



Original Article

## Health Information Technology (HIT): A Hit or Miss in Private Dental Practice in Chennai, Tamil Nadu, India – A Cross Sectional Survey

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### Abstract

**Objective:** To assess the knowledge, perception and use of Health Information Technology (HIT) among private dental practitioners in Chennai, Tamil Nadu, India.

**Material and Methods:** The sample population consisted of private dental practitioners in Chennai District of Tamil Nadu who were individually approached to participate in the cross-sectional survey. A structured, self-reported, close-ended questionnaire, which contained queries on the knowledge, usage and concerns about HIT in their practice, was designed. Descriptive statistics such as frequency distribution and percentages were analyzed using SPSS version 24. **Results:** Of the 483 dental clinics that were approached, 352 dental practitioners completed the questionnaire survey. A significant proportion of dental practitioners (65 percent) reported positive attitude towards use of HIT systems and believed that HIT systems could help make their work easier and efficient. However, it is unfortunate to note that almost half (47 percent) the dental practitioners were not interested in implementing HIT systems in their practice due to various monetary concerns such as installation and maintenance costs. **Conclusion:** The widespread adoption of HIT provides system connectivity and information exchange among providers of the same organisation, providers at different organisations and, ultimately, providers practising regionally and nationally.

**Keywords:** Medical Informatics; Informatics; General Practice, Dental.

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## Introduction

Whilst there are constant changes in the field of science and technology, it is important to adapt to the changes through innovation to progress further. The advent of Information Technology in health sector is yet another revolutionary change which has taken place. This has opened a new domain called Health information and technology [1]. Health Information Technology (HIT) describe the comprehensive management of health information across computerized systems and its secure exchange between consumers, providers, government and quality entities, and insurers [2]. India is one of the developing countries which tends to provide quality healthcare services, with 5.2% expenditure of the GDP every year and it has been estimated to grow 17% in compounded annual growth rate (CAGR) in the next 7-10 years [3].

There is a definite inequity of literacy rates observed between rural and urban areas in India. For example, rural areas report a literacy rate of 68.9 percent, whereas urban areas report 85 percent [4]. However, the advent of technology in the form of mobile phones have high penetration rates in rural as well as urban areas of the country [5]. Of the total telecom subscriber base in India, close to 94 percent are wireless subscribers [6]. A report by Telecom Regulatory Authority of India for the month of September 2014 suggests total Internet Subscribers to be 254.40 million in India [7]. Therefore, HIT can become a crucial tool in enhancing health service delivery through the use of low-cost, easy-to-use technologies using mobile telephony and internet service, which may help to bridge some of the gaps in patient-provider interactions and increase awareness among the patient in India. Currently HIT is used through electronic health records (HER); telemedicine; digital health knowledge resource; hospital information management system; e-learning technologies and health informatics [8].

Implementation of HIT in medical field started as early as 1990's when primary care informatics project was initiated in the district of Bhorugram in the state of Rajasthan, India [9]. Subsequently, the States of Tamil Nadu and Maharashtra have received substantial funding from the respective governments of their state and have resulted in successful implementation [10,11]. Some of the multi-specialty private hospitals have already been reported using Telemedicine on a bigger scale to help people to access their services at distant locations [12,13]. One of the major drivers for HIT for the people of India is be public private partnership. Studies have reported that majority (87%) of clinicians felt that information technology could potentially improve quality of care in rural and underserved settings using tools such as online information sources, telemedicine programs, and electronic health records [5,14].

Although there has been previous evidence of successful implementation of HIT in medical field [14], the implementation and the impact of HIT in dentistry has not been explored. Numerous studies report that strong dentist-patient relationship is important because it influences patient care outcomes such as treatment compliance, patient satisfaction, trust and adherence to treatment [15,16]. Information technologies create channels for information-sharing to facilitate communication between dental care providers and dental patients [15]. Therefore, the aim of the

survey was to assess the knowledge, perception and use of HIT among private dental practitioners in Chennai, Tamil Nadu, India.

## Material and Methods

### Study Design and Population

The study employed a cross-sectional survey design conducted during the period of August to December 2016.

G\*Power statistical software was used to estimate the sample size. The sample size required for the study was calculated to be 384, with 90% power and 5%  $\alpha$  error. The sample population consisted of 392 private dental practitioners in Chennai District of Tamil Nadu who provided written consent to participate in the survey. A structured, self-reported, close-ended questionnaire, which contained queries on the knowledge, usage and concerns about HIT in their practice, was designed.

Notices and reminders were sent to dentists who requested for time to complete the survey, due to their busy schedule. The criteria for inclusion was that only those dentists who completed the questionnaire were considered for further analysis.

