ORIGINAL ARTICLE

USE OF INFORMATION & COMMUNICATION TECHNOLOGY BY MEDICAL AND DENTAL STUDENTS: A STUDY

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ABSTRACT

The aim of this study was to investigate the impact of information and communication technology (ICT) usage and ICT literacy on the academic performance of the students along with determining the extent and nature of use of social media by medical and dental students of Fatima Memorial Medical and Dental College

A cross-sectional survey was carried out to investigate the capability and attitude of medical and dental students towards computers, using a questionnaire.

The students who spent more time using ICT for study purposes were spending lesser time using ICT for entertainment purposes. Females of both MBBS and BDS programs rated their ICT literacy lesser than males. High achievers rated themselves as having least ICT literacy skills. The participants identified several barriers in use of internet for education. Lack of time and lack of browsing skills were most cited barriers. Students found ICT usage helpful in the understanding of complex concepts and inter class communication.

ICT usage for study purpose had a positive impact on academic outcomes

Key Words: *ICT (Information and Communication technology), ICT skills, medical education, social media, academic performance*

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INTRODUCTION

Advancements in modern technologies and the advent of smart devices and Internet have brought about a digital transformation in global healthcare.[1] One of the revolutionary advances in the Internet-based platforms with multidimensional objectives is progress and expansion of social media. The use of social media platforms is multipurpose; sharing of knowledge, entertainment, and education. For educational purpose, students use social media for compilation of presentations, organizing events and academics, developing collaborative group work, tutorials, gauging knowledge, faculty support, and for updating regional and global information.[2] Convenient accessibility to knowledge using ICT facilitates learners and teachers in the delivery of education. This change of approach by which knowledge is instilled in students anytime and from anywhere prepares them to become lifelong learners.[3]

The biggest limitation of present-day is time. Medical knowledge is developing at a fast pace and this pace requires a logical and systematized method to obtain, manage and understand information. This requirement is further emphasized when we take into consideration the diverse academic outcomes amongst individuals. In the medical profession the acquisition of knowledge outside the classroom is extensive. This may include audiovisual aids, microscopic and macro-

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scopic specimens, structural models and mannequins, and procedural training. Computer assisted learning (CAL) provides systematic approach to learning which the student can adjust according to his/her pace. [4]

Both developed and developing countries face difficulties in integrating ICT in education. Pakistan as a developing country faces various challenges in major sectors including education and is lagging behind in the pursuit of growth and development. No policy has been incorporated for the integration of technology in the education sector by the government. Novel methods of imparting education are being adopted by most of the world but regrettably the situation in Pakistan is not very good.[5]

There are limited studies on the access and impact of the use of ICT on the academic outcomes despite the fact that the use of smart devices are on the rise in medical and dental students. The present study aims to investigate the perspective of medical and dental students on the impact of ICT and social media on their learning/academic performance. This study will provide an insight for the future incorporation of ICT and social media for better teaching, training, medical and dental care and research to the best of its potential. The objectives of this study were to investigate the impact of ICT usage and ICT literacy on the academic performance of the students and to determine the extent and nature of use of social media by medical and dental students.

MATERIALS AND METHODS

This cross-sectional survey was conducted on the students of Fatima Memorial Dental and Medical College Lahore. Information was derived from a self-made questionnaire which was developed with queries on different aspects of ICT Usage.

The reliability of this survey was established through a test–retest process on a sample of 40 medical and dental students from various years who did not participate in the actual study. The scores were correlated with one another and yielded a Cronbach's alpha reliability coefficient of 0.8, which is within the range of a reliable test according to Gliem and Gliem, 2003.[6]

