Original Article

# Information Technology Practices Amongst Dental Undergraduate Students at a Private Dental Institution in India

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## Abstract:

**Objective:** In dental and medical education, information and communication technology (ICT) has been playing an important role and its use is rapidly increasing. In developing countries, however, information technology is still only available to a minority of health professionals. The present study aimed to assess the level of computer use among dental undergraduate students pursuing their career at a private dental institution in India.

**Materials and Methods:** The study population comprised dental undergraduate students from first to fourth year pursuing their career in a private dental institution of India. Information technology practices were assessed using a questionnaire that consisted of 14 questions.

**Results:** In total, 247 students with an overall response rate of 66% participated in the study. Only 58.3% of the study population mentioned that they had access to computers. Students from preclinical years reported to be competent in IT skills more frequently than the clinical year students (chi square test, P=0.007). Compared to women, men used computers more regularly both for academic activities (P=0.082) and personal use (P=0.006). Similarly, students of clinical years used computers more than preclinical students for both purposes (academic activities, P=0.045; personal use, P=0.124).

**Conclusion:** The present study revealed that computer literacy of Indian dental undergraduate students was comparable with students of other countries whereas accessibility of IT sources was poor. Expansion of computer-assisted learning which requires careful strategic planning, resource sharing, staff incentives, active promotion of multidisciplinary working, and effective quality control should be implemented.

**Key Words:** Information Science; Computer Communication Networks; Computer Literacy; Students, Dental; India

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## INTRODUCTION

Computer and internet allow people to communicate freely across an international electronic computer network [1]. Moreover, the development of the Internet, as a vehicle for worldwide communication, and the emergence of the World Wide Web, has made instantaneous access to much of the entire body of medical information possible [2].

In fact, with the great developments of the computer and the internet, information technology (IT) has positively influenced health care delivery systems, especially in the fields of disease control, diagnosis, patient manage-

ment, and teaching [3-5].

In other words, information and communication technology (ICT) plays a pivotal role in dental and medical education and its use is rapidly increasing [6]. This rapid development leading to enhanced medical literature retrieval applications, together with increased access to personal computers have changed both the study and practice environments in dentistry, as in other disciplines [7-9]. On the other hand, the development of information technology in developing countries is slow due to limited accessibility of computers and internet, at home and on campus.

Previous studies have emphasized that a graduate dentist must be able to use ICT for the benefit of his personal and professional development [10,11]. A critical factor for the implementation of ICT in dental education is computer competence of dental students as well as of the academic staff [12]. Computer literacy for students and staff should include generic data management, presentation and communication applications as well as search strategies and techniques. In recent studies of medical practitioner's use of online evidence, it has been reported that over 80% of practitioners studied believed that the use of electronic information resources has the potential to improve patient care [13,14].

In contrast to its extensively acknowledged importance, computer access and computer related skills demonstrate a wide diversity, both regional and within students and faculties of the same institution [15-17]. This may be due to the limited financial resources available to maintain IT infrastructure in developing countries whereas diversity among academics could be explained by attitudes of academic staff towards information technology.

Though India is considered the information technology hub of Asia, computer penetration accounts to no more than 20 per thousand and education comprises of a mere 3.3% of the domestic IT market of India. No studies exist from this country regarding computer use among dental students. In India, duration of the Bachelor of Dental Surgery (BDS) Course is of four calendar years followed by a year of rotatory internship. The first two years comprise the preclinical years and latter the clinical.

The aim of the present study was to assess the level of computer use among dental undergraduate students pursuing their careers at a private dental institution in India.

## MATERIALS AND METHODS

The study population comprised dental undergraduate students from first to fourth year enrolled at Rajasthan University of Health Sciences pursuing their career at Darshan Dental College and Hospital, Udaipur, India.

Verbal consent was obtained from the respondents and ethical approval for performing the survey was availed from the ethical committee for research of Darshan Dental College and Hospital.

Level of information technology usage was measured using a modified questionnaire which was derived from previous surveys [16 - 18]. Fourteen multiple-choice questions suit-

**Table 1.** Distribution of subjects according to gender and year of study

| Year of Study | Male | Female | Total | Response rate | | |
|---|---|---|---|---|---|---|
| | | | | Males | Females | Total |
| **1st year** | 26 | 36 | 62 | 72% | 56% | 62% |
| **2nd year** | 20 | 46 | 66 | 62% | 81% | 74% |
| **3rd year** | 30 | 30 | 60 | 63% | 65% | 64% |
| **4th year** | 30 | 29 | 59 | 64% | 64% | 64% |
| **Total** | 106 | 141 | 247 | 65% | 66% | 66% |

able to Indian dental education were included in the questionnaire. The questionnaire also requested information on students' age, gender, year, and course of study (preclinical/clinical).