### Statistical Analysis

The descriptive statistics with frequency distribution was obtained from the questionnaire survey using SPSS Software version 24.0

### Ethical Aspects

The study was approved by the Institutional Review Board of Priyadarshini Dental College and Hospital and the ethical approval was obtained from the Institutional Ethical Committee of Priyadarshini Dental College and Hospital. The main objective of the study was clearly explained to all the dentists and an informed consent was obtained from them.

## Results

Of the 483 dental clinics that were approached, 392 dental practitioners responded to complete the survey but only those who completely filled the questionnaire (n=352) were considered for further analysis. Therefore, a good response rate of 73 percent was achieved in the study. Table 1 shows baseline characteristics of information asked in the questionnaire about the sample distribution such as years and investment of practice establishment and average number of walk-in patients per week. In addition, questions on HIT included knowledge, attitude, perception and implementation status of HIT in dental practices.

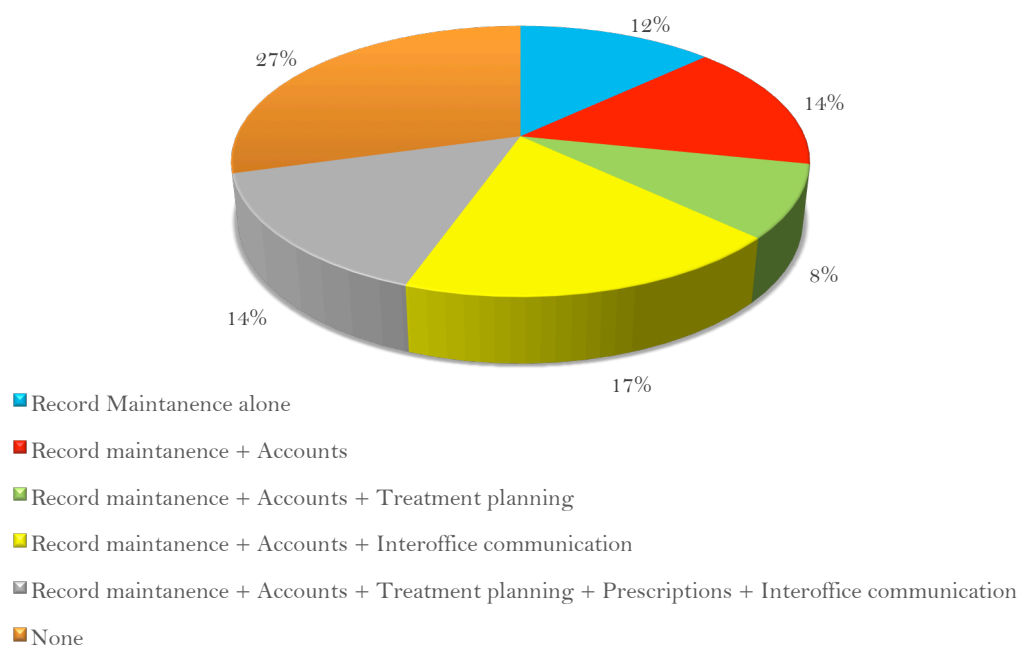
It was noted that almost 40 percent of the dental practices in the sample population were established in the last 5 years with the average investment was up to 5 lakh rupees. It is observed that 50 percent of the dental practices had 7 to 20 patients per week on average. In regards to HIT, a

significant portion of dental practitioners had positive attitude towards use of HIT systems and believed that HIT systems could help make their work easier and efficient. However, it is unfortunate to note that almost half (47 percent) the dental practitioners were not interested in implementing HIT systems in their practice.

**Table 1. Baseline characteristics of the dental practices and information on HIT knowledge and utilization (n=352).**

<b>Baseline Characteristics</b>	<b>n</b>	<b>%</b>
<b>Establishment of dental practice</b>		
0-5 years	140	39.7
6-10 years	105	29.7
11-20 years	74	21.2
More than 20 years	33	9.4
<b>Investment in practice establishment</b>		
Up to 5 lakhs	154	43.8
6 to 10 lakhs	88	25
More than 10 lakhs	68	19.3
Not sure	42	11.9
<b>Average number of walk-in patients per week</b>		
Less than 7	63	18
7 to 20 patients	176	50
21 to 40 patients	67	19
More than 40 patients	46	13
<b>Interested in implementing HIT in dental practice</b>		
Yes	187	53.1
No	165	46.9
<b>Attitude towards HIT in dental practice</b>		
Very important	126	35.7
Somewhat important	101	28.6
Neutral	53	15.1
Somewhat unimportant	5	1.4
Unimportant	8	2.3
Not sure	59	16.9
<b>Likelihood of using technology for efficiency</b>		
Very likely	124	35.1
Somewhat likely	118	33.4
Neutral	60	17.1
Somewhat unlikely	9	2.6
Very unlikely	3	0.9
Not sure	38	10.9
<b>HIT implementation status in dental practice</b>		
Fully implemented	23	6.6
Under process	111	31.5
Planned in the next 12 months	50	14.2
Not planned/ not sure	168	47.7

Figure 1 shows the top five reported HIT uses among dental practitioners in their respective practices. Whilst it is noted that HIT systems have been widely used for different functions, a significant proportion (27 percent) of practitioners reported not using HIT systems for any of the listed purposes. Dentists were also asked about their budgetary concerns in relation to implementing HIT systems of which the top five reported concerns are shown in Table 2.