The students were initially appraised on the aims of the study and then a link to the on-line survey form was shared on their WhatsApp groups. The instrument was organized into four sections: The first section was on demographics and the information requested in this section was age, gender, location, course (MBBS or BDS), year of study and a query about their last annual exam performance. The second section had queries related to the device owned by them and the time spent on various modalities of information technology, ranging from social media to entertainment and their usage for academic purposes. Questions were also asked about the number of hours of ICT usage daily. ICT usage for entertainment purpose was also asked for the average number of hours daily used on social media networks. The third section had queries about their perceived level of skilfulness and proficiency in performing various web-based and non-web-based academic tasks. Their responses were rated on a 5 point rating scale as 1 being the lowest and 5 being highest. In this section students were also asked if they had any barriers in using internet for their education. Participants were also asked about their most frequent mode of access to the internet during college hours (College Wifi, Personal Wifi or Hotspot device, Mobile Data, College Computer Lab)

The fourth section was on the students' perceptions regarding the impact of ICT on their learning and academic out comes. Also they were asked to rate on a 5 points scale that how communication using IT, Facebook, WhatsApp helped them in their studies and how IT has helped them better understand the complex concepts and help them get better grades.

The data for 272 Medical and Dental students of Fatima Memorial Hospital College of Medicine and Dentistry, Lahore was obtained, however after removing four ambiguous responses it was reduced to 268. The study cohort was also segregated on the basis of bachelor programme (MBBS vs BDS), gender and year of education (year 1-4 BDS; year 1-5 MBBS) to access difference in their use of ICT. The students were classified into high achievers, poor performers and average students on the basis of their previous exam result as reported by them. The ICT usage of these groups was compared.

Four composite score variables were created, ICT usage for Study score ranges from 5 to 12 was obtained by adding the responses of average daily number of hours for study, average daily hourly usage of electronic devices for Medline/Pubmed/PakMedinet, textbooks, online dental/medical courses and other resources. ICT usage for entertainment scores ranges from 1 to 9 was obtained by adding the responses of hours daily spend on social media networks and on entertainment like Movies, Music, videos, online games etc. Overall ICT Usage score ranges from 6 to 17 was created by adding the scores of overall ICT usage for Study and entertainment purposes, lastly ICT literacy score ranges from 5 to 25 was created by adding the response (1 – 5) from various variables to know the ICT usage skills of the participants.

The data were analyzed using PASW SPSS version 18. The descriptive statistical analysis was performed by reporting numbers and percentages for qualitative

variables and Median with Inter Quartile Range for quantitative variables and scores created using the information of various variables reporting the ICT usage time for study, entertainment and skills scores. Mann – Whitney test and Kruskal Wallis test was performed to make comparisons of various scores across various categories of variables. Spearman's correlation coefficient was obtained to observe the relationship between the variables. All the tests were performed after checking all the assumptions at 5% significance levels.

RESULTS

The total number of participants was 268, out of which 108(40.3%) were MBBS and 160(59.7%) were BDS students. Number of female participants was higher than male with 69(63.9%) in MBBS and 127(79.4%) in the BDS program. The demographic details like age, year, residence, academic achievement and number of devices are given in Table 1.

The students who spent more time using ICT for study purposes were spending lesser time using ICT for entertainment purposes having correlation coefficient -0.094 (p-value = 0.123) as in (Table 2). High performing and low performing MBBS versus BDS students spent significantly more time on using ICT for entertainment with (p-value = 0.005) and (p-value = 0.048) respectively (Table 3).

