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Senior dental student's utilization and self-reported skills of information technology (IT)

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Background Given that one of the targets of Global oral health care goals in 2020 is to increase the proportion of the population covered by health care information systems, the future dentists should be more oriented about Information Technology (IT) to help the health systems in reaching this goal. The aim of this study was to evaluate the utilization of IT among senior dental students and to evaluate the association of self-reported skills with utilization of IT.
Methods The target population comprised senior dental students of all four dental schools of Tehran City in 2015. An anonymous self-administered questionnaire queried their utilization of IT in four areas: general use of computers, general use of internet, professional use of computers, and professional use of internet. In addition, the students self-reported IT skill was obtained in two areas: internet searching skills and computer using skills. Background questions were also asked.
Results Totally, 218 questionnaires out of 250 were returned for an overall response rate of 85%. The students' mean score for professional usage of computer was 15.3 (± 4.2) out of 30 and for professional usage of internet 10.8 (± 3.1) out of 20. The mean score for general usage of computers was 22.6 (± 5.4) out of 40 and for general usage of internet 46.1 (± 13.2) of 80. About computer skills, a mean of 18.6 (±4) out of 28 and internet searching skills a mean of 15.3 (±4) out of 24 was acquired. The linear regression model revealed that older student (regression coefficients = 0.325, $P = 0.001$) and those with higher computer using skills (regression coefficients = 0.223, $P = 0.031$) and internet searching skills (regression coefficients = 0.220, $P = 0.027$) obtained higher scores in general usage of IT. Also higher research experience gained was associated with higher scores in professional usage of IT (regression coefficients = −0.378, $P = 0.02$).
Conclusion IT utilization and skills were not desirable in present students. The fact that IT skills were associated with a higher IT utilization regardless of other background factors casts light on the importance of training to facilitate full utilization.
Keywords information technology, senior dental students, internet searching skill, computer using skill, IT utilization

Introduction

World has witnessed rapid progress and expansion of information technology (IT) in dentistry in the last few years.[1] Nowadays, internet and social networks have found their place among young doctors and this penetration of computers and internet has revolutionized the study and practice of dentistry.[2] Along with general usage of computer and internet for communication and entertainments, dental education and research, office management, digital imaging, electronic health records, video conferencing, remote communication with patients and other dentists and, continuous distance and patient education are some examples of professional IT usages.[1]

Several studies of IT usage reveal that about 60–95% of dental students use internet for personal and educational purposes and most of them own personal computers or laptops.[3–7] A study in Finland represented that all dental students use internet for both personal and educational purposes but senior students are more likely to use it.[3] Another study in Jordan showed that more than 91% of students use internet for educational purposes.[8] Nevertheless, the students' computer literacy and skills were insufficient as less than half the students had been exposed to some form of computer education in the university making full use of IT inaccessible.[9] It has been suggested that sufficient training and skill has an important role in student attachment to IT while other background factors have lesser impact on IT usage.[4] A previous study in Iran revealed the lesser dentists are familiar with IT, the more management and financial errors happen in office. This may lead to miscommunication between doctor and patient.[2]

Lack of time, unavailability and high costs may be also named as barriers of IT usage.[8,10] Because of such barriers, despite great spread of dental webpages, their usage and effectiveness in dental training is still unclear and as a result, some of dental students are not enthusiastic to them.[2] However, IT has undeniable role in training students and actually can be addressed as one of the main components in new methods which increases the training speed.[1]

The aim of this study is to evaluate the orientation and utilization of IT among senior dental students and to evaluate the association of self-reported skills with usage of IT.

Methods

The target population comprised senior dental students of all four dental schools of Tehran City in 2015 in a census way (n = 250). The questionnaire was constructed from previous literature[1,2,4,11] and some researchers made questions. It was assessed by five community oral health experts and one epidemiologist for content validity. After minor revisions, we distributed the questionnaire two times within a 2-week-interval among 20 dental students, out of the main target population, to check the reliability (minimum agreement 0.9). The survey was voluntary with no identifiable information

collected. The ethics committee of Tehran University of Medical Sciences (TUMS) approved the survey. No honorarium was offered to the participants.

The self-reported questionnaire collected data on the utilization of IT in four areas as follows: General usage of computers (8 questions), general usage of internet (16 questions), professional usage of computers (6 questions), and professional usage of internet (4 questions). It also included 13 questions on IT self-reported skills in two areas: Internet searching skills (6 questions) and computer using skills (7 questions).

Background questions were also asked about age, sex, marital status, living place (dormitory or not), name of university, grade point average, self-estimated family economic status, paternal and maternal educational level, research experience, owning personal computers, emails and website.

The questions in utilization section, had five-point Likert scale for response alternatives from daily use to never used. The self-reported skill section questions had four-point scale as I don't know how to use it, I have some primary experiences, I know how to use it but I want to learn more, my skills are sufficient. The answers were scored and totals calculated in each section.

For further analysis, we summed general usage of computer and internet scores to reach a total general IT usage. Also professional usage of computer and internet scores were summed to reach a total professional IT usage.

All numerical data were entered and analyzed using the Statistical Package for Social Sciences (SPSS version 18). Initial descriptive statistics were expressed as frequency, mean and standard deviation.

Analyses were performed using Pearson correlation test and linear regression.

Results

Background information

Totally, 218 questionnaires out of 250 were returned for an overall response rate of 85%. Most participants were between 24 and 26-year-old (59%), 144 were females (67%) and 40% has got A⁻ as last grade point average. Among the participants, 29 (14%) had middle economic status and 37 (17%) were in high level while others were categorized in the very high level of self-reported economic status (69%).

Less than 1% (n = 1) of fathers were illiterate, 3% of them had primary education, 96% had academic degrees while 3% of mothers were illiterate (n = 3), 5% had elementary education and 92% had academic degrees.

Among all, 31 (15%) lived in university dormitories and 165 (77%) were single. From all 218 respondents 209 (97%) had personal laptops, 214 (99%) had personal emails and 71 (33%) had research experiences other than their thesis.

Utilization of IT among students

Professional usage of computers

The students' score for professional usage of computers was between 26.6 and 100 with a mean of 51 (±14) out of 100 (Table 1). Among all, 96% used computers for writing and file saving, 67% benefited from digital graphic editing, 23% for designing webpages and 93% for creating multimedia through computers. Moreover, 69% of the students used computer for creating and editing scientific audio and video files.

Professional usage of internet

The students' score for professional usage of internet ranged between 20 and 95 with a mean of 54 (±15.5) out of 100 (Table 2). Among all, 91% of students used internet to access faculty portal, 91% to search among references, 91% downloaded educational videos and 74% downloaded educational books and articles.

General usage of computers

The students' score for general usage of computers ranged between 25 and 100 with a mean of 56.5 (±13.5) out of 100 (Table 3). Among all, 97% used computers for writing and file saving while 78% benefited from digital graph editing. Also,

Table 1. **Professional usage of computer (with no internet connection) for academic education and research among senior dental students of Tehran (%)**

	Daily	Weakly	Monthly	Less than once in a month	Never
For saving data	29 (14%)	72 (34%)	47 (22%)	53 (26%)	9 (4%)
Digital graphic editing (e.g. Photoshop)	4 (2%)	20 (10%)	66 (31%)	87 (41%)	33 (16%)
Designing websites	3 (2%)	7 (3%)	4 (2%)	33 (16%)	157 (77%)
Creating multimedia (e.g. PowerPoint)	9 (4%)	32 (15%)	107 (51%)	57 (27%)	6 (3%)
Creating and editing audio and video files	4 (2%)	17 (8%)	39 (19%)	80 (39%)	64 (31%)

Table 2. **Professional usage of internet for academic education and research among senior dental students of Tehran (%)**

	Daily	Weakly	Monthly	Less than once in a month	Never
Access to faculty portal	11 (5%)	46 (22%)	60 (28%)	78 (36%)	18 (9%)
Search among references	24 (11%)	39 (19%)	61 (29%)	68 (32%)	18 (9%)
Download educational videos	12 (5%)	17 (7%)	49 (22%)	83 (40%)	53 (26%)
Download educational books and articles	12 (6%)	43 (20%)	71 (34%)	77 (36%)	9 (4%)

28% of students designed webpages and 86% created multimedia through computers. Moreover, 71% of them created and edited entertainment audio and video files, 96% used computers for saving general files and 91% for playing films and music and finally 73% for games.

General usage of internet

The students' score for general usage of internet was between 25 and 100 with a mean of 57.6 (±16.5) of a max of 100 (Table 4). Among all respondents, 95% students used internet for accessing general information, 65% for online game, 94% for online music and films, 51% for online shopping, 84% for payments, 97% for emailing, 88% for chatting, 23% for designing and managing websites and weblogs, 56% for using online softwares, 69% for downloading and sharing files and music, 84% for sharing photos, 81% for international phone calls, 57% for video chatting, 70% for reading RSS Feeds, 81% for following weblogs and commenting on their posts and finally 91% for using social networks.

Self-reported IT skills among students

Computer using skills among students

The students' score for computer using skills ranging between 25 and 100 with a mean of 66.4 (±14.2) out of a max of 100 (Table 5). Among all, 93% of students had the ability to use windows for their tasks, 95% could do advanced web search, 89% could use painting software, 97% knew how to use Microsoft Office Word, 97% could use Microsoft Office PowerPoint, 75% had the ability to use Microsoft Office Excel and 43% were able to use SPSS.

Internet searching skills among students

The students' score for internet searching skills ranging between 25 and 100 with a mean of 63.7 (±16.6) out of 100 (Table 6). Among all students, 92% could search in Medline, 57% of students could use Cochrane and 90% were able to read full text articles, 83% were able to use educational e-books, 78% could access resources of e-learning, 82% could do advanced search in search engines such as Google.

Table 3. **General usage of computer (with no internet connection) among senior dental students of Tehran (%)**

	Daily	Weakly	Monthly	Less than once in a month	Never
For saving data	53 (25%)	69 (32%)	43 (20%)	41 (20%)	7 (3%)
Digital graphic editing (e.g. Photoshop)	8 (4%)	27 (13%)	43 (21%)	84 (40%)	46 (22%)
Designing websites	5 (3%)	10 (5%)	9 (5%)	33 (16%)	144 (72%)
Creating multimedia (e.g. PowerPoint)	9 (4%)	32 (16%)	80 (39%)	56 (27%)	29 (14%)
Creating and editing audio and video files	18 (9%)	32 (15%)	31 (15%)	66 (32%)	61 (29%)
Using offline saved files	48 (23%)	63 (30%)	46 (22%)	46 (22%)	8 (4%)
Listening to music and watching films	111 (52%)	53 (25%)	28 (13%)	18 (9%)	2 (9%)
Games	30 (15%)	39 (19%)	41 (20%)	39 (19%)	54 (27%)

Table 4. **General usage of internet connection among senior dental students of Tehran (%)**

	Daily	Weakly	Monthly	Less than once in a month	Never
Accessing general information	108 (51%)	67 (31%)	19 (9%)	19 (9%)	1 (5%)
Online games	24 (11%)	30 (14%)	34 (16%)	50 (24%)	73 (35%)
Listening to music or watching films	82 (39%)	48 (23%)	27 (13%)	42 (20%)	12 (6%)
Online shopping	12 (6%)	23 (11%)	33 (16%)	40 (19%)	102 (49%)
Online payments	19 (9%)	39 (18%)	75 (35%)	46 (22%)	35 (16%)
Using email	66 (31%)	65 (31%)	36 (17%)	37 (18%)	7 (3%)
Chatting	88 (42%)	38 (18%)	33 (16%)	28 (13%)	25 (12%)
Managing a website or weblog	8 (4%)	12 (6%)	10 (5%)	26 (13%)	152 (73%)
Using online softwares	21 (10%)	26 (13%)	22 (11%)	46 (23%)	89 (44%)
Downloading, sharing and uploading files	33 (16%)	43 (21%)	30 (15%)	37 (18%)	63 (31%)
Sharing photos	37 (18%)	53 (25%)	40 (19%)	46 (22%)	34 (16%)
Making international phone calls	59 (28%)	41 (20%)	30 (14%)	41 (20%)	39 (19%)
Video chatting	14 (7%)	28 (13%)	24 (11%)	54 (26%)	91 (43%)
Reading RSS Feeds	40 (20%)	34 (17%)	23 (11%)	47 (23%)	61 (30%)
following weblogs and commenting	33 (16%)	31 (15%)	40 (19%)	63 (30%)	40 (19%)
Using social networks	80 (38%)	45 (21%)	37 (17%)	33 (16%)	18 (9%)

Table 5. **Computer literacy among senior dental students, Tehran, Iran (%)**

Computer using skill	I cannot use it.	I have elementary experiences.	I can use it but I want to learn more.	I can use it perfectly.
Basic use of Windows	15 (7)	25 (12)	99 (46)	77 (36)
Advanced web search	10 (5)	48 (22)	97 (45)	60 (28)
Advanced use of printer	24 (11)	68 (32)	87 (41)	36 (17)
Microsoft Word	3 (1)	50 (23)	101 (47)	61 (28)
Microsoft PowerPoint	6 (3)	34 (16)	93 (44)	80 (38)
Microsoft Excel	54 (25)	92 (43)	55 (26)	14 (7)
Statistical softwares like SPSS	122 (57)	59 (27)	31 (14)	4 (2)

Table 6. **Internet literacy among senior dental students, Tehran, Iran (%)**

Internet searching skill	I cannot use it.	I have elementary experiences.	I can use it but I want to learn more.	I can use it perfectly.
Searching Medline (PubMed)	16 (8)	48 (23)	71 (34)	74 (35)
Using Cochrane library	92 (43)	65 (31)	44 (21)	12 (6)
Using full text articles	20 (10)	74 (36)	82 (40)	31 (15)
Using dental E-books	36 (17)	73 (35)	72 (34)	30 (14)
Using digital references	46 (22)	77 (36)	59 (28)	31 (15)
Advanced use of search engines such as Google	17 (8)	37 (17)	70 (33)	90 (42)

Utilization in relation to background and self-reported skills

The linear regression model was controlled for owning personal computer, other background information, computer using skills and internet searching skills (Table 7) revealed that older student (regression coefficient = 0.325, $P = 0.001$) and those with higher computer using skills (regression coefficient = 0.223, $P = 0.031$) and internet searching skills (regression coefficient = 0.220, $P = 0.027$) obtained higher scores in general usage of IT. Another regression model revealed students with higher research experience gained higher scores in professional usage of IT (regression coefficient = −0.378, $P = 0.02$).

Discussion

Our study showed insufficient utilization and self-reported IT skills related to IT usage among senior dental students in Tehran based on their mean scores acquired from the total maximum possible. Despite the introduction of IT course as two credits in the second year of dentistry curriculum in Iran,[12] the present students could almost get about the half of what should be achieved in professional and general IT fields, the students' skill in IT was also just a little better (65%) of the maximum possible.

The fact that more skillful students had higher IT usage may be a key finding to focus in improving the current situation.

One of the targets of global oral health care goals in 2020, was mentioned to increase the proportion of the population covered by health care information systems in different countries, and this means that the future dentists should be more oriented about IT.

Our study declared no differences among male and female students in using computers and internet and their attachment to IT while Mariño et al.[1] study from Australia showed that male students generally use internet more than female students. On the other hand, Mohebbi et al.[2] stated that in their study, Iranian male dentists demonstrated higher professional usage of internet in 2014. Two other studies in Jordan and Turkey reported higher frequency and skill in using internet and computers among male students in 2005.[8,13] Rahman[6] also stated that in Saudi Arabia men had more access to internet and computers than women in 2011. One of the reasons of difference in our results with the others might be that almost all mentioned studies are older than ours. It seems that this gender difference of technology and IT access may be on the way of fading.

In a previous study conducted in 2012 among dentists,[2] about half of the dentists reported to use computer and internet for general or professional usage. They had stated that 12.5% of dentists did not have any personal e-mail while it was just 1% in our study. It can all be justified according to time and generation gaps.

In comparison of the trend of IT usage from the previous study on dentists and the present dental students, we understand that in using social networks, there has been a difference of about two-fold between dental students and dentists in Iran; while 21.5% of dentists used internet for social networks daily, 38% of students did so which can also be a pathway for the increase of rape in IT, used among everyone including our respondents.

In our study, 97% owned personal computer and 99% had personal e-mail. In mentioned Jordanian study 74% of students owned personal computer and 90% had personal

Table 7. **The association between general and professional usage of computer and internet and background factor and computer and searching skills; linear regression**

	General usage of IT				Professional usage of IT			
	P-value	Regression coefficient	95% of CI of β		*P*-value	Regression coefficient	95% of CI of β	
Independent variables								
Owning personal computer	0.165	−0.119	−25.57	4.40	0.751	0.056	−7.01	9.64
Owning website or weblog	0.238	−0.96	−12.07	3.02	0.647	−0.069	−5.20	3.27
Age	0.001	0.325	1.054	4.10	0.350	0.174	−1.00	2.75
Gender	0.295	−0.099	−10.57	3.23	0.675	0.079	−3.81	5.82
Marital status	0.472	0.064	−4.52	9.71	0.577	0.088	−3.49	6.18
Last score	0.636	0.044	−2.35	3.84	0.102	0.279	−0.36	3.77
socioeconomic status (SES)*	0.346	0.085	−6.95	2.45	0.423	−0.155	−4.27	1.83
Paternal educational*	0.596	−0.69	−6.14	3.54	0.138	0.417	−0.79	5.44
Maternal education*	0.277	0.147	−2.11	7.30	0.074	−0.455	−5.78	0.28
Living in dormitory	0.583	0.055	−6.23	11.03	0.843	0.037	−4.831	5.88
Research experience	0.083	−0.148	−11.99	0.75	0.020	−0.378	−9.00	−0.82
Computer using skills	0.31	0.223	−2.03	−0.098	0.746	0.069	−0.51	0.71
Internet searching skills	0.027	0.230	0.12	1.91	0.973	−0.007	−0.61	0.59

*These variables are used in continuous forms.

e-mail which is a high rate but less than our study.[8] Rahman et al.[6] from Saudi Arabia mentioned that 92% of their students had personal laptops. Uribe et al.[7] from Chile stated that 92.2% of students had personal e-mails which was the nearest to ours.[7] A total of 26% for owning personal computer was mentioned in Bello et al.[5] study from Nigeria. Virtanen stated that in 2002, 60% of dental students had personal e-mail in Finland which is not a high rate. About 18% used Medline and full text articles [3].

In Romanov's[4] study in Finland, 24% of searched Medline twice a month, 10% seeked full text articles twice a month and 12% never search Medline while 40% never used full text articles. It seems that insufficient professional use of computer and searching skills are even found among developed countries such as Finland and training are not enough for meeting their needs because 1/3 of them also proclaimed for more training needs. In this Finnish study, general usage of computers reported higher than professional which was similar to ours.[4]

Odusanya[14] stated that 19% of Nigerian students used computer for games, 18% for translation and 58% of them had personal e-mail which is a low proportion, while in our study 63% of students used computers for games, which is much more than Odusanya study and almost everyone had personal e-mail which was also significantly more than Odusanya study.

In professional usage of computers like making PowerPoint slides in Rahman's[6] study in Saudi Arabia, the rate was 61% while ours was 97% which is a high one.

Skill and literacy

Among dental students in Saudi Arabia, 35% had proper skills in using PubMed and 42% had proper skills in using search engines like Google.

In Bello et al.[5] study (Nigeria), 54% were trained to use computers, 18.9% had appropriate computer literacy and skill, 58.8% had moderate and 22.3% had mild computer skills.

In our study, IT skills was assessed in two field: Computer using skills and internet searching skills among students. Both skills were insufficient and students could gain about half of the maximum possible which maybe comparable with those of the Nigerian students.

Therefore, emphasis should be placed on training IT skills and increasing related literacy by interactive continuous workshops and by IT-enabled teaching and learning.

Strengths and limitations of the study

The study included all dental students living in Tehran, and the high response rate speaks for the representativeness of the present study and increases its value. Our cross-sectional design permits investigation of potential associations between one's IT utilization and level of skill; causality clearance, however, would require a longitudinal design. Surveys with a self-administered questionnaire may also have some typical shortcomings, such over- and under-reporting due to social acceptance, a phenomenon that the anonymous character of this study may have minimized. The other limitation of our study was poor accessibility to senior dental students due to their educational schedules and sometimes they do not have enough time to answer all questions. This limitation was dealt with by explanations about the importance of their participation in planning for future intervention.

Conclusion

Information technology utilization and skills were comparable to developing countries and in some aspects with developed ones but was skill insufficient.

Especially in searching skills which might play a key role for learning and research purposes, most of students expressed a need to achieve more skills.

The fact that IT skills were associated to a higher IT utilization regardless of other background factors casts light on the

importance of training as the main factor to provide full utilization.

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Competing Interest

The authors declare that they have no competing interests.

Authors' Contributions

The authors SR, RY, MM, MB have contributed equally to this work in making substantial contributions to conception and design, acquisition of data, and analysis and interpretation of data and being involved in drafting the manuscript or revising it critically for important intellectual content. All authors read and approved the final manuscript.

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