The study was conducted during the beginning of the academic year 2007-2008. All undergraduate students were requested to participate in the study. Questionnaires were distributed in students' ordinary classroom settings during lecture sessions with prior permission from the Dean of the institution. Aims of the study were explained upon distribution. The questionnaires were retrieved immediately after completion.

All participants took part in the study voluntarily and no incentives were given to the respondents. Students who were present on the days of the survey were included. No attempt was made to trace students who remained absent on the survey days.

The data collected was entered on to the spreadsheets and was analyzed using Statistical Package for Social Sciences version 11.0 (SPPS 11.0). The chi square test was used to compare the responses by gender and to analyze the differences between courses of study for various questionnaire items. The level of statistical significance was set at $P<0.05$.

## RESULTS

The total sample size accounted to 247 students with an overall response rate of 66% as presented in Table 1. No statistically significant difference existed in gender distribution of students in different study years (chi-square value=7.054, df=3 and P=0.07).

### Computer and Printer Access

Only 58.3% of the study population reported that they had access to computers, of which a major proportion accessed their computers at home (24.7%), followed by internet cafe and

**Table 2.** Responses to questionnaire items on computer and printer access amongst a sample of Indian dental students (n=247)**.**

| Question | Response | N | % |
|---|---|---|---|
| **Do you have access to a computer** | Yes | 144 | 58.3 |
| | No | 103 | 41.7 |
| **Where do you have access to computer?** | At college | 9 | 3.6 |
| | At home | 61 | 24.7 |
| | Other place (Internet cafe) | 29 | 11.7 |
| | At both home and internet café | 45 | 18.2 |
| **How would you describe the access and availability of the computer?** | Good/very good | 67 | 27.1 |
| | Adequate | 86 | 34.8 |
| | Poor/very poor | 94 | 38.1 |
| **Do you have access to a printer?** | Yes | 100 | 40.5 |
| | No | 147 | 59.5 |
| **Where do you have access to printer?** | At college | 9 | 3.6 |
| | At home | 53 | 21.5 |
| | Other place (Internet cafe) | 22 | 8.9 |
| | At both home and Internet café | 16 | 6.5 |
| **How would you describe the access and availability of the printer?** | Good/very good | 51 | 20.6 |
| | Adequate | 96 | 38.9 |
| | Poor/very poor | 100 | 40.5 |

N= Number

home. More than one thirds (38.1%) of the study sample was not satisfied with the access and availability of the computers as illustrated in Table 2.

Almost 40% of students did not have access to printer and among the subjects who had, 21.5% had access at home in contrast to 3.6% at college. More than half (59.5%) of the individuals were satisfied with accessibility of printers.

## Computer Skills and Training

Table 3 presents responses to questions on computer skills and training. More than one third (34.8%) of the study population had been using computers for more than three years. One-third of the respondents (33.2%) reported irregular use of computer (Table 3) with no statistically significant difference related to gender or course of study. More than half of the subjects were competent in some basic skills. Majority (57.9%) of the students said they familiarized themselves with computers through personal study and experience and only 4.9% gained these skills through courses in the college. Nearly half the subjects (48.1%) reported that the quality of IT training received at college is adequate.

According to their responses, students from preclinical years were more competent in IT skills than the clinical year students (P=0.007) (Table 4). Women were also more competent in "some basic skills" than men. On the other hand, 24.5% of men reported they were competent in "most basic skills" in comparison to 12% of women. The differences of self-reported IT skills between the two genders were significant (P=0.044).

