


## Utilization of E-Devices and Internet among Medical Students in a private medical college in central Kerala, India

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**Introduction:** This study was conducted to find the nature, impact, whether beneficial or adverse, the e-Devices are having on student's academics, physical and mental health and, is making their life convenient or harming them. **Material and Methods:** Cross-sectional study was conducted in a private medical college in central Kerala and proportions, test of significance like Chi square, t test was used. **Objectives:** To find the prevalence and pattern of utilization of electronic devices; to evaluate the pattern, purpose of internet usage and factors influencing it; and to assess the need for incorporating computer education in medical curriculum. **Results:** 350 students participated in the research; 90(25.7%) of students don't spend money to get access to internet; 255(79.45%) spend 2 hours or less on the internet; 296(84.6%) of students use internet for academic purposes; 152(43.4%) felt that e-Devices made their academic performance better while 40(11.4%) of the students felt it to be worse. 88(25.1%) prefer reading e books over conventional textbooks. 213(60.9%) do not have any problem while using internet but 96(27.4%) students had problems of eye strain while using internet. **Conclusions:** Most students seem to be able to balance the e-Device used and use it for academic purpose and making their lives efficient. But few got their academic performance worse, and some are suffering from eye strain, so efficient management of time on e-devices and internet without hindering their academic performance is needed.

**Keywords:** Computer, e-Devices, Internet, Medical Students

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## Introduction

The use of computer and information technology is on an escalation. The internet, one of the key developments in this field, provides instant access to latest medical information [1]. Computer assisted management of medical information has also increased. The evolving nature of medical knowledge and technology requires that medical practitioners develop computer skills to enhance the quality of patient care and for ongoing education and research [2]. There was an urgent need to do this study on medical students. Medical students are spending increasing amount of their time on electronic devices like laptops, smart phones, tablets, Personal Computers, etc. So this study was done to examine this issue in detail to see how this time can be channelized to meet their education goals, to improve their efficiency, productivity and also to make sure it does not hamper their education, moral, psychological, physical health and safety. We did not include the issue of e-waste in this study as in our opinion very little e-waste is being generated by medical colleges and hospitals in India.

Objectives of the study are to gather data from the students of a medical college to-

01. Find the prevalence and pattern of utilization of electronic devices,
02. Evaluate the pattern, purpose of internet usage and factors influencing it,
03. Assess the need for incorporating computer education in medical curriculum.

## Material and Methods

After taking permission from Institutional Ethics Committee & Research Committee a cross-sectional study was conducted in November 2015 in a Private medical college in Central Kerala, India. All medical students were included in the study. Consent was obtained from the students by disclosing that the data collected is for research purpose, that the pretested questionnaire is anonymous and their participation in the study is voluntary.

For convenience, in our study following criteria was given and defined for family income, i.e. >Rs 6 lakhs /year as Upper Income and < or equal to Rs 6 lakhs/year income as Lower Income Family, as we did not want to make multiple small groups based on per capita income or above and below poverty line.

The collected data was tabulated and analyzed using MS Excel and SPSS and for significance by various tests of significance like  $\chi^2$  and t-test.

## Results

Demography: 350 students 261(74.6%) were females and 89(25.4%) were males; religion wise Christians were 78(22.3%), Hindus 222(63.4%) and Muslims 50(14.3%); 186(53.1%) of students were from rural area and 164(46.9%) from urban area; 32(9.1%) were day scholars and 318(90.9%) lived in the hostel; 241(61.1%) were from families with income less than or equal to Rs. 6 lakhs per year, and 136(38.6%) were from families with income of more than Rs. 6 lakhs per year. Mean age of the students was 20.48 years (range 17-24 years).

Table 1 clearly shows the increasing trend of utilization of mobile phones among all e-devices and usage and ownership of smart phones is also high. Even though more than half the students own a laptop, only a quarter use it regularly; and 12% students have the tablet. Students spent an average of 3.44 hours per day on e-devices Standard Deviation (SD) 4.42 hours. Out of the 256(73.14%) students who paid the recurring monthly cost for e-devices from their own pocket money, monthly average was Rs. 217.24 per month, SD Rs. 244.35 per month.