Females of both MBBS and BDS programs rated

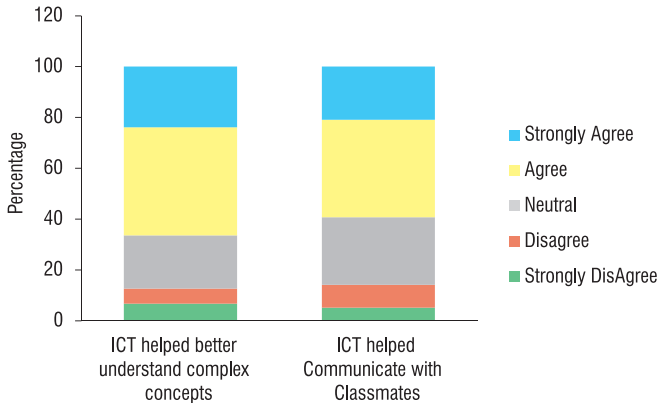

Fig 1: Students' experience with ICT usage for study

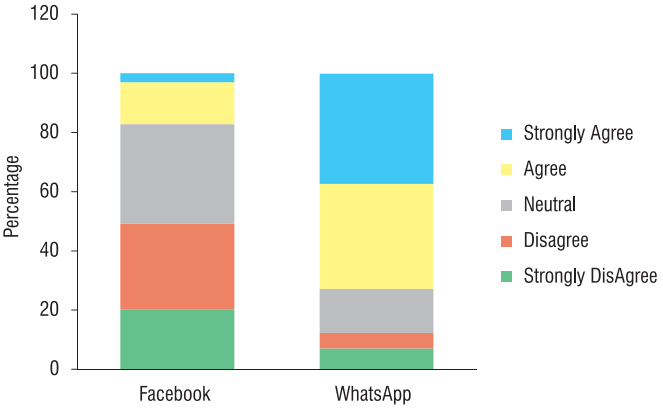

Fig 2: Primary mode of communication among students

TABLE 1: DISTRIBUTION OF THE SOCIO DEMOGRAPHIC FACTORS

	MBBS 108 (40.3%)	BDS160 (59.7%)
Gender		
Male	39 (36.1%)	33 (20.6%)
Female	69 (63.9%)	127 (79.4%)
Age Median (IQR)	21.76 (1.23)	21.19 (1.18)
Year		
Second	17 (15.7%)	63 (39.4%)
Third	32 (29.6%)	38 (23.8%)
Fourth	35 (32.4%)	59 (36.9%)
Fifth	24 (22.2%)	NA
Residence		
Boarder	58 (53.7%)	114 (71.3%)
Day Scholar	50 (46.3%)	46 (28.8%)
Number of devices used		
One	32 (29.6%)	44 (27.5%)
Two	59 (54.6%)	94 (58.8%)
Three	14 (13.0%)	16 (10.0%)
Four	3 (2.8%)	6 (3.8%)

TABLE 2: SPEARMAN'S CORRELATIONS AMONG THE VARIOUS COMPOSITE SCORES*

	Study scores	Entertainment Scores	Overall ICT usage scores	ICT Literacy scores
Study scores		- 0.094 (0.123)	0.610 (0.00)	-0.010 (0.864)
Entertainment scores	-0.094 (0.123)		0.688 (0.00)	0.025 (0.678)
Overall ICT usage scores	0.610 (0.00)	0.688 (0.00)		0.016 (0.790)
ICT Literacy scores	-0.010 (0.864)	0.025 (0.678)	0.016 (0.790)	

* Spearman's Correlation coefficient (P-value)

TABLE 3: ICT USAGE SCORES FOR ENTERTAINMENT PURPOSES AMONG MBBS AND BDS STUDENTS

Category of Students	Average ICT Usage Scores for Entertainment Median (IQR)		P – Value *
	MBBS 108 (40.3%)	BDS 160 (59.7%)	
Gender	**Median (IQR)**	**Median (IQR)**	
Male Students	3.00 (2.00)	3.00 (3.00)	0.491
Female Students	4.00 (2.00)	3.00 (2.00)	0.056
Year wise distribution			
Second	3.50 (3.00)	3.00 (2.00)	0.549
Third	4.00 (2.00)	4.00 (2.00)	0.952
Fourth	3.00 (3.00)	3.00 (2.00)	0.406
Fifth	4.00 (2.00)	NA	NA
Residence			
Boarder	4.00 (2.00)	3.00 (2.00)	0.143
Day Scholar	4.00 (2.00)	3.50 (3.00)	0.167
Stratification on the basis of academic performance			
Low	5.00 (NA)	2.50 (2.00)	0.048
Average	5.00 (2.00)	4.00 (1.00)	0.464
Above Average	3.00 (2.00)	3.00 (3.00)	0.971
High	4.00 (2.00)	2.00 (2.00)	0.005

* Mann – Whitney U test to observe the difference in averages between MBBS and BDS students

(IQR) Inter Quartile Range

their ICT literacy lesser than males (p-value = 0.029); both high performing categories in BDS rated lesser ICT literacy as compared with low performing students (p-value = 0.003). High achievers rated themselves as having least ICT literacy as compared with other students, with low performing students rated having better ICT literacy (p-value = 0.009) (Table 4). Scoring for overall ICT usage was statistically significant in high achieving students (p-value 0.044) (Table 5). Students rated their ICT skills in using Internet for browsing information, 55.2% rated themselves as efficient in using internet for browsing information, whereas, 49.2% for Microsoft office skills, 60.1% for Graphics software like Photoshop and flash, 52.2% for having understanding of legal issues related to the use of technology and 70.8% rated themselves as having no sufficient skills overall.

The participants identified several barriers in use of internet for education. Lack of time and lack of browsing skills were most cited barriers (Table 6). About 268 (61%) students preferred moderate to extensive ICT usage in the classroom teaching (Table 7). In the class majority of the students 228 (85.1%) students accessed the internet by using mobile data or their own personal Wi-Fi devices, whereas 28 (10.4%) used college Wi-Fi and a very small percentage 12(4.5%) used the college computer lab to access the internet.

TABLE 4: COMPARISON OF ICT LITERACY SCORES ACROSS VARIOUS CATEGORIES OF INDICATORS

Category of Students		MBBS 108 (40.3%)	P-Value	BDS 160 (59.7%)	P-Value	Combined Data 268 (100.0%)	P-Value
Gender	**n (%)**	**Median (IQR)**		**Median (IQR)**		**Median (IQR)**	
Male	72 (16.9%)	13.00 (5.00)	0.014*	14.00 (7.00)	0.606*	14.00 (6.00)	0.029*
Female	196 (73.1%)	13.00 (7.00)		12.00 (7.00)		12.00 (7.00)	
Year							
Second	80 (29.9%)	13.50 (9.00)	0.527**	12.00 (9.00)	0.327**	13.00 (8.00)	0.890**
Third	70 (26.1%)	12.00 (6.00)		14.00 (8.00)		13.00 (6.00)	
Fourth	94 (35.1%)	14.00 (8.00)		12.00 (5.00)		12.50 (6.00)	
Fifth	24 (9.0%)	13.00 (7.00)		NA		13.00 (7.00)	
Residence							
Boarder	96 (35.8%)	12.00 (9.00)	0.039*	11.50 (8.00)	0.476*	12.00 (8.00)	0.064*
Day Scholar	172 (64.2%)	14.00 (6.00)		13.00 (7.00)		13.00 (6.00)	
Academic Achievement							
Low	11 (4.2%)	17.00 (NA)	0.199**	17.00 (9.00)	0.003**	17.00 (7.00)	0.009**
Average	32 (12.2%)	12.50 (3.00)		17.00 (8.00)		14.00 (7.00)	
Above Average	181 (69.1%)	13.00 (8.00)		12.00 (7.00)		12.00 (7.00)	
High	38 (14.5%)	11.00 (7.00)		12.00 (6.00)		12.00 (7.00)	

* Mann – Whitney U test to observe the difference in averages (Median) across various categories of the categories of the students

** Kruskal Wallis test was performed to observe the difference in average (Median) across various categories of the categories of the students.

TABLE 5: DISTRIBUTION OF THE OVERALL ICT USAGE SCORES AMONG STUDENTS OF MBBS AND BDS

Category of Students	Average Overall ICT Usage Scores Median (IQR)		P - Value*
	MBBS 108 (40.3%)	B.D.S. 160 (59.7%)	
Gender	**Median (IQR)**	**Median (IQR)**	
Male	10.00 (3.00)	10.00 (2.00)	0.945
Female	11.00 (3.00)	10.00 (3.00)	0.058
Year			
Second	10.00 (3.00)	10.00 (3.00)	0.381
Third	11.00 (4.00)	10.00 (2.00)	0.095
Fourth	10.00 (3.00)	9.00 (2.00)	0.165
Fifth	11.00 (3.00)	NA	NA
Residence			
Boarder	11.00 (3.00)	10.00 (3.00)	0.288
Day Scholar	10.00 (3.00)	10.00 (2.00)	0.354
Academic Achievement			
Low	11.00 (NA)	10.00 (6.00)	0.921
Average	12.00 (3.00)	10.50 (3.00)	0.357
Above Average	10.00 (3.00)	10.00 (2.00)	0.639
High	11.00 (4.00)	9.00 (2.00)	0.044

* Mann – Whitney U test to observe the difference in averages between MBBS and BDS students

TABLE 6: DISTRIBUTION OF THE PERCEIVED BARRIERS FOR THE STUDENTS FOR ACADEMIC PURPOSES

	MBBS 108 (40.3%)	B.D.S. 160 (59.7%)	Total 268 (100%)
Barriers			
Yes	38 (35.2%)	29 (18.1%)	67 (25.0%)
No	47 (43.5%)	92 (57.5%)	139 (51.9%)
Maybe	23 (21.3%)	39 (24.4%)	62 (23.1%)
Cause			
Lack of Access	14 (22.2%)	20 (20.8%)	34 (21.4%)
Cost	7 (11.1%)	4 (4.2%)	11 (6.9%)
Lack of Time	18 (28.6%)	38 (39.6%)	56 (35.2%)
Lack of browsing Skills	24 (38.1%)	34 (35.4%)	58 (36.5%)

* Reported results are n (%)

TABLE 7: PERCEPTION OF THE STUDENTS WITH RESPECT TO ICT USAGE IN CLASSROOM TEACHING

	MBBS 108 (40.3%)	B.D.S. 160 (59.7%)
ICT Usage Preference		
No	17 (15.7%)	19 (11.9%)
Limited	31 (28.7%)	36 (22.5%)
Moderate	36 (33.3%)	51 (31.9%)
Extensive	24 (22.2%)	54 (33.8%)

* Reported results are n (%)

The results showed that 192 (71.6%) of the respondents spent 1-3 hours on social media and 76 (28.4%) spent 4-8 hours on social media (Table 8). Students found ICT usage helpful in understanding complex concepts (66.4%) (Figure 1). Fifty nine percent students used ICT to communicate with classmates. Majority of students (72.7%) used WhatsApp for communication with regards educational purposes as compared to Facebook (Figure 2). Details of hourly ICT usage for various purposes by the participants is given in Table 8.

DISCUSSION

In present study the effect of ICT usage and literacy has been evaluated in relation to the academic outcomes of the students by using a questionnaire. According to the results, the correlation coefficient of these two variables (i.e. ICT literacy and usage) was directly related to their academic achievements.

The number of female participants was high since the female student ratio is high in both BDS and MBBS and this phenomenon is present in most medical and dental colleges in South East Asia.[7]

According to present study high performers had higher average ICT usage score for study purposes where as they had low ICT usage scores for entertainment purposes. This finding is similar to many other studies whereby students who used ICT for academic purposes had better academic results.[8,9] As the average ICT time usage is the same for all students, it will be logical to conclude that those spending more time on entertainment will be spending less time for study purpose and vice versa.

In present study 49.2% of the students claimed to be efficient in Microsoft office skills however 70.8% claimed to have insufficient skills as a whole. This finding is in contrast to another study in which there was a drop in the percentage of those who rated themselves as beginners in word processing (19.4 percent) and an increase in the percentage of students who rated themselves as competent (80.6 percent).[10] In another study students rated their Microsoft Word skills to be very good (31.7%) and good (24.2%).[11] Also females self-perceived proficiency in ICT was less than males which has also been reported in other studies.[12]

In present study high performers rated themselves as less proficient in ICT skills possibly due to higher expectations from themselves a factor seen in competitive students.[13] Low performers over estimate themselves leading to poor academic performance.

TABLE 8: DISTRIBUTION OF THE HOURLY ICT USAGE BY THE MEDICAL AND DENTAL STUDENTS

	MBBS 108 (40.3)	B.D.S. 160 (59.7)	Total 268 (100)
Social Networking Sites			
1 hour	35 (32.4)	61 (38.1)	96 (35.8)
2 – 3 Hours	38 (35.2)	58 (36.3)	96 (35.8)
4 – 6 Hours	20 (18.5)	31 (19.4)	51 (19.0)
6 – 8 Hours	11 (10.2)	5 (3.1)	16 (6.0)
More than 8 hours	4 (3.7)	5 (3.1)	9 (3.4)
Time using Electronic Device			
1 hour	3 (2.8)	16 (10.0)	19 (7.1)
2 – 3 Hours	29 (26.9)	59 (36.9)	88 (32.8)
4 – 6 Hours	43 (39.8)	51 (31.9)	94 (35.1)
6 – 8 Hours	18 (16.7)	18 (11.3)	36 (13.4)
More than 8 hours	15 (13.9)	16 (10.0)	31 (11.6)
Daily computer or Electronic device for study (Medline)			
1 Hour	99 (91.7)	141 (88.1)	240 (89.6)
2 – 3 Hours	9 (8.3)	17 (10.6)	26 (9.7)
4 – 6 Hours	0 (0)	2 (1.3)	2 (0.7)
Daily computer or Electronic device for study (Textbook)			
1 hour	74 (68.5)	101 (63.1)	175 (65.3)
2 – 3 Hours	28 (25.9)	47 (29.4)	75 (28.0)
4 – 6 Hours	3 (2.8)	10 (6.3)	13 (4.9)
6 – 8 Hours	2 (1.9)	1 (0.6)	3 (1.1)
More than 8 hours	1 (0.9)	1 (0.6)	2 (0.7)
Daily computer or Electronic device for study (Online Courses)			
1 hour	95 (88.0)	140 (87.5)	235 (87.7)
2 – 3 Hours	12 (11.1)	19 (11.9)	31 (11.6)
4 – 6 Hours	1 (0.9)	1 (0.6)	2 (0.7)
Daily computer or Electronic device for study (Other resource)			
1 hour	87 (80.6)	139 (86.9)	226 (84.3)
2 – 3 Hours	16 (14.8)	19 (11.9)	35 (13.1)
4 – 6 Hours	3 (2.8)	2 (1.3)	5 (1.9)
6 – 8 Hours	2 (1.9)	0 (0)	2 (0.7)

The barriers to ICT reported in the study were mostly lack of time and lack of browsing skill. Rodrigo found that the barriers were difficulty in access and cost amongst Australian Health Professionals.[14] Another study conducted amongst three public sector universities of Lahore, the students pointed out load shedding, non-availability of required software, slow speed of the computers and virus threat as possible barriers.[15]

According to present study 84-90% of the students use ICT for study purpose for one hour daily. While 86% of the respondents spent 1-3 hours on social media and (14%) of the respondents spent 1-6 hours on social media. This is similar to another study in which 71.6% of the students spend 1-3 hours on social media while 19% of the students spend 4-6 hours on social media.[16]

The results of present study showed that only 17.2 % of the students used Facebook while 72.7% used WhatsApp for educational purpose and communication. These results are similar to a metaanalysis by Guraya, in which majority(70–80%) of the respondents used SNSs for social communications, however, 20% (1.7–54%) used SNSs for sharing academic and educational information.[17]

With regards to classroom teaching 61.6% of the students preferred moderate to extensive use of ICT in classroom teaching. This is similar to results given by another Indian study where 89.5 % of the students agreed that ICT can be used effectively in teaching and learning process.[18]

Lack of a standard ICT literacy test was a limitation of this study. Also, the population under study came from only one institution in which most of the students were from affluent back ground. Increasing the cohort to encompass public section institutions can shed more light on this topic.

CONCLUSION

This study found that high achievers rely on ICT for learning instead of entertainment. Low achievers prefer to spend time on ICT based entertainment. The majority of the students believe that ICT assists in their learning process. Lack of browsing skills was the main barrier identified.

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3 Ayesha Ehsan:	Data analysis and proof reading.
4 Shaila Tahir:	Critical review of the manuscript.
5 Sharoon Hanook:	Statistical analysis and interpretation of the data.
6 Muhammad Aamir Khan:	Cross references and revision, abstract and final review.