**Figure 1. Top 5 reported uses of HIT systems among dentists in their practice (n=352).**

**Table 2. Top 5 budgetary concerns regarding HIT systems (n=352).**

Reported budgetary concerns	Strongly Agreed (%)
High installation costs	15.4
Little or no return on investment	10
Cost of maintenance and additional logistics	21.4
Installation cost + maintenance cost	9.7
Not sure	23.7

## Discussion

India has become one of the strong contenders in terms of health-related and scientific manpower. Due to the strong impact of technology in the health sector, it is critical not only to understand the important use of different technologies but also to bring about innovative changes using these technologies with extensive scientific inputs of indigenous origin [5]. In this study, it is observed that almost 40 percent of the private dental clinics were established in the last five years. The reason for the increasing numbers of new practices can be attributed to two main reasons. Firstly, majority of dentists prefer working in private clinics as they reported that it provides flexibility of work hours and freedom in terms of not subjected to bureaucracy [17]. As job

opportunities are becoming scarce in government and private sector, most dental professionals are forced to start private dental offices [18-20].

Whilst around 68 percent (very likely and likely) agreed that use of technology improves work efficiency, it is surprising to see that only 6.6 percent had fully implemented a HIT system in their practice. The main concern was obviously monetary as 15 percent reported their concerns regarding installation setups and 21 percent reported that the cost of maintenance and additional logistics would prove expensive. As aforementioned, most of the practices were fairly new and the dentists had spent much on their establishments, they were reluctant to spend additional costs incurred for establishing HIT systems. More than 90 percent of the practitioners work in and around major cities and spend large amounts of money in purchasing dental devices and materials for their clinics. Even though, the Indian dental equipment and appliances market is around \$ 90 million, with a yearly growth rate of 10 per cent per annum [21]. One of the main reasons for increase in yearly growth rate of Indian dental equipment and appliances market is due to yearly increase in the new practice setups. Every year approx. 12,000 to 15,000 new practices start in the country [22]. Therefore, a significant 46 percent of practitioners were not interested in HIT systems.

Figure 1 shows the top five reported uses of HIT reported by the participant practitioners in the study. Whilst 17 percent of practitioners only used HIT for record maintenance, communication and accounts, the other 14 percent reported incorporating HIT for treatment planning and prescriptions in addition to other basic uses. Similar findings have been reported in a survey conducted by Urban Indian Health Program, where 92 percent reported Email usage, 79 percent in practice management system, 29 percent reported HER, 75 percent for Document Scanning, 67 percent reported for accounts and registries of patient with specific diseases [23]. In International context, most California dentists have embraced electronic methods to help with the business side of dentistry such as for billing, accounting, and scheduling [24].

This study is one of the few surveys that have explored the knowledge, attitude and practice on the use of HIT systems among dental practitioners in India. Whilst it is a mistaken consensus that HIT systems are more relevant to bigger hospital facilities, use of HIT systems has been proven to get work done more easily and efficiently even in smaller dental practices. The response rate of 73 percent achieved in this study was quite an achievement. The reasons for reluctant use of HIT systems in terms of investment and budgetary concerns were well explored. However, this study has limitations and opportunities worth improving. The use of self-reported questionnaire might have contributed to some degree of bias affecting the results [25]. Furthermore, there is difficulty in establishing causation using the cross-sectional study design [26].

## Conclusion

The widespread adoption of HIT provides system connectivity and information exchange among providers of the same organisation, providers at different organisations and, ultimately, providers practising regionally and nationally. This would prove to be valuable especially in a

developing country like India in the rural areas where there is scarce health professional manpower. The findings of this study would provide critical information for dental practitioners about the wide use of HIT systems and also policy makers in implementing this technology for rural outreach programs.

