

# A Study to Assess Economic Burden and Practice of Cell Phone Disposal among Medical Students

MITTAL ANUJ, VEDAPRIYA DANDE RAJASEKAR, LAVANYA KRISHNAGOPAL

## ABSTRACT

**Context:** Our country India is having 919.17 million cell phone users; currently this is the second largest number of cell phone users after China. The youth spend a good amount on talk time and purchasing cell phone handsets. Discarding of cell phone is another issue which needs attention because of generation of e-wastes, which leads to environmental pollution.

**Aim:** To assess economic burden and practice of cell phone disposal among medical students.

**Methodology:** It is a cross-sectional study where self filled questionnaire were given to randomly chosen students.

**Results:** Out of total 311 participants, 133 were males and 178 were females. Mean monthly expenditure of students was Rs. 2787. Out of 311 students only 2 (0.64%) boys were not

using cell phones. It was observed that boys are more inclined towards cell phone than girls, as number of previous handsets, money spent on buying handsets and therefore average monthly costs of handsets were significantly higher among boys than girls. Most common reason for frequent changing of handsets was that they were outdated (46.14%). 47.13% of handsets were disposed by exchanging or giving to somebody for use, but 36.57% of handsets were lying waste or thrown away.

**Conclusion:** As noticed that a good amount of money was spent on cell phones, students and parents should be counseled regarding cost effective use of cell phone. An effort should be made to dispose off handset in environment friendly way, which can be done by creating awareness about collection centers and strengthening collection chain.

**Key Words:** Cell phone, Economic burden, Disposal

## INTRODUCTION

This is an era of information technology, an era of communication devices, the most common being cell/ mobile phones. Cell phones have become an indispensable accessory nowadays. This small and relatively inexpensive device holds an important place in the day to day life. Cell phones have many functions which include calls, SMS (short messaging system), emails, internet access, music, storage of files, banking, etc, which has made life more dependable on cell phones. Cell phones have made life very easy and approachable.

Our country, India, has 919.17 million cell phone users [1]. Currently, India has the second largest number of cell phone users after China [2]. The average life of a cell phone is about 10 years as per the company's guidelines [3], but an average individual changes his handset much earlier because of various reasons. Often, youth are more inclined towards cell phones and their expenditure consists of a good amount of money which they spend on cell phones. Irrespective of the average Monthly Per Capita Consumer Expenditure (MPCE) of Rs.1052 in urban India [4], the youth spend a good amount on talk time and on the purchase of cell phone handsets. Discarding of cell phones is another issue which needs attention because of the generation of e-wastes, which leads to environmental pollution. No organized effort is being made to reduce or channelize this e-waste in India. But with 919.17 million cell phone users, some effort needs to be made, to deal with this problem. The data on the cell phone disposal and the economic burden is not adequate in India. Considering all the available information, this study was planned to assess the pattern of cell phone use, the disposal of cell phones and the economic burden

of cell phone usage among medical students.

## MATERIALS AND METHODS

A cross-sectional study was planned, where a questionnaire was developed, pretested and validated for fulfilling the study's objectives. It was a self filled questionnaire where the students were assured that their identity would not be revealed, in order to get unbiased responses. A pilot study was conducted among medical students, which concluded that 57% of the students spent more than ten thousand rupees on purchasing handsets. By considering an allowable error of 10%, a sample size of 300 was estimated and an additional 10% students were included, considering the attrition. Hence, 330 medical students were selected for the study. The students were selected from the attendance registers by using a random number table, but nine did not consent and ten questionnaires which had incomplete information were excluded. So, the final sample size remained at 311. The data collection was carried out during April 2011 to March 2012.

The data which was thus collected was entered in the Ms Excel 2007 version and it was analyzed by the SPSS 11.5 software. The Chi square test and ANOVA were applied as tests of significance to derive the p values.

