

A Study of Factors Affecting Awareness of SAR Value of Mobile Phone

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Abstract

Mobile /Cell phone is an inevitable part of ones life. Once been luxury has now become necessity. But while using cell phone for talking or being connected to someone the user gets exposed to harmful Electro Magnetic Radiations. The exposure rate to these radiations vary from handset to handset. This exposure is measured as SAR value of handset or the amount of Radio frequency energy absorbed by the human body while connected on cellular network.

The Research paper aims to measure the awareness of SAR value of handset in Kota city and the factors that influence awareness of SAR value.

Keywords: EMR, DoT, SAR value, awareness.

1. Introduction

Mobile phones often referred as a **'health time bomb'** are a part of our lives to such an extent that they are not merely restricted to the elite but is also one of the most common gadget owned by almost every individual. The voice function is only one of the enticing features and but features like texting, voice calls, internet browsing, music playback, multimedia features and a host of other user friendly options embedded in the handset which adds to the reasons of its acceptability. Besides, camcorders, ring tones, games, FM radio, push to talk (PTT), infrared and Bluetooth connectivity are the features that add to their rising popularity and acceptability

To communicate with the cellular network, mobile phones emit low levels of radiowaves (also known as Radio Frequency or 'RF' energy) when being used. While

using mobile phone we are getting exposed to EMR (Electro Magnetic Radiations), which are dangerous and becoming a serious health risk Governments around the world have adopted comprehensive international safety guidelines, developed by independent scientific organizations, governing the exposure to RF energy. Mobile phones have to be designed to operate within these stringent limits as per international safety guidelines. Every mobile phone model is tested for radio wave emissions. A measurement is made using an internationally agreed method that meets government and regulatory standards. This gives the SAR value, a mobile phone's Specific Absorption Rate which is a measure of the amount of Radio Frequency (RF) energy absorbed by the body when using the mobile phone handset. It is a measure of the maximum energy absorbed by a unit of mass of exposed tissue of a person using a mobile phone, over a given time or more simply the power absorbed per unit mass of human tissue. SAR values are usually expressed in units of watts per kilogram (W/kg) measured in either 1g or 10g of tissue. While there may be differences in SAR levels among mobile phone models, all of them must meet RF exposure guidelines.

2. International Exposure limits for RF fields (1800 MHz)

12 W/m ²	USA, Canada and Japan
9 W/m ²	Australia
2.4 W/m ²	Belgium
1.0 W/m ²	Israel
0.5 W/m ²	New Zealand
0.45 W/m ²	Germany
0.4 W/m ²	China
0.2 W/m ²	Bulgaria
0.1 W/m ²	Poland, france, hungary
0.095 W/m ²	Switzerland, italy

3. Studies Being Conducted in India related to EMR-

1. Indian Council of Medical Research (ICMR) supported an animal study (2005-08) entitled "Microwave radiations effects on reproductive systems of male rats" under Prof. J. Behari, School of Environmental Sciences, Jawaharlal Nehru University, NewDelhi. Ante oxidative changes were noticed in reproductive pattern of male rates and increase in the level of CAT activity The result obtained showed that the chronic exposure to these radiations cause double strand DNA breaks in sperm cells. This study also shows that the microwave radiation exposure can cause statistically significant decrease in the sperm count and testes weight
2. To study the adverse effects of cell phone the ICMR has initiated (June, 2010) a study in Delhi to examine whether use of cell phone create risk of

neurological disorders and reproductive dysfunctions. Measurement of specific absorption rate (SAR) from various types of cell phones and power density, wave length and frequency of RFR emitted from cell phone towers is also under study. These physical characteristics of RFR will be correlated with the clinical & laboratory findings.

3. Studies conducted in Guru Nanak Dev University, Amritsar has found correlation between mobile phone use (exposure to radio frequency radiations) and DNA and chromosomal damage in lymphocytes of individuals using mobile phones which may have long-term consequences in terms of neoplasia and/or age-related changes (Gandhi & Anita, 2007)⁸⁰. Exposure to radiofrequency radiations has been reported to affect physiological, neurological, cognitive and behavioral changes. (Gandhi et al. 2005).
4. **PGIMER, Chandigarh**, has conducted a study (Panda et al., 2010) and recommended following criteria's for the release of harmful rays from mobile phones.
 - Mobile phones should not be used continuously for more than one hour in a day.
 - Hands free technology to be used where excessive use of the mobile phone is unavoidable. This includes use of microphones and Bluetooth so that the handset remains away from the ear and thus avoids the direct impact of harmful electromagnetic radiations on the ear and the brain.
 - People to avoid long talks and discussions on mobile phones as far as possible.
 - On January 25, 2012, all indigenous manufacturers of handset were instructed by the Department of Telecommunications of India to make necessary changes in the design, software and packaging of their respective handsets. in compliance with these instructions by September 1, 2013. To regulate indigenous as well as imported mobile phones, the Bureau of Indian Standard (BIS) has been asked to frame standards for all mobile phones under the BIS Act 1986. All cellphone handsets sold in India will comply with relevant Bureau of Indian Standard's (BIS) benchmark, handsets will be covered by BIS standards and the DoT needs to approach them; however there are no provisions for such compliance under the Indian Telegraph Act.