## Use of Computers for Academic and Personal Purposes

Results as presented in Table 5 reveal that nearly two thirds of students (70.9%) used the internet in pursuit of their studies. According

**Table 3.** Responses to questionnaire items on computer skills and training among dental undergraduate students attending a private dental school of India.

| Question | Response | N | % |
|---|---|---|---|
| **How long ago did you first start using a computer regularly?** | Not using regularly | 82 | 33.2 |
| | 1-6 months ago | 19 | 7.7 |
| | 7-12 months ago | 24 | 9.7 |
| | 13-24 months ago | 20 | 8.1 |
| | 25-36 months ago | 16 | 6.5 |
| | 37 or more months ago | 86 | 34.8 |
| **How would you grade your general IT skills (Windows, Microsoft Office, and Internet)?** | Unable/beginner | 69 | 27.9 |
| | Competent in some basic skills | 135 | 54.7 |
| | Competent in most basic skills | 43 | 17.4 |
| **How did you familiarize yourself with computers?** | Through a course in the college | 12 | 4.9 |
| | Through personal study and experience | 143 | 57.9 |
| | Through a special course | 22 | 8.9 |
| | Through a course in the college, personal study and experience, and a special course | 21 | 8.5 |
| | Through a special course and personal study and experience | 39 | 15.8 |
| | Through a course in the college and personal experience | 10 | 4.0 |
| **How would you describe the quality of IT training you received?** | Good/very good | 52 | 21.1 |
| | Adequate | 119 | 48.1 |
| | Poor/very poor | 76 | 30.8 |

N= Number

to their reports, clinical year students used presentations and Medline for their studies more frequently than preclinical year students (P=0.05). Moreover, using these features was more frequent among women compared to men. Men reported competency in most basic skills of producing a page of text more frequently than women (24% vs. 10%, P=0.012). Frequency of reporting never using computer for academic purposes was higher among preclinical compared to clinical course students (49% vs. 33%, P=0.045). Men used computers more regularly than women both for academic activities and personal use (chi-square, P=0.006). Similarly students of clinical years used computers more than preclinical students for both the purposes (academic activities, P=0.045; personal use, P=0.124).

**Table 4.** Information technology skills and training along with computer activities used according to course of study and gender of a sample of Indian dental students (n=247).

| Question | Response | By Course | | | By Gender | | |
|---|---|---|---|---|---|---|---|
| | | Pre clinical N (%) | Clinical N (%) | P value | Male N (%) | Female N (%) | P value |
| **Length of time students said they had been using computers regularly** | Not using regularly | 41 (32.0) | 41 (34.5) | NS | 31 (29.2) | 51 (36.2) | NS |
| | 1-6 months ago | 11 (8.6) | 8 (6.7) | | 7 (6.6) | 12 (8.5) | |
| | 7-12 months ago | 13 (10.1) | 11 (9.2) | | 11 (10.4) | 13 (9.2) | |
| | 13-24 months ago | 11 (8.6) | 9 (7.6) | | 9 (8.5) | 11 (7.8) | |
| | 25-36 months ago | 8 (6.2) | 8 (6.7) | | 12 (11.3) | 4 (2.8) | |
| | 37 or more months | 44 (34.3) | 42 (35.3) | | 36 (34.0) | 50 (35.5) | |
| | Total | 128 | 119 | | 106 | 141 | |
| **IT skills** | Unable/beginner | 27 (21) | 42 (35.3) | 0.007 | 25 (23.6) | 44 (31.2) | 0.044 |
| | Competent in some basic skills | 71 (55.5) | 64 (53.8) | | 55 (51.9) | 80 (56.7) | |
| | Competent in most basic skills | 30 (23.4) | 13 (10.9) | | 26 (24.5) | 17 (12.0) | |
| | Total | 128 | 119 | | 106 | 141 | |
| **Quality of IT training at the college** | Good/very good | 36 (28.1) | 16 (13.4) | 0.018 | 21 (19.8) | 31 (22.0) | NS |
| | Adequate | 56 (43.8) | 63 (52.9) | | 49 (46.2) | 71 (50.3) | |
| | Poor/very poor | 36 (28.1) | 40 (33.6) | | 36 (34) | 39 (27.7) | |
| | Total | 128 | 119 | | 106 | 141 | |
| **Competency in performing computer activities** | Word processing | 6 (4.7) | 6 (5.0) | 0.05 | 4 (3.8) | 8 (5.7) | NS |
| | Multimedia | 13 (10.1) | 6 (5.0) | | 8 (7.6) | 11 (7.8) | |
| | Internet | 96 (75) | 79 (66.4) | | 82 (77.3) | 93 (65.9) | |
| | Presentations | 5 (3.9) | 15 (12.6) | | 5 (4.7) | 15 (10.6) | |
| | Medline | 0 (0.0) | 3 (2.5) | | 0 (0.0) | 3 (2.1) | |
| | Data management | 4 (3.1) | 4 (3.5) | | 3 (2.8) | 5 (3.6) | |
| | Others | 4 (3.2) | 6 (5) | | 4 (3.8) | 6 (4.3) | |
| | Total | 128 | 119 | | 106 | 141 | |
| **Using internet is** | Very easy | 55 (43.0) | 51 (42.9) | 0.067 | 53 (50.0) | 53 (37.6) | 0.001 |
| | Fairly easy | 41 (32.0) | 30 (25.2) | | 20 (18.9) | 51 (36.2) | |
| | Average | 24 (18.8) | 25 (21) | | 29 (27.4) | 20 (14.2) | |
| | Not very easy | 7 (5.5) | 4 (3.4) | | 2 (1.9) | 9 (6.4) | |
| | Not at all easy | 1 (0.8) | 9 (7.6) | | 2 (1.9) | 8 (5.7) | |
| | Total | 128 | 119 | | 106 | 141 | |