## RESULTS

### The Socio-Demographic Profile of the Study Population

The Aarupadai Veedu Medical College is an unaided college in Pondicherry, India, where students of different states are imparted education. A majority of the students are from the southern states

of India, namely Pondicherry, Tamil Nadu, Karnataka, Kerala and Andhra Pradesh, India. Approximately 10% of the students are from other parts of India. Of the total 311 participants, 133 were males and 178 were females. The study subjects were studying in 2nd to 8th semesters. The participants belonged to various age groups which ranged from 17 to 26 years, with a mean age of 20.2 years. 74.6% of the students resided in hostels/outside, while 25.4% lived with their parents. The monthly expenditure of these students (excluding the hostel and mess fees) ranged between 500 to 10,000 rupees. A majority of the students belonged to the middle and upper classes and had a mean monthly expenditure of Rs. 2787. Among the 311 students, only 2 (0.64%) boys did not use cell phones; so, their findings were not depicted in the further analysis. As was observed, there was no significant difference in the socio demographic profiles of the male and female study subjects [Table/Fig-1].

### The Economic Burden of the Cell Phone Use on Medical Students

The students had been using cell phones from 2 months to 120 months (10 years), the mean duration being 45.47 months. There was a significant difference in the duration of the cell phone use among males and females ( $p=0.01$ ) [Table/Fig-1]. Approximately 72.5% of the students changed their handsets in less than 3 years; among them, 25.89% were frequent changers who changed their handsets within less than a year [Table/Fig-2]. Only 0.65% of the students had been using their handsets for more than 5 years, though the company guidelines state that the handset life is about 10 years. 15.53% of the students had not changed their handsets currently. On the contrary, 17.48% [Table/Fig-3] students had changed more than 5 handsets. The habit of changing handsets was significantly more in males as compared to females ( $p=0.014$ ) [Table/Fig-1]. The frequent change of handsets increased the economic burden on their users, but they cited various reasons

for their actions. To estimate the amounts which were spent on buying handsets, the students were asked to recollect the costs of various handsets and to deduct the amount that they got in case of exchange of the handsets. The average money which was spent on buying handsets was Rs. 24316 for males and it was Rs. 17127 for females, which was significantly higher in males as compared to that in females ( $p=0.004$ ) [Table/Fig-1]. For purchasing the handsets, 3.24% of the users had spent  $\leq 2000$  rupees and 18.44% had spent more than 30,000 rupees, whereas a majority (39.48%) had spent between 10,001 to 30,000 rupees [Table/Fig-4].

Though the above findings suggested the patterns of spending of the students, to get a clearer picture, we calculated the average monthly cost of the handset, which was derived by dividing the total amount which was spent on buying the handsets by the total duration of use of the cell phones. The mean of the average monthly cost of the handsets was Rs. 453.7. 68.28%, of students spent between 100-500 rupees for their handsets. Approximately 7.44% of the students spent greater than 1000 rupees monthly on their handsets [Table/Fig-4]. The average expenditure on the handset of males was significantly higher than that of females ( $p=0.05$ ), [Table/Fig-1]. Another important factor which added to the economic burden of the cell phone use was the monthly expenditure on the talk time; the mean monthly expenditure on the talk time was Rs. 359.42. Most (45.31%) of the students spent between Rupees 101 – 300 on the monthly talk time recharge [Table/Fig-4]. The monthly expenditure on the talk time was marginally higher among females (Rs. 362.4) than among males (Rs. 355.3), but this difference was not significant statistically [Table/Fig-1].