Out of 350 students who responded, mean time spent daily on internet is 1.83 hours per day (SD 2.98 hours per day). Students spent on an average Rs. 87.14 on getting access to internet monthly (SD Rs. 174.10 per month).

**Table-1: Use of E-devices (N=350)**

Device	Ever Used	Regularly Used	Devices Owned
Mobile Phone	255(72.9%)	223(63.7%)	240(68.6%)
Smart Phone	166(47.4%)	155(44.3%)	163(46.6%)
Lap Top	226(64.6%)	89(25.4%)	178(50.9%)
Tablet	52(14.9%)	15(4.3%)	42(12.0%)
iPod	80(22.9%)	35(10%)	76(21.7%)

**Table-2: Resource Utilization by Urban and Rural Students**

Variable	Residence	N	Mean	Mean Difference	t	p value
Hours / day on e-Devices	Rural	186	2.69	-1.589	-3.285	.001
	Urban	163	4.28			
Money./ month on e-devices	Rural	137	185.39	-68.513	-2.255	.025
	Urban	119	253.91			

Money./ month on internet	Rural	142	80.68	-40.120	-2.383	.018
	Urban	117	120.80			

Hours / day on internet	Rural	186	1.54	-0.62	-1.936	.054 (NS)
	Urban	164	2.16			

NS- Not Significant

**Table-3: Resource Utilization and Family Income**

Variable	Family Income (lakhs/year)	N	Mean	Mean Difference	t	p value
Hours / day on e-Devices	Less than equal to 6	213	2.94	-1.274	-2.342	.020
	More than 6	136	4.21			
Money./ month on e-devices	Less than equal to 6	159	190.94	-69.424	-2.081	0.039
	More than 6	97	260.36			
Money./ month on internet	Less than equal to 6	163	79.60	-51.815	-2.668	.009
	More than 6	96	131.42			
Hours / day on internet	Less than equal to 6	214	1.37	-1.178	-3.200	.002
	More than 6	136	2.55			

**Table-4: Physical Problems while using e-devices**

Nature of the Problem	Frequency (N=350)
Pain in the back	17(4.9%)
Pain in the Hands	23(6.6%)
Pain in the Neck	30(8.6%)
Headache	68(19.4%)
Eye Strain	95(27.1%)
No Physical Complaints	214(61.1%)

**Table-5: Resource utilization and Eye Strain**

Variable	Eye strain	N	Mean	Mean Difference	t	p value
Hours / day on e-Devices	Yes	95(27.1%)	4.76	1.817	2.65	.009
	No	254(72.8%)	2.94			
Money./ month on e-devices	Yes	68	199.10	-24.700	-0.714	.476(NS)
	No	188	223.80			
Money./ month on internet	Yes	67	102.36	3.442	0.178	.859(NS)
	No	192	97.92			
Hours / day on internet	Yes	95	2.08	0.347	0.969	.333(NS)
	No	255	1.74			

**Table-6: Place of Internet Access**

Place of Access	Frequency (N=350)
Netsetter	48(13.7%)
Library Free Access	50(14.3%)
Smart Phone Internet Access	132(37.7%)
Home – Family Connection	148(42.3%)
Mobile Phone Internet Access	157(44.9%)

**Table-7: Pattern & Purpose of Internet Use**

Purpose of Access	Ever Used	Regularly Use
Keep in touch with Friends & Family	294(84.0%)	257(73.4%)
Download music, films & games	278(79.4%)	199(56.9%)
Academic Purpose	297(84.9%)	219(62.6%)
Online Banking	52(14.9%)	38(10.9%)
News & Gossip Reading	116(33.1%)	78(22.3%)
Technical Support	73(20.9%)	45(12.9%)
Online Shopping	86(24.6%)	50(14.3%)
Online Games	68(19.4%)	42(12%)

View Pornography	32(9.1%)	20(5.7%)
Video chatting/Video conference with Webcam	65(18.6%)	39(11.1%)