NS=Not significant, N= Number

## DISCUSSION

The present study revealed that even though the accessibility of computers and printers was low probably due to limited financial resources of the dental institution, IT literacy of the study subjects was comparable to dental students from developed countries.

The nature and composition of the sample, which consisted of undergraduate dental students in one private dental school of India, may limit the potential for generalization of the study's findings.

Moreover, the computer services available in the present dental school are limited to four computers with internet in the central library and one printer with scanner, which is a paid service. It is however, the first attempt to assess usage of information and technology in a group of Indian dental undergraduate students. Furthermore, the reader is expected to be cautious while interpreting the results bearing in mind the limitations of cross-sectional studies. It should also be noted that dental education and financial resources vary across countries and therefore, only tentative comparisons should be made with other studies. The response rates were variable between genders and years of study and hence comparisons between years of study and gender should be treated with caution.

A previous study has stated that use of computer and internet technology by health science students will result in more effective medical education, including teaching, medical examination, and diagnosis of disease [19]. However, these gains will only occur when students have increased access to this technology. In the present study, it was observed that only 58.3% of the sample reported access to computers, of which only 3.6% used computers at college. This figure is lower than the 100% dental undergraduate students at college of

**Table 5.** Responses of a sample of undergraduate dental students (n=247) of India to questionnaire items on computer activities**.**

| Question | Response | N | % |
|---|---|---|---|
| **What features of computers do you use more in the pursuit of your studies?** | Word processing | 12 | 4.9 |
| | Multimedia | 19 | 7.7 |
| | Internet | 175 | 70.9 |
| | Presentations | 20 | 8.1 |
| | Medline | 3 | 1.2 |
| | Data management | 8 | 3.2 |
| | Other | 10 | 4.0 |
| **How would you rate your ability to use a word processor to produce a page of text?** | Unable/beginner | 73 | 29.5 |
| | Competent in some basic skills | 131 | 53 |
| | Competent in most basic skills | 43 | 17.5 |
| **How often do you utilize the computer for academic activities?** | Every day | 23 | 9.3 |
| | 2-3 days a week | 14 | 5.7 |
| | Once a week | 19 | 7.7 |
| | Once a month | 88 | 35.6 |
| | Never | 103 | 41.7 |
| **How often do you utilize the computer for personal use?** | Every day | 32 | 13.0 |
| | 2-3 days a week | 42 | 17.0 |
| | Once a week | 45 | 18.2 |
| | Once a month | 100 | 40.5 |
| | Never | 28 | 11.3 |

N= Number

Jordan [18] and Chile [20] followed by 95% undergraduate dental students in Oulu, Finland [21], 84% of undergraduate students in Glasgow, United Kingdom (UK), [22] and 94% of medical students from Jeddah, Saudi Arabia [19].

Similar studies have found that higher proportions of students had used computers than the present study: 80% final year medical students from Lagos, Nigeria [23], 71.7% of first year medical students of Denmark [24] and 61% medical students from Malaysia [25]. The only study that had similarly lower rates as the present study was from Nigeria where it was found that 43% of the clinical and nursing students had access to computers [26].

This reasonably lower proportion of those who could use the computer in this study indicates the limited financial resources among Indian dental colleges for providing computer services.