### Disposal Pattern of Handsets

In total, 804 handsets were disposed by the students. The average life of a handset was 21.8 months for males and it was 20.9 months for females [Table/Fig-1]. The most common reason for the disposal of the handsets was that they were outdated, as was stated by

| S.No | Variables  | Males                    | Females                   | P value            |
|------|--|--------------------------|---------------------------|--------------------|
| 1    | Age (years)                                      | 20.27 (1.7)              | 20.15 (1.7)               | 0.261*             |
| 2    | Residing Parents Hostlers/outside                | 35 (26.3%)<br>98 (73.7%) | 44 (24.7%)<br>134 (75.3%) | 0.84*              |
| 3    | Monthly Expenditure (Rs)                         | 2715 (2130)              | 2840 (2799)               | 0.668 <sup>†</sup> |
| 4    | Duration of use (months)                         | 49.59 (25.2)             | 42.44 (23.1)              | 0.01 <sup>†</sup>  |
| 5    | Number of previous handsets                      | 2.95 (2.36)              | 2.33 (2.01)               | 0.014 <sup>†</sup> |
| 6    | Money spent on buying handsets (Rs)              | 24316 (26478)            | 17127 (16901)             | 0.004 <sup>†</sup> |
| 7    | Average monthly cost of handset (Rs)             | 499.95 (400.2)           | 419.72 (318.5)            | 0.05 <sup>†</sup>  |
| 8    | Money spent on talk time (Rs)                    | 355.3 (352)              | 362.4 (398)               | 0.872 <sup>†</sup> |
| 9    | Average life of handset in months (m=116, f=145) | 21.8 (15.06)             | 20.9 (12.85)              | 0.604 <sup>†</sup> |

[Table/Fig-1]: Comparison of study parameters among males and females.

\*Chi square test, <sup>†</sup>ANOVA.

| Average duration of use | Males (n=131) | Females (n=178) | Total (n=309) |
|-------------------------|---------------|-----------------|---------------|
| $\leq 12$ months        | 34 (25.95%)   | 46 (25.84%)     | 80 (25.89%)   |
| 12 – 36 months          | 61 (46.56%)   | 83 (46.63%)     | 144 (46.6%)   |
| 36 – 60 months          | 20 (15.27%)   | 15 (8.42%)      | 35 (11.33%)   |
| >60 months              | 1 (0.76%)     | 1 (0.56%)       | 2 (0.65%)     |
| Not changed (currently) | 15 (11.45%)   | 33 (18.54%)     | 48 (15.53%)   |
| Total                   | 131 (100%)    | 178 (100%)      | 309 (100%)    |

[Table/Fig-2]: Average duration of use of single handset by students<sup>†</sup>.

<sup>†</sup>Calculated by dividing duration of use of cell phones by number of handsets used till date.

46.14% students; this habit was more common among males (50.65%) than among females (41.97%) [Table/Fig-5]. There was a significant difference in the reasons for the disposal between males and females ( $p < 0.0001$ ). 47.13% of the handsets were disposed off in an economic way, which were either exchanged or given to somebody for use, but our concern was about 36.57% handsets which were lying waste or were thrown away. These thrown away handsets would directly cause harm to the ecosystem and the handsets which lay waste would never be used again. After a few years, they would be discovered, to be finally thrown away when their lives were complete.

| Number | Males (n=131) | Females (n=178) | Total (n=309) |
|--------|---------------|-----------------|---------------|
| 0      | 15 (11.45%)   | 33 (18.54%)     | 48 (15.53%)   |
| 1-2    | 50 (38.17%)   | 73 (41.01%)     | 123 (39.81%)  |
| 3-4    | 38 (29.01%)   | 46 (25.84%)     | 84 (27.18%)   |
| ≥5     | 28 (21.37%)   | 26 (14.61%)     | 54 (17.48%)   |
| Total  | 131 (100%)    | 178 (100%)      | 309 (100%)    |