**Table-8: Significant Differences among sexes for e-devices use**

Device	Males (%)	Females (%)	$\chi^2$	p value
Ever Used Smart Phones	64(71.9)	102(39.1)	28.688	0.000
Ever Used Laptops	68(76.4)	158(60.5)	7.305	0.007
Ever Used Tablet	21(23.6)	31(11.9)	7.204	0.007
Ever Used iPod	31(34.8)	49(18.8)	9.705	0.002
Daily use Mobile Phones	45(50.6)	178(68.2)	8.930	0.003
Daily use Smart Phones	60(67.4)	95(36.4)	25.879	0.000
Daily use Laptop	30(33.7)	59(22.6)	4.314	0.038
Daily Use iPod	16(18)	19(7.3)	8.439	0.004
Ownership Mobile Phone	53(59.6)	187(71.6)	4.507	0.034
Ownership Smart Phone	61(68.5)	102(39.1)	23.147	0.000
Ownership iPod	27(30.3)	49(18.8)	5.220	0.022
Internet on Smart Phone	49(55.1)	83(31.8)	15.28	0.000

Degree of Freedom =1, N=350.

**Table-9: Utilization of e-devices by urban and rural students**

Device	Urban (%)	Rural (%)	$\chi^2$	p value
Mobile Phone Ever Used	107(65.2)	148(79.6)	9.045	0.003
Smart Phone Ever Used	88(53.7)	78(42.9)	4.804	0.028
Laptop Ever Used	117(71.3)	109(58.6)	6.183	0.013
Daily use Mobile Phone	92(56.1)	131(70.4)	7.744	0.005
Daily use Smart Phone	83(50.6)	72(38.7)	5.002	0.025
Own Mobile Phone	101(61.6)	139(74.7)	6.989	0.008
Own Smart Phone	89(54.3)	74(39.8)	7.347	0.007
Own Tablet Computer	26(15.9)	16(8.6)	4.340	0.037

Degree of Freedom = 1, N=350

**Table-10: Difference in online behavior among**

**Male & Female Students.**

Behavior	Males (%)	Females (%)	$\chi^2$	p value
Gave Phone Number to Stranger	14(15.7)	5(1.9)	24.671	0.000
Gave Email to Stranger	21(23.6)	7(2.7)	39.440	0.000
Gave Address to Strangers	10(11.2)	1(0.4)	25.680	0.000
Gave Photograph to Strangers	15(16.9)	7(2.7)	22.629	0.000
Gave Name to Strangers	28(31.5)	22(8.4)	28.751	0.000
Not Given any info to Strangers	58(65.2)	232(88.9)	26.290	0.000
Ever for Contacting Friend	83(93.3)	211(80.8)	7.612	0.006
Ever for Banking	26(29.2)	26(10)	19.446	0.000
Ever for News	51(57.3)	65(24.9)	31.441	0.000
Ever for Technical Support	41(46.1)	32(12.3)	45.952	0.000
Ever for Shopping Online	38(42.7)	48(18.4)	21.155	0.000
Ever for Online Gaming	30(33.7)	38(14.6)	15.546	0.000
Ever for Online Pornography	31(34.8)	1(0.4)	94.811	0.000
Ever for Online Video Chat	30(33.7)	35(13.4)	18.082	0.000
Ever Online for Rail Ticket	44(49.4)	66(25.3)	17.962	0.000
Ever Online for Bus Ticket	18(20.2)	18(6.9)	12.776	0.000
Ever Online for Holiday Pack	13(14.6)	19(7.3)	4.289	0.038
Do not go Online Regularly	6(6.7)	39(14.9)	3.984	0.046
Regularly Contact Friend	73(82.0)	184(70.5)	4.518	0.034
Regularly for Banking	20(22.5)	18(6.9)	16.636	0.000
Regularly for News	37(41.6)	41(15.7)	25.635	0.000
Regularly Technical Support	27(30.3)	18(6.9)	32.584	0.000
Regularly for Shopping online	23(25.8)	27(10.3)	13.018	0.000
Regularly for Online Game	21(23.6)	21(8.0)	15.196	0.000
Regularly for Online Porno.	20(22.5)	0(0.0)	62.206	0.000
Regularly Online Video Chat	19(21.3)	20(7.7)	12.554	0.000
Prefer Reading eBooks	30(33.7)	58(22.2)	4.652	0.031

N=350, Degree of Freedom 1, higher percentage has been marked in bold.

**Table-11: Cross-tabulation - Resource utilization and Regular Social Networking**

Variable	Regular social Networking	N	Mean	Mean Difference	t	p value
Hours / day on e-Devices	Yes	256(73.35%)	3.81	1.4 hours	3.433	.001
	No	93(26.64%)	2.41			
Money./ month on e-devices	Yes	183	236.09	Rs. 66.09	1.965	0.51(NS)
	No	73	170.00			
Money./ month on internet	Yes	180	124.48	Rs. 84.18	4.774	0.000
	No	79	40.30			
Hours / day on internet	Yes	257(73.43%)	2.13	1.13 hours	3.181	0.002
	No	93(26.57%)	1.00			

**Table-12: Cross-tabulation - Resource utilization and Regular Downloading**

Variable	Regular downloading	N	Mean	Mean Difference	t	p value
Hours / day on e-Devices	Yes	199	4.36	2.155	4.639	.000
	No	150	2.21			
Money./ month on e-devices	Yes	145	249.59	74.595	2.444	.015
	No	111	174.99			
Money./ month on internet	Yes	146	138.24	90.381	5.606	.000
	No	113	47.86			
Hours / day on internet	Yes	199	2.55	1.672	5.405	.000
	No	151	0.88			

**Table-13: Cross-tabulation - Resource utilization and Regular Use for Academics**

Variable	Regular Use for Academics	N	Mean	Mean Difference	t	p value
Hours / day on e-Devices	Yes	218	3.98	1.443	2.985	.003
	No	131	2.53			
Money./ month on e-devices	Yes	159	230.31	34.483	1.096	.274(NS)
	No	97	195.82			
Money./ month on internet	Yes	154	123.16	60.077	3.567	.000
	No	105	63.09			
Hours / day on internet	Yes	219	2.08	0.670	2.045	.042
	No	131	1.41			

Thirty five (10%) students did not spend any time on e-devices in a day. Eighty four (24%) did not spend any time on internet in a day. Ninety (25.7%) do not spend any money to get access to the internet. Two hundred and fifty five (79.4%) spend 2 hours or less on internet and 91(26%) did not know how much money they spent on the internet as their parents paid the bill directly. Only 2 students (0.6%) are connected to internet 24 hours a day.

On doing further t-test on 95(27.1%) students who complained of eye strain as compared to 254(72.8%) who did not have eye strain, we found that those with complains of eye strain were spending an average of 4.76 hours per day on e-devices, as compared to an average of 2.94 hours on e-devices per day by those who did not complain of eye strain, a mean difference of 1.817 hours per day,  $t=2.650$ , and  $P=0.009$ . Thus there was a significant difference on number of hours spent on e-devices and complain of eye strain.

Even though those with complain of eye strain spent a mean of 0.347 hours more on internet per day, the difference was not significantly associated with complain of eye strain ( $t=.969$ ,  $P=.333$ ). We further looked into the second highest complain of headache reported by 68(19.4%) students. We found that those complaining of headache were spending an average of 1.158 and 0.520 hours more on e-devices and internet per day,

Respectively; but this was not significantly associated with daily use of e-devices ( $t=1.945$ ,  $P=0.053$ ) and daily use of internet ( $t=1.292$ ,  $P=0.197$ ). Other complains of pain in the neck, back and hands were reported by less than 10% of students and were not significantly associated with number of hours of daily use of e-devices and daily use of internet, as per this study.

One hundred and thirteen (32.3%) students do not spend any time every day on the internet. Nineteen (5.4%) gave real phone number, 28(8%) gave real email id, 11(3.1%) gave real address, 22(6.3%) gave real photograph, 50(14.3%) gave real name to strangers online, Two hundred nineteen (82.9%) have not given any of their details to strangers online.

Out of total students, 110(31.4%) were online for railway ticket reservation, 55(15.75%) for banking, 50(14.3%) for net banking, 45(12.9%) for air ticket reservation, 36(10.3%) for bus ticket reservation, 32(9.1%) for holiday package reservation, 22(6.3%) for hotel reservation, 4(1.1%) for car reservation, and 152(43.1%) had not been online for any of these purposes.

Two hundred and fourteen (61.1%) preferred internet because it saved time, 233(66.6%) because it gave latest information, 138(39.4%) felt it was more useful, 84(24%) because it was less expensive and 92(26.3%) felt it was a more preferred medium.

