

**A SUMMARY REPORT ON**  
**“A STUDY OF CONSUMER AWARENESS AND IMPACT OF SPECIFIC**  
**ABSORPTION RATE (SAR) ON MOBILE PHONE USERS OF**  
**RAJASTHAN”**

For registration to the degree of

Master of Philosophy

**IN THE FACULTY OF COMMERCE & MANAGEMENT**



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The mass hysteria that is known as the mobile phones in the modern world has become such an indispensable part of our lives that it has become impossible to live without it. Almost all of us would not imagine living without mobile phones in our hands.

A mobile phone, cell phone or hand phone is an electronic device used to make mobile telephone calls across a wide geographic area, served by many public cells, allowing the user to be mobile.

Mobile phones have a phenomenal impact on users world-wide. Their ingenuity was an integral part since their inception. The cellular phone business is today a multi-billion dollar industry with high profit margins. Little we know when telephones were first introduced, that they were set to embark on a revolution like never before. Although they made their foray a decade ago, the impact they have on the masses is incredible. It gets on thinking, if it is the technology or the resourcefulness which makes them so indispensable.

Mobile phones were first introduced in the early 1980s. The first hand-held mobile phone was demonstrated by ~~Dr Martin Cooper~~ of Motorola in 1973, using a handset weighing 2 kg. In 1983, the ~~DynaTAC-8000x~~ was the first to be commercially available. In the twenty years from 1990 to 2010, worldwide mobile phone subscriptions grew from 12.4 million to over 4.6 billion, penetrating the ~~developing economies~~ and reaching the ~~bottom of the economic pyramid~~.

There are many brands available in India and most popular among them are Nokia, Samsung, Motorola and LG mobiles. This industry is immensely popular and despite being a third world nation, India is one of the leading mobile phone users in the world.

Phones have impacted our lives to such an extent that it is not merely restricted to the elite but is also one of the most common gadgets owned by almost every individual. The voice function is only one of the enticing features and mobile phones have 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 its durability. Besides, camcorders, ring tones, games, radio, push to talk (PTT), infrared and Bluetooth connectivity are the features that add to their rising popularity.

Daily we are swimming in a sea of Electromagnetic Radiation (EMR) produced by electrical appliances, overhead power lines, wiring in buildings, and other technologies that are part of the modern life. From the dishwasher and microwave oven in the kitchen and the clock next to your bed, to the cellular phone you hold close to your ears, we are getting exposed to EMR, which is dangerous and becoming a serious health risk.

In India by March, 2011, 66% of Indian citizens were having mobile phones. At 861.48 million connections in April 2011 'Indian Telecom Industry' is the third largest and fastest growing in the world. Over the last 5 years, nine out of every ten new telephone connections have been wireless. Consequently, wireless now accounts over 95% of the total telephone subscriber base, as compared to only 40% in 2003. And the numbers are still growing for 'Indian Telecom Industry'. But to our concern, mobile phone also creates radiation when it is in use. This radiation is harmful for the human body.

Since the introduction of mobile phones, concerns (both scientific and public) have been raised about the potential health impacts from regular use. Electromagnetic Radiation (often abbreviated E-M radiation or EMR) is a form of energy exhibiting wave-like behavior as it travels through space. EMR from mobile phones, as well

as tower-based antennas carrying the signals have been found to develop health problems such as headaches, brain tumors, cancer, Alzheimer's and more. The effects are cumulative and safety measures should be taken now before it is too late.

To communicate with the cellular network, mobile phones emit low levels of radio waves (also known as Radio Frequency or 'RF' energy) when being used. 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, which must be below an agreed level. Only mobile phones that pass this test are allowed to go on sale.

A mobile phone's Specific Absorption Rate (SAR) 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. The higher the SAR the more radiation is absorbed.

Mobile handsets manufactured and sold or imported in India from other countries would be checked for compliance of Specific Absorption Rate (SAR) limit and no

mobile phone that is not comply to the international norms will be made or sold in India.

Mobile phones and mobile networks have sometimes been perceived as a threat is the widely reported and later discredited claim that mobile phone masts are associated with the ~~Colony Collapse Disorder~~ (CCD) which has reduced bee hive numbers by up to 75% in many areas.

This study aims at analyzing the consumer awareness level as regards the Specific Absorption Rate (SAR) of mobile phone users in Rajasthan. It will also help in understanding the impact of mobile phone radiations on its users and the extent of damage or harm it does to the human body.

The literature reviews had provided me with a background for understanding current knowledge on my topic. These papers provided a base to my study of research. These reviews helped me in understanding the impact of mobile phone radiations. It has also helped me to gain an insight into the harmful effects of mobile phone radiations.

Through the reviews studied, it was concluded that EMR from cellular phones have linked to develop health problems such as headaches, high blood pressure, brain tumors, cancer, Alzheimer's, and more. Inhabitants living nearby mobile phone base stations are more at a risk for developing neuropsychiatric problems. It also causes an increase in blood-brain barrier permeability through stabilization of endothelial cell stress fibers. It was also concluded through the reviews that children should be discouraged from using mobiles because their thinner skulls and developing nervous systems made them especially vulnerable.

**The objectives of the study were:**

1. To study mobile phone radiations and its working.

2. To analyze the harmful effects of mobile phone radiations on human body and to what extent.
3. To study the customer's viewpoints about the hazards of usage of mobile phones.
4. To study Specific Absorption Rate (SAR) and its awareness among mobile phone users.
5. To study the SAR value limits according to the established standards.
6. To study the relative market share of different mobile manufacturers, in the state of Rajasthan.
7. To study the factors that influence mobile phone purchase behavior.