**[Table/Fig-3]:** Number of previous handsets used

| Money spent on buying handset (Rs)            | Males (n=131) | Females (n=178) | Total (n=309) |
|---|---------------|-----------------|---------------|
| ≤2000   | 2 (01.53%)    | 8 (04.49%)      | 10 (03.24%)   |
| 2001-10000                                    | 38 (29.01%)   | 82 (46.07%)     | 120 (38.83%)  |
| 10001 – 30000                                 | 62 (47.33%)   | 60 (33.71%)     | 122 (39.48%)  |
| 30001 – 50000                                 | 15 (11.45%)   | 19 (10.67%)     | 34 (11%)      |
| ≥50001  | 14 (10.69%)   | 9 (05.06%)      | 23 (07.44%)   |
| Average monthly cost of handset (Rs)          | Males (n=131) | Females (n=178) | Total (n=309) |
| ≤100  | 5 (03.82%)    | 8 (04.49%)      | 13 (04.21%)   |
| 100-500                                       | 86 (65.65%)   | 125 (70.22%)    | 211 (68.28%)  |
| 500-1000                                      | 28 (21.37%)   | 34 (19.1%)      | 62 (20.06%)   |
| 1000-2000                                     | 11 (08.40%)   | 11 (06.18%)     | 22 (07.12%)   |
| ≥2000   | 1 (0.76%)     | 0 (0%)          | 1 (0.32%)     |
| Average monthly expenditure on talk time (Rs) | Males (n=131) | Females (n=178) | Total (n=309) |
| ≤100  | 31 (23.66%)   | 35 (19.66%)     | 66 (21.36%)   |
| 101-300                                       | 54 (41.22%)   | 86 (48.31%)     | 140 (45.31%)  |
| 301-500                                       | 24 (18.32%)   | 36 (20.22%)     | 60 (19.42%)   |
| ≥500  | 22 (16.79%)   | 21 (11.8%)      | 43 (13.92%)   |

**[Table/Fig-4]:** Economic burden of Cell phone use

| Reason for disposal <sup>§</sup> | Males (n=387) | Females (n=417) | Total (n=804) |
|----------------------------------|---------------|-----------------|---------------|
| Broken/defective                 | 117 (30.23%)  | 185 (44.36%)    | 302 (37.56%)  |
| Lost                             | 74 (19.12%)   | 57 (13.67%)     | 131 (16.29%)  |
| Outdated                         | 196 (50.65%)  | 175 (41.97%)    | 371 (46.14%)  |
| Mode of disposal <sup>  </sup>   | Males (n=387) | Females (n=417) | Total (n=804) |
| Exchange                         | 73 (18.86%)   | 88 (21.1%)      | 161 (20.02%)  |
| Given to somebody                | 108 (27.91%)  | 110 (26.38%)    | 218 (27.11%)  |
| Lying waste                      | 107 (27.65%)  | 130 (31.18%)    | 237 (29.48%)  |
| Thrown away                      | 25 (06.46%)   | 32 (07.67%)     | 57 (07.09%)   |
| Stolen/missed                    | 74 (19.12%)   | 57 (13.67%)     | 131 (16.29%)  |

**[Table/Fig-5]:** Disposal pattern of handsets.

<sup>§</sup>Chi-square value = 17.61, df = 2,  $p < 0.0001$ . <sup>||</sup>Chi-square value = 5.6, df = 4,  $p = 0.2311$ .

## DISCUSSION

It was observed in our study, that boys were more inclined towards cell phones than girls. The average monthly costs of the handsets were significantly higher among boys than among girls. It was estimated that approximately 31.5% of the monthly expenditure of boys was spent on cell phones, whereas it was 26.55% among girls.

Prensky M. [5], stated that the cell phone usage had increased to more than 100% (the users had multiple handsets) in the UK, Italy, Sweden and the Czech Republic. In Asian countries also, namely, Taiwan, Hongkong and Japan, the cell phone use is increasing. A similar trend was seen among students, where 99.36% were using cell phones, while 68 (21.86%) were using more than one handset. Similar findings were noticed among Jordanian University [6] students, where approximately 30% students owned multiple handsets. The most common reason for the frequent changing of handsets was that they were outdated, which was because of the aggressive marketing by companies and peer pressure. Approximately 20% of the students had exchanged their handsets, which correlated well with the reports of the United States Environment Protection Agency, which had estimated that the end use collection of the handsets was below 20% [7].

In the current study, it was observed that 16.3% of the handsets were lost, while it was estimated that approximately eight million cell phones were lost in the year 2007 [8]. 29.5% handsets were lying waste. These handsets could be reused or recycled, depending on their conditions, but as the shelf lives of these handsets would increase, the chances of reusing them would be less. The reuse of a handset was a better option, as we observed that the life of a cell phone was left when it was disposed. So, its reuse would reduce the economic burden on the individual and it would also reduce the e-waste generation.

## RECOMMENDATIONS

As it was noticed that a good amount of money was spent on cell phones, the students and their parents should be counseled regarding the cost effective use of cell phones. An effort should be made to dispose off the handsets in environment friendly way, which can be done by creating awareness about the cell phone collection centres and by strengthening the collection chain. Further studies can be done to assess the pattern of the cell phone usage and the effects of the extensive use of cell phones.

## ACKNOWLEDGEMENT

We thank our students for sharing their information with us. We thank our office assistant, Mrs. S. Kousalya, for her help in the data entry.

## REFERENCES

- [1] Press release no. 86/2012, Telecom Regulatory Authority of India, <http://www.trai.gov.in/WriteReadData/WhatsNew/Documents/PR-TSD-Mar03052012.pdf>(accessed October 24,2012).
- [2] [http://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_number\\_of\\_mobile\\_phones\\_in\\_use](http://en.wikipedia.org/wiki/List_of_countries_by_number_of_mobile_phones_in_use)(accessed on June 15, 2012).
- [3] Nokia (2005b) Integrated product policy pilot project stage 2 final report: options for improving life-cycle environmental performance of mobile phones, Nokia, Espoo, Finland, September 2005.
- [4] [http://www.mospi.nic.in/nss\\_pressnote\\_508.htm](http://www.mospi.nic.in/nss_pressnote_508.htm). (accessed on June 15, 2012).
- [5] Prensky, M. 2005. What can you learn from a cell phone? Almost anything! *Innovate* 1 (5). <http://www.innovateonline.info/index.php?view=article&id=83> (accessed October 24,2012).
- [6] Dr. Khalid Al-Qudah. Mobile Phone Ownership and Usage among Students at Jordanian Universities; University of Sharjah. *Journal for Humanities and Social Sciences*. June. 2008; 5: 69-100.
- [7] EPA (2008) Fact sheet: recycle your cell phone—it's an easy call, EPA530-F-07-046, January 2008, US EPA. [www.state.nj.us/dep/dshw/recycling/whatsnew/cell\\_phones.pdf](http://www.state.nj.us/dep/dshw/recycling/whatsnew/cell_phones.pdf)(accessed October 26, 2012).
- [8] Bruce Hoard, 8M cell phones will be lost in '07 -- how to back yours up, *Computerworld*, July13, 2007, <http://www.computerworld.com/action/article.do?command=viewArticleBasic&articleId=9026944>(accessed October 26,2012).

### AUTHOR(S):

1. Mittal Anuj
2. Vedapriya Dande Rajasekar
3. Lavanya Krishnagopal

### PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Community Medicine, Aarupadaiveedu Medical College and Hospital, Kirumampakkam, Puducherry, India.
2. Associate Professor, Department of Community Medicine, Aarupadaiveedu Medical College and Hospital, Kirumampakkam, Puducherry, India.
3. Assistant Professor, Department of Pathology, Aarupadaiveedu Medical College and Hospital, Kirumampakkam, Puducherry, India.

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Mittal Anuj,  
Department of Community Medicine,  
Aarupadaiveedu Medical College and Hospital,  
Kirumampakkam, Puducherry-607402, India.  
Phone: 9952474094  
E-mail: dranujm@rediff.com

### FINANCIAL OR OTHER COMPETING INTERESTS:

None.

Date of Submission: **Nov 04, 2012**  
Date of Peer Review: **Nov 11, 2012**  
Date of Acceptance: **Feb 07, 2013**  
Date of Publishing: **Apr 01, 2013**