Two hundred and nineteen (62.6%) had no problems in using the internet, 40(11.4%) were not able to use internet as they lacked time, 3(0.9%) due to inadequate computer education, 22(6.3%) due to lack of accessibility, 31(8.9%) lack of interest, 29(8.3%) because it is expensive, only 2(0.6%) felt it lacked privacy, and 3(0.9%) considered it as insecure.

Forty five (12.9%) would like to have some computer and internet classes. Eighty eight (25.1%) preferred reading e-books than conventional textbooks. One hundred fifty two (43.4%) felt that e-device usage made their academic performance better and 40(11.4%) felt it became worse while 154(44%) felt it had no effect on their academic performance. So in total 55.4% felt it had no effect on their academic performance or made it worse.

Cross Tabulations: Junior students had significantly lower experience in laptop use as compared to seniors ( $\chi^2$  57.794,  $p=0.000$ ). They also had a significantly lower ownership of laptops ( $\chi^2$ 18.389,  $p=0.001$ ). Older students had significantly more laptop experience ( $\chi^2$ 35.497,  $p=0.000$ ).

Religion had no significant difference in the use of mobile phone, smart phone, laptop, and tablet computer. Table 9 shows the utilization of e-devices by urban and rural students. The urban students who have ever used and owned mobile phones were proportionately less than rural students. But the prevalence of utilization and ownership of smart phones and laptops are higher among urban students. Urban students use smart phone daily more than rural students while it is vice versa for mobile phones.

In table 10, it can be seen that female students are following male students, many times closely, in online behavior; but the girls are much wiser than boys in not giving personal information to the strangers online, and more girls do not go online regularly without any work.

Religion wise significant differences- Only 54(69.2%) Christians and 37(74.0%) Muslim students ever downloaded anything from internet as compared to 187(84.2%) Hindu students ( $\chi^2$  9.004, DF 2,  $p=0.011$ ). Similarly using the internet ever for banking was only 3(6.0%) among Muslims, 8(10.3%) among Christians as compared to 41(18.5%) among Hindus.

There was no significant difference religion wise in physical discomfort, place of access of

Internet, hours of internet use per day, money spend for internet, giving personal information over the internet, using internet for social networking, using internet for academic purposes, using internet for news and gossips.

## Discussion

**Prevalence and Pattern of Utilization of Electronic Devices-** With the advancement in modern technology and over all development the role of E-devices in medical education has also increased. Our studies shows that 68.6% own mobile phones, 46.6% own smart phones, 50.9% own lap tops and 63.7%, 44.3% and 25.4% regularly use mobile phones, smart phones and laptops, respectively. But the computer use is fairly higher in other studies, as in study done by Lal et al (81.6%), Inamdar et al (84.5%).[2, 4] This is because of increased application, mainly of internet, in mobile phones, smart phones and tablets (Tablet Computers) in the present modern times.

Table 3 clearly shows that even though the students from richer family background, in our study from families with income more than 6 lakhs per year, do not spend too much money more than those students who come from lower income families but they do spend valuable time from daily study time, of 1.274 hours and 1.178 hours of time more per day on e-devices and internet use as compared to students from lower income group families. This type of daily waste of time adds up and may reflects on academic performance. Further studies need to be done that correlate or cross tabulate the academic performance with daily time spent on e-device and internet, to find out if the students from higher income families are throwing little money and lot of time from their academic time. Students from higher income families need to understand that just because you are from a higher income family background does not mean that you should throw away your time on wasteful activities of addiction of new technology, so as to loose daily study time.

**Pattern, Purpose of Internet Usage and Factors Influencing It-** Use of the internet is a part of college student's daily routine. It has been integrated into their daily communication habits and become a technology as ordinary as telephone or television. When compared to the study done by Unnikrishnan et al 69.5% undergraduates used internet for entertainment whereas in our study it was 56.9% and a difference of 20% was found in use for academic purposes [7].

A student has to attend classes for eight hours and needs good sleep of eight hours, taking another two hours for lunch, dinner, breakfast and bath etc. a total of 18 hours are busy hours. This leaves only five to six hours in a 24 hour day to study. For our calculation we are taking the daily study time to be six hours. Table 11 clearly shows the 256(73.35%) students who did regular social networking spent on an average 1.4 hours (23.3% of study time) more per day on e-devices. The 257(73.43%) students who did social networking, spent on an average 1.13 hours (18.83% of study time) more per day on internet. Those who did social networking regularly as compared to those who did not, the time spent, which comes from study time (almost 42.12% of their average study time daily) is a lot.

Average time spent for internet usage by the students in our study is 1.81 hours per day whereas from other studies done by Maroof *et al* and Unnikrishnan *et al*, it was found to be less than three (3) hours per week.[6, 7] From their study about 34.5% students prefer textbooks than internet whereas 25.1% of students in our study prefer e-books. According to our study students (66.6%) preferred internet as it provides latest information and this was high when compared to the above study which gave a result of 58.1%.

Based on the study done by Kochhar *et al* students had problems in using internet due to lack of time (51.43%), lack of interest (5.71%), cost of accessing (20%), and privacy (<50%) while ours were 11.4%, 8.9%, 8.3%, 0.6%, respectively. [8] The data obtained indicates that majority of the medical students participated in the study embrace and use internet for entertainment.

While looking at the figures from table 4, in the context of medical students we have to take in account that medical students are supposed to study a lot and understand a lot of different complex subjects and ideas during their medical education. This regular medical study, the primary purpose of coming to medical college, also requires work that is a strain on the eyes and can give headache, complain that was found in 27.1% and 19.4% of students. T-test clearly showed (Table 5) that hours spent on e-devices was significantly associated with complain of eye strain. Medical students need to make a choice of more mature behavior with e-device use and those who have eye strain, need to reduce the number of hours they spend on e-devices per day, this is likely to benefit them and reduce their complain of eye strain.

Students need to be more careful about their privacy and security and should not give their real information to strangers online.

Table 8 shows that a gender difference seen as males chasing more latest and new technology. Table 10 shows that female students in this college are more conservative in their online behavior. Though Table 7 showed 20(5.7%) students were going online for pornography regularly, looking at closely clearly tells us that 20(22.5%) of male students are going online regularly for viewing pornography. Lal *et al* in Maulana Azad Medical College (MAMC) in 2005 showed that only 1.8% of undergraduates and no postgraduates were going online for viewing pornography.[2] The figure in our study may be higher due to the fact that our survey was anonymous, and in MAMC study methodology, anonymity has not been mentioned. Another reason for higher findings could be better internet facility with broadband, etc. now in 2014 as compared to time of MAMC study in 2005.

**Need for Incorporating Computer Education in Medical Curriculum-** In our study the number of students willing to undergo training is 12.9%. This when compared to study by Inamdar *et al* in the year 2004 is quite low which gave result that 82.8 % students were willing to undergo training [4].

In our study only Forty five (12.9%) would like to have some computer and internet classes and 3(0.9%) said that they have inadequate computer education. This is probably due to the fact that we are a new generation of students who have been working on computers and e-devices since lower kindergarten class.

Undergraduate students need to use the internet for preparing for seminars and projects. Besides that they do other e-device and internet activity mainly for entertainment and social networking.

## Conclusions & Recommendations

E-devices have penetrated the student population of this college and their ownership and usage is universal. Only one student did not own a mobile phone. Students are now migrating from wired internet to wireless devices that provide internet, like mobile and smart phones, wireless Netsetter, etc. and are not dependent on partially blocked free internet being provided by the college. Library internet cannot be used to access entertainment, downloading, or other adult sites.

So, especially for entertainment (movies and music) and e-book download, students need to have their own internet connection. Once downloaded students share these files quite freely in the college. Some students are spending a lot of time on the internet and e-devices and some of those are suffering from eye strain. They need, as a mature and grown up adult, to make a choice to reduce the time they are spending on e-devices to come back to positive health.

The internet was used regularly by the medical students in social networking (73.4%), entertainment (56.9%), and academic purpose (62.6%). Entertainment and social networking is important for morale and happiness, and e-devices are useful. But 11.4% of the students felt that the academic performance became worse with e Device usage. Hence proper planning and utilization of e-devices are needed. Some students are giving their personal information to strangers online, this has to be avoided for the reasons of privacy and security. Compared to ten (10) years ago, the use of e-devices has become an epidemic, and all colleges need to put a control on it by educating against overuse of e-devices.

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