It has therefore been decided that suitable amendments in the Indian Telegraph Rules under the Indian Telegraph Act 1885, shall be enacted so that government can enforce mandatory certification of SAR limit on mobile handsets. The DoT (Department Of Telecommunications) has also set a deadline that after September 1, 2013, only handsets with revised SAR value of 1.6 watt/kg averaged over 1 gram tissue would be permitted to be manufactured or imported. Compliance with the new norms will make Indian telecom regulations 10 times more rigid than they are in over the 90% of the countries across the globe.

Because of the everyday reliance on cell phones for business and lifestyle – people are unlikely to give up the use of their cell phones in the immediate future. Some important findings are:

- Nearly 4 new mobile phone subscribers added every second
- Mobile Phone sales to hit 206 million units by 2014
- There are 13 million cell phones sold every month in India
- India is World's Fastest Growing Mobile Phone Market: IDC Report
- Mobile Handset sales in India could top 322 million by 2015 –Technology Researcher, Gartner

The only alternative to avoid exposure to EMR is – The use of a scientifically-proven device that effectively neutralizes the effects of harmful radiation.

4. Literature Review

A survey with questions about SAR concern, SAR knowledge, importance to purchase decisions and ways to reduce exposure was developed and surveyed by commercial survey company (Circle Research, London, UK). In Australia, Brazil, Chile, France, Germany, India, Japan, Switzerland and the USA survey was conducted in order to provide a wide geographic spread and to include countries with recent interest related to expanded consumer access to SAR information (France, India, USA) and countries with existing voluntary initiatives related to SAR information (Germany, Switzerland). Results showed that consumers do not understand the SAR concept and it was the lowest ranked factor in purchase decisions. The most important factors in purchase decisions were network quality, phone experience and cost. For the small proportion of persons interested in SAR information almost half would seek this information from Internet searches, handset manufacturer websites or manuals and less than 20% would look for the information in retail outlets. Given the low understanding of SAR and low awareness of measures available to individuals to reduce their exposure, provision of information via websites and handset manuals, where supporting explanatory information can be supplied, are likely to provide the most effective consumer communication channels. (Jack Rowley, Chris Althaus, Michael Milligan)

5. Objectives Of Study

The Present study aims at analyzing the consumer awareness level as regards to the Specific Absorption Rate (SAR) of mobile phone users in Rajasthan. It will also help in understanding the influence of SAR values during purchase of mobile phone. The main objectives of study are as follows:

- To study Specific Absorption Rate (SAR) and its awareness among mobile phone users.
- To study the factors that influence mobile phone purchase behavior.

6. Research Methodology

The study is based on primary survey of 200 respondents belonging to kota city, using a structured questionnaire. The questionnaire was designed to record the responses on awareness of SAR values.. The socio-demographic profiles of the respondents were also recorded on the parameters such as gender, age, education level, occupation and monthly income. Simple data analysis techniques were adopted such as descriptive statistics; cross tabulation and chi-square test using SPSS 15.0. The Regression Model has been used to analyze the factors influencing the awareness level of consumers on SAR value.

7. Hypotheses

Gender has significant difference in awareness of SAR (Specific Absorption Rate) of mobile phones.

Occupation has significant difference in awareness of SAR (Specific Absorption Rate) of mobile phones.

Education has significant difference in awareness of SAR (Specific Absorption Rate) of mobile phones.

Age has significant difference in awareness of SAR (Specific Absorption Rate) of mobile phones.

Monthly Income has significant difference in awareness of SAR (Specific Absorption Rate) of mobile phones.

8. Discussion

8.1 Socio-Demographic Profile of Samples

Table 2 provides awareness of SAR value across socio-demographics of sample respondents. Of the total 200 respondents surveyed, 62 respondents had awareness of SAR values of mobile phone i.e. 31.% of total respondents. Males are comparatively more aware than females. This could certainly be interpreted by higher male literacy as compared to female literacy in the studied area. The majority of the respondents who were aware of SAR values were in the age below 45 years

Table 1: Demographics of Respondents.