Nearly one-third (33.2%) of the present study subjects were not using a computer regularly. This is in accordance with Jordanian students [18] where 44% did not use a computer regularly but is in disagreement and higher than the 5% for Bristol, 20% for Manchester, and 22% for Newcastle students mentioned in a study from UK [27].

More than one third of the students in our study said they had been using a computer for more than three years. This proportion is greater than 20% for Manchester and 14% for Bristol students, though it is lower than the 57% reported for Newcastle students [27]. This is due to slow pace in the integration of information technology usage in dental education curriculum of India.

In our study, no significant gender differences existed in the length of time students said they had been using a computer regularly. This is in contradiction with previous studies [18,28,29] which observed a clear influence of gender on computer usage.

There was a statistically significant difference between the two genders (P=0.044) for competency in computer skills. Twenty four percent of men reported they were competent in most basic skills in comparison to 12% females. It seems that male students are much more eager to search for computer courses on their own initiative, favoring the freedom of time and space offered by electronic learning, while females may be more pragmatic and more focused on exams with a tendency to rely on education provided by their instructors in accordance to previous studies [16,24].

No major difference existed among men (56.7%) and women (51.9%) for responses against being competent in some basic skills. This observation is explained by the provision for teaching of basic computer skills in all primary and secondary schools.

Nearly half the subjects (48.1%) reported that the quality of IT training received at college is adequate, even though no special courses in computers are offered at the college; however, 57.9% of the subjects said they have familiarized with computers through their personal study and experience and only 4.9% through courses in the college. Hence, emphasis should be placed on the provision of IT training in dental undergraduate curriculum.

In comparison with preclinical year students, clinical year students used presentations and Medline for their studies more frequently; this may reflect the amount of work that requires literature search for projects, clinical seminars, and presentations during the clinical years of study. Moreover, compared to men, women reported using presentations and Medline more frequently. This suggests that females are more keen and sincere in completing their quota than are males.

More than half (53%) of the subjects said they were competent in some basic skills in producing a page of text and 17.5% were competent in most basic skills as preparation of presentations requires good word processing skills.

Eighty-eight percent of the students used com-

puters for personal use whereas only 58.3% used for academic activities, which is in strong contradiction with 91% of students using computers for academics at college of Jordan [18]. Hence, transformations need to be made to the undergraduate curriculum in India.

Almost 40% of students did not have access to a printer. Among those subjects who had access to printer, 21.5% found it accessible at home in contrast to 3.6% at college. Major proportions (59.5%) of the respondents were satisfied with accessibility of printer while 40.5% of the respondents said that availability of a printer was poor. Similar conditions were observed among nursing students in Nigeria [26]. Increased funding in this direction by management is likely to solve this problem.

## CONCLUSION

Although the ICT is an important source of medical information, dental undergraduate students at a private dental institution in India have not fully utilized these facilities and have reported levels of use that were less than students in other Universities which may be due to limited access to IT resources.

This finding also suggests that this dental school has not made substantial effort to capitalize on IT resources and capabilities to enrich the curriculum. Hence, increased funding for introduction of computer education into existing curriculum would enhance students' ability to acquire, appraise, and use information from the internet to solve health problems quickly and efficiently during training and practice.

Expansion of computer assisted learning, which requires cultural change, as well as careful strategic planning, resource sharing, staff incentives, active promotion of multidisciplinary efforts, and effective quality control should be implemented. Furthermore, research should be focused on designing and evaluating computer and IT training for students and staff.

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## REFERENCES

1-Myers MR. Telemedicine: an emerging health care technology. Health Care Manag (Frederick) 2003 Jul-Sep;22(3):219-23.

2-Edworthy SM. Telemedicine in developing countries. BMJ 2001 Sep 8;323(7312):524-5.

3-Feliciani F. Medical care from space: Telemedicine. ESA Bull 2003 May;114:54-9.

4-Coiera E. Medical informatics. BMJ 1995 May;310 (6991):1381-7.

5-Kastin S, Wexler J. Bioinformatics: searching the Net. Semin Nucl Med 1998 Apr;28(2):177-87

6-Nattestad A, Attström R. Information technology in oral health education. Eur J Dent Educ 1997 Aug;1(3):101-7.

7-Greenwood SR, Grigg PA, Vowles RV, Stephens CD. Clinical informatics and the dental curriculum. A review of the impact of informatics in dental care, its implications for dental education. Eur J Dent Educ 1997 Nov;1(4):153-61.

8-Grigg P, Stephens CD. Computer-assisted learning in dentistry. A view from the UK. J Dent 1998 Jul-Aug;26(5-6):387-95.

9-Nattestad A. The Internet in dental education. Eur J Dent Educ 1999;3 Suppl 1:57-60.

10-Schittek M, Mattheos N, Lyon HC, Attström R. Computer assisted learning. A review. Eur J Dent Educ 2001 Aug;5(3):93-100.

11-Nattestad A, Attstrom R, Mattheos N, Ramseier C, Canegallo L, Eaton K, et al. 4.1 Web-based interactive learning programmes. Eur J Dent Educ 2002;6 Suppl 3:127-37.

12-Mattheos N, Nattestad A, Attstrom R, Eaton K, Feeny L. Dissemination and the Net. In: Shanley D, editors. Dental education in Europe: towards convergence. Budapest: Dental Press Kft; 2001. pp. 132-9.

13-Magrabi F, Coiera EW, Westbrook JI, Gosling AS, Vickland V. General practitioners' use of

online evidence during consultations. Int J Med Inform 2005 Jan;74(1):1-12.
14-Westbrook JI, Gosling AS, Coiera E. Do clinicians use online evidence to support patient care? A study of 55,000 clinicians. J Am Med Inform Assoc 2004 Mar-Apr;11(2):113-20.
15-Virtanen JI, Nieminen P. Information and communication technology among undergraduate dental students in Finland. Eur J Dent Educ 2002 Nov;6(4):147-52.
16-Mattheos N, Nattestad A, Schittek M, Attström R. Computer literacy and attitudes among students in 16 European dental schools: current aspects, regional differences and future trends. Eur J Dent Educ 2002 Feb;6(1):30-5
17-Walmsley AD, White DA, Eynon R, Somerfield L. The use of the Internet within a dental school. Eur J Dent Educ 2003 Feb;7(1):27-33.
18-Rajab LD, Baqain ZH. Use of information and communication technology among dental students at the University of Jordan. J Dent Educ 2005; 69(3):387-98.
19-Mansoor I. Computer skills among medical learners: a survey at King Abdul Aziz University, Jeddah. J Ayub Med Coll Abbottabad. 2002 Jul-Sep;14(3):13-5.
20-Uribe S, Marino RJ. Internet and information technology use by dental students in Chile. Eur J Dent Educ 2006 Aug; 10(3):162-8.
21-Virtanen JI, Nieminen P. Information and communication technology among undergraduate dental students in Finland. Eur J Dent Educ 2002 Nov;6(4):147-52.
22-Jones RB, Navin LM, Barrie J, Hillan E, Kinane D. Computer literacy among medical, nursing, dental and veterinary undergraduates. Med Educ 1991 May;25(3):191-5.
23-Odusanya OO, Bamgbala OA. Computing and information technology skills of final year medical and dental students at the College of Medicine University of Lagos. Niger Postgrad Med J 2002 Dec;9(4):189-93.
24-Dørup J. Experience and attitudes towards information technology among first-year medical students in Denmark: longitudinal questionnaire survey. J Med Internet Res 2004 Mar 5;6(1):e10.
25-Nurjahan MI, Lim TA, Yeong SW, Foong AL, Ware J. Utilization of information technology in medical education: a questionnaire survey of students in a Malaysian institution. Med J Malaysia 2002 Dec;57 Suppl E:58-66.
26-Ajuwon GA. Computer and internet use by first year clinical and nursing students in a Nigerian teaching hospital. BMC Med Inform Decis Mak 2003 Sep 18;3:10.
27-Grigg P, Macfarlane TV, Shearer AC, Jepson NJ, Stephens CD. Computing facilities available to final-year students at 3 UK dental schools in 1997/8: their use, and students' attitudes to information technology. Eur J Dent Educ 2001 Aug; 5(3):101-8.
28-Plasschaert AJ, Wilson NH, Cailleteau JG, Verdonschot EH. Opinions and experiences of dental students and faculty concerning computer-assisted learning. J Dent Educ 1995 Nov;59(11): 1034-40.
29-Lang WP. Trends in students' knowledge, opinions, and experience regarding dental informatics and computer applications. J Am Med Inform Assoc 1995 Nov-Dec;2(6):374-82.