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## References

1. Bardhan IR, Thouin MF. Health information technology and its impact on the quality and cost of healthcare delivery. *Decis Support Syst* 2013; 55(2):438-49. doi: 10.1016/j.dss.2012.10.003.
2. Jones SS, Rudin RS, Perry T, Shekelle PG. Health information technology: an updated systematic review with a focus on meaningful use. *Ann Intern Med* 2014; 160(1):48-54. doi: 10.7326/M13-1531.
3. Masetti J. Healthcare sector over view and trends – 2010 [Internet]. Available from [www.harneedi.com/index.php/healthcare-articles/1738-indian-healthcareindustry-overview-and-trends-2010.html](http://www.harneedi.com/index.php/healthcare-articles/1738-indian-healthcareindustry-overview-and-trends-2010.html).
4. Census of India. 2011. Status of Literacy. Available at: <http://censusmp.nic.in/censusmp/All-PDF/6Literacy21.12.pdf>.
5. DeSouza SI, Rashmi MR, Vasanthi AP, Joseph SM, Rodrigues R. Mobile phones: The next step towards healthcare delivery in rural India?. *PloS One* 2014; 9(8):e104895. doi: 10.1371/journal.pone.0104895.
6. Telecom Regulatory Authority of India. Telecom Sector in India: A decadal profile. 2012. Available at: <http://www.trai.gov.in/WriteReadData/Publication/Document/201304121052403536675NCAER--Report08june12.pdf>.
7. Telecom Regulatory Authority of India. The Indian Telecom Services Performance Indicators. Report January – March, 2013. Available at: [http://www.trai.gov.in/Content/PerformanceIndicatorsReports/1\\_1\\_PerformanceIndicatorsReports.aspx](http://www.trai.gov.in/Content/PerformanceIndicatorsReports/1_1_PerformanceIndicatorsReports.aspx).
8. Kalpa S. Health IT in Indian healthcare system: A new initiative. *Res J Recent Sci* 2012; 1(6):83-6.
9. Singh AK, Kohli M, Trell E, Wigertz O, Kohli S. Bhorugram (India): revisited A 4 year follow-up of a computer-based information system for distributed MCH services. *Int J Med Inform* 1997; 44(2):117-25. doi: 10.1016/S1386-5056(96)01251-8.
10. Krishnan A, Nongkynrih B, Yadav K, Singh S, Gupta V. Evaluation of computerized health management information system for primary health care in rural India. *BMC Health Serv Res* 2010; 10(1):310. doi: 10.1186/1472-6963-10-310.
11. Radhakrishna K, Goud BR, Kasthuri A, Waghmare A, Raj T. Electronic health records and information portability: a pilot study in a rural primary healthcare center in India. *Perspectives in health information management/AHIMA*. American Health Information Management Association, 2013.
12. Mishra SK. Current status of E-health in India. Available at: <http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan045983.pdf>.
13. Sharma AK. Telemedicine: A technology in waiting. *Indian J Public Health* 2011; 55(4):286-8.
14. Sequist TD, Cullen T, Hays H, Taulii MM, Simon SR, Bates DW. Implementation and use of an electronic health record within the Indian Health Service. *J Am Med Inform Assoc* 2007; 14(2):191-7. doi: 10.1197/jamia.M2234.
15. Kirshner M. The role of information technology and informatics research in the dentist-patient relationship. *Adv Dent Res* 2003; 17(1):77-81.
16. Rozier RG, Horowitz AM, Podschun G. Dentist-patient communication techniques used in the United States: the results of a national survey. *J Am Dent Assoc* 2011; 142(5):518-30. doi: 10.14219/jada.archive.2011.0222.
17. Baharvand M, Moghaddam EJ, Pouretmad H, Alavi K. Attitudes of Iranian dental students toward their future careers: an exploratory study. *J Dent Educ* 2011; 75(11):1489-95.

18. Samuel SR. Dental education: Too many graduates in India. *Br Dent J* 2016; 220(5):219. doi: 10.1038/sj.bdj.2016.155.
19. Yadav S, Rawal G. The current status of dental graduates in India. *Pan Afr Med J* 2016; 23:22. doi: 10.11604/pamj.2016.23.22.7381.
20. Dagli N, Dagli R. Increasing unemployment among Indian dental graduates – High time to control dental manpower. *J Int Oral Health* 2015; 7(3):i-ii.
21. Chakravarthi I. Medical equipment industry in India: Production, procurement and utilization. *Indian J Public Health* 2013; 57(4):203-7. doi: 10.4103/0019-557X.123242.
22. Ahuja NK, Parmar R. Demographics & current scenario with respect to dentists, dental institutions & dental practices in India. *Indian J Dent Sci* 2011; 3(2):8-11.
23. Kavitha G. Impact of information technology in Indian healthcare system. *IJET* 2013; 5(1):110-14.
24. California Healthcare Foundation. Health Information Technology in California Dental Practices: Survey Findings. Available at: <http://www.chcf.org/~media/MEDIA%20LIBRARY%20Files/PDF/PDF%20H/PDF%20HealthITInCADentalPracticesSnapshot.pdf>.
25. Delgado-Rodriguez M, Llorca J. Bias. *J Epidemiol Community Health* 2004; 58(8):635-41. doi: 10.1136/jech.2003.008466.
26. Webb P, Bain C. Essential epidemiology: an introduction for students and health professionals. Cambridge University Press; 2010.