Demographics	Frequency	Percentage %
<u>Gender</u>		
Male	121	60.5
Female	79	39.5

<u>Occupation</u>		
Students	42	21
Service	71	35.1
Business/trade	63	32.5
Housewife	14	7
Retired	10	5
<u>Education</u>		
< Secondary	2	1
Secondary/HigherSecondary	31	15.5
Graduated	76	38.0
Post graduate	64	32.0
Professional Study	27	13.5
<u>Age</u>		
<25	48	24
25-35	52	26
35-45	50	25
45-55	29	14.5
>55	21	10.5
<u>Monthly Income</u>		
<10,000	47	23.5
10,000 – 20,000	74	37
20,000 – 30,000	51	25.5
30,000 – 40,000	19	19.5
>40,000	7	3.5

Table 2: Awareness of SAR value.

Demographics	Awareness		Chi Square
	Aware	Unaware	
<u>Gender</u>			
Male	39	82	8.252 Accepted
Female	23	56	

<u>Occupation</u>			
Students	20	22	24.641
	30	41	Accepted
Service			
	9	54	
Business/trade	2	12	
	1	9	
Housewife			
Retired			
<u>Education</u>			
< Secondary	0	2	39.542
	5	26	Accepted
Secondary/HigherSecondary	22	54	
Graduated	20	44	
	15	12	
Post graduate			
Professional Study			
<u>Age</u>			
<25	13	35	20.353
25-35	22	30	Accepted
35-45	18	32	
	10	9	
	9	12	
45-55			
>55			
<u>Monthly Income</u>			
<10,000	5	42	
10,000 – 20,000	25	49	13.865
20,000 – 30,000	25	26	accepted
30,000 – 40,000	5	14	
	2	5	
>40,000			

9. Discussion

Education plays important role to enhance awareness among people. The results of chi-square tests revealed significant difference in education levels between those aware of SAR value and non-aware ($=39.542$, $p<0.10$), which implies that educated people are

comparatively more aware of SAR. It is also evident that about 11 percent respondents, with awareness on SAR values, were educated upto graduate level education. As for as occupations & income level of the consumers are concerned, majority of the respondents belong to service class and higher income levels and had higher level of awareness of SAR values

Table 3: Factors influencing Purchase of handset.

Factors	Very Important%	Important %	Can't Say%	Not Important %	Not at all Important %
Cost of handset	50	35	0	13	2
Battery Life	4	12	10	45	29
Handset Brand Reputation/ Goodwill	44	32	5	15	4
Screen Size	9	29	23	32	7
Ease of Use of handset	54	33	2	11	0
Specifications of camera	44	25	19	7	5
Applications	36	24	18	20	2
Handset Appearance	30	30	4	21	15
Ability of Internet Access	24	29	15	24	8
SAR Value/ Radiation Info.	5	4	80	11	0
Previous Experience of brand	45	54	0	1	0

10. Discussion

SAR value as a factor to influence purchase decision had very scarce % of respondents. 99% of the respondents gave due consideration to their previous experience of brand followed by 85% respondents who said that they give they consider cost of handset while purchase of handset, while only 9% .

On applying paired correlation highest positive correlation was found between cost of handset and previous experience of Brand while highest negative correlation was found between SAR value and previous experience of Brand.

Table 4: Regression Model Factors affecting consumer's awareness on SAR values.

	Beta	Standard error	Exp Beta	Sig.
Gender	0.698	.422	0.098	0.098
Occupation	0.514	.408	.205	0.205
Education	1.397	.426	4.043	.001
Age	0.580	.494	1.786	.240
Monthly Income	0.713	.413	2.040	.084
Constant	-3.092	0.633	0.045	0.0

The purpose of this nine country study was to assess

Factors Affecting Consumers' Awareness of SAR values of mobile phones

The Regression Model has been used to analyse the factors affecting consumer's awareness on SAR values. This model estimates the relationship between socio-demographic profiles of the consumers and SAR value concerns. Findings of regression analysis indicate that gender, education level, monthly income level were important socio-demographic factors affecting the awareness level of the consumers . Result indicates that male are more likely to be aware than femalet. Education of the consumers have significant role to play on awareness level. Consumer with monthly income of more than Rs. 10.000 to 30.000 are two-times more likely to have awareness on SAR values.

R- square was 0.524. Chi square was 98.6

11. Conclusions and Suggestions

From September 1, 2013 onwards it will be mandatory for every mobile phone brand to disclose the SAR value of respective handset which could not be more than 1.6W/Kg. Hence as the study suggest there is a need to create awareness about it. The SAR value information of the mobile handset should be available on the manufacturer's website and in the handset manual. The information on SAR values shall also be made available to mobile subscribers at the handset point of sale.

Further, all mobile handsets manufactured and sold in India or imported from international destinations shall be checked for compliance of the SAR limit.

References

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