**To meet the objectives of the study, following hypotheses were formulated and tested.**

1. People are aware of SAR (Specific Absorption Rate) of mobile phones.
2. Mobile phone radiations have adverse/harmful effects on human body.
3. Consumers consider SAR value while purchasing mobile phone.

**The research will benefit in future the various segments of the society such as:**

1. To the mobile phone manufacturers: The market research will certainly be valuable and important for mobile phone manufacturers who will come to understand their customers needs better.
2. To the prospective customers of mobile phone handset: The study will provide a comparative account of the pros and cons of different mobile handsets regarding its SAR value, which will help a prospective customer in selecting an appropriate mobile handset suiting his needs.

3. To the intermediaries of mobile phones: The following study will help the distributors to carefully analyze and choose the merchandise appropriate to usage of customers from the point of view their health.
4. To the academicians, researchers and students: It will help them understand the pattern of preferences and the psychological behavior of the consumers using and buying the mobile telecommunication handsets in Rajasthan.

### **Research methodology used**

The research design was based on the analysis of consumer awareness about Specific Absorption Rate (SAR) and impact of mobile phone radiations on human body on users of Rajasthan. So it was descriptive and exploratory research in nature.

The criteria of our sampling plan were as follows:

1. **Universe:** People who have cell phones
2. **Sampling Unit:** Individuals who use cell phones
3. **Sample Size:** Our sampling size is 200.
4. **Sampling Method:** Our sampling method was convenience random sampling. The respondents were selected by stratified sampling technique from a universe comprising of strata based on two criterions namely:

a) **Gender:**

Male respondents : 100

Female respondents : 100

b) **Age-group:**

<u>Age-group</u>	<u>No. of respondents</u>
16-25	50
26-35	50
36-45	50
46 and above	50

**Data collection:** The data was collected through Primary and secondary sources.

Primary data was collected through questionnaire from 200 respondents. Secondary data has been collected from websites available on Internet, especially that of the mobile phone manufacturers. Besides, the cyber forums also serve as source of secondary data, wherein the forum members provide the relevant secondary data available with them.

**Tools and techniques for data collection:** The research study is more of a behavioral study and so it is qualitative as well as quantitative in nature. It included a descriptive and exploratory research. Open ended and closed ended structured questionnaire was adopted for the collection of primary data and circulated among the respondents.

The data was analyzed using various statistical techniques like tabulation, histograms, pie charts, bar charts, etc. Descriptive statistics was done to draw conclusions regarding the brand preferred and the preference of mobile phone attributes.



**Scope of the study:** The present study was aimed at studying the awareness about SAR and its impact on the mobile phone users of Rajasthan. The primary data was collected from mobile phone users of Jaipur district of Rajasthan.

The study was mainly based on the primary data. In order to supplement the information reference to secondary data available on the Internet was used besides the published and unpublished materials like the Mobile phone manufacturer's annual report, newsletters, articles, journals etc.

**Limitations of the study:** The study suffered from the common limitations of a subjective research. The quantification problem, imperfections of data and the intricacy involved in the statistical analysis are in a way inevitable in all such behavioral science researches.

Main source of data being the primary source of data, manipulation at the respondent's end cannot be averted. Effect of uncontrollable extraneous variables may also influence the respondents sub-consciously.

The published and unpublished secondary data available on Internet has its own limitations, as many of them are the author's own views and not a generalized perception. Further, the respondents often times did not portray a true picture and opinion.

The conclusions, therefore, are subject to aforesaid constraints and are only exploratory and suggestive in nature.

## Findings

- Nokia mobile phones are preferred most followed by Samsung and blackberry.
- Users under 16-25 age group are most prone to quick change in handsets
- Only 5% people are aware of SAR and only 3% consider it while purchasing mobile phone. General public don't have any knowledge about this term SAR and its relevance to mobile phone radiations.
- Brand is considered the most dominating factor that consumer's prefer while purchasing mobile phone. Battery life and features are considered next followed by price and memory. Other features are considered last.
- People under 16-25 age group use mobile phone for longer hours as compared to other age group.
- People have reported some kind of uneasiness in body after using it for long period of time in a day. Problems were headache, ear pain, stress, etc.
- It was observed most of the people keep mobile phone within half meter from the body i.e. very near to body. College going students keep it very close to body as compared to people under higher age group.
- Though people are aware of the precautions to save themselves from mobile phone radiations, but they apply them very rare in routine. Precautions mainly used are
  - ✓ Kept away from body
  - ✓ Less use while charging

✓ Less use while driving

- It was found that most of the people do not talk on mobile phone while driving. One of the main reasons behind it is that prohibited by law to use it while driving.

## **Conclusion**

- Through this research it is concluded that most of the people are not aware of the term SAR. They don't have any idea as to what this term is related with. People with high knowledge, people working under mobile phone companies are the one who are aware of this SAR value and its relevance to mobile phone radiations.
- Through the survey it was found Nokia is the most demanded brand followed by Samsung. Other brands have an average demand. Though Samsung market share has increased recently, still Nokia dominates the market.
- People have recorded various problems what they feel after long hour's usage of mobile phone such as headaches, heart problems, blood brain barