In Tamil Nadu, 14 colleges were established in the period of 2001-2010. It could be noted that alarmingly about 60 dental colleges were established between the years of 2001-2010 in the south Indian states. Until 1960, there were only few government dental institutions. The establishment of private dental colleges were initiated in the year 1966. [13] The tremendous need to compensate the demand for coveted dental

profession might have been the reason behind establishment of private dental institutions. [14] This could be the possible reason behind the mushrooming of dental colleges in the south Indian states.

The speciality wise distribution of government and private postgraduate seats in South Indian states shows that in Andhra Pradesh and Pondicherry there are no government seats available in the specialities of Pedodontics, Orthodontics, Oral pathology and Public Health Dentistry. In the case of Goa there are no postgraduate positions in both government and private in Pedodontics and Public Health Dentistry. The highest number of seats is present in the speciality of Conservative Dentistry (164) in private colleges of Karnataka. In the state of Telangana, there are no Public Health Dentistry seats available in government as well as private. Although both these specialities are concerned with prevention and public health care services, students preferring to choose these departments have been low. [15] This might be the reason behind the seats being lesser in these two specialities even in the government.

The results of this study shows that highest percentage of college distribution is present in Karnataka (35.5%), followed by in Tamil Nadu (21.4%). The lowest percentage distribution of dental institution is in Pondicherry (2.9%) and in Goa (0.7%). In the case of Pondicherry, for a population of 0.4% there are about 2.9% of dental colleges present. In Tamil Nadu, for a population of 26.6% there are about 21.4% of dental colleges. In case of Karnataka, 22.6% of population, there is 35.5% of college that is distributed. The basic problem behind this could be the uneven distribution of dental institutions in India. [16] There should be a proper distribution of dental colleges in the South Indian states and union territories. One dental institute for each one district in the South Indian states and union territories to meet the dental demands of the people in India is the need for the hour now.

Analysing the dentist population ratio of south Indian states, in Telangana, the dentist population ratio is 1:35158. In Andhra Pradesh, the dentist population ratio is 1:3965. In Tamil Nadu, the dentist population ratio is 1:3085. In case of Kerala it is 1:1637, Karnataka it is 1:15181, in Goa it is 1:1073 and in Pondicherry it is 1:1721. World Health Organization recommends a Dentist Population ratio of 1:7500. [17] It could be noted that in any of the south Indian states the recommended ratio is not met. The problem basically lies behind the distribution of dental colleges itself than the number of dentists. The concentration of dental colleges in one region without an even distribution among states according to population could be attributed as a reason. The equal distribution of dental surgeons across different geographical regions is really crucial for a corroborate equality in access to dental care among the population in India. [18]

The total number of Primary Health Centres and Community Health Centres in south Indian states shows that in Karnataka 2353 PHCs and 206 CHCs and there are 1372 PHCs and 385 CHCs in Tamil Nadu. 827 PHCs and 222 CHCs present in Kerala and totally 1069 PHCs and 179 CHCs in Andhra Pradesh. There are 668 PHCs and 114 CHCs in Telangana. 24 Primary Health Centres and 3 Community Health centres are present in Pondicherry. In Goa there are 21 Primary Health Centres and 4 Community Health centres present. There is a need for appointment of general dental surgeons in PHCs and Public Health Dentist in CHCs. Appointment of a dental surgeon at every PHC and a Public Health Dentist in every CHC will ensure that the dental, gingival and periodontal health of the population in rural areas of India is taken care of. This may reduce the burden of oral diseases in India. [19]

The results of this study in Figure 7 projects the percentage distribution of dental practitioner's workforce as fraction of National total in south Indian states. It shows that about 9.22% of dental

practitioners work in Kerala, 8.63% work in Tamil Nadu, followed by 8.24% in Karnataka, 0.83% work in Goa and only 0.37% work in Pondicherry. Only about 30% of the dental practitioners work in south Indian states compared to the national total. The lack of job and increased unemployment among dentist is a proven fact by this finding. Imbalance between the demand and supply of dental surgeons is viewed to be the most important reason behind unemployment according to Dagli N and Dagli R. [5]

The major limitation that was encountered during the study was obtaining the number of dentists working in different sectors such as government and private in each states of South India. Details regarding the medical force, nurses and paramedics working in different sectors are available whereas the details about dental surgeons are not available in any platform.

Recommendations:

The state governments must take action to appoint general dental surgeons in Primary Health Centres and Public Health Dentists in Community Health Centres to reduce the oral health burden of the people.

The Dental Council of India must take action for the proper and equitable distribution of dental institutes in all districts around the southern region taking care of urban rural divide according to the oral health care needs of the people. Actions to normalise the dentist population ratio among all the south Indian states and union territories must also be taken up by the DCI and the state government.

CONCLUSION

More and more dentists keep graduating every year but there is an absolute lack of job opportunities for them in India. A proper distribution of dental manpower for the people in need is the pressing priority now. A combined effort of both the state government and the Dental Council of India can address this issue. If all the necessary actions are taken and the oral

health burden is reduced, then dentistry will flourish in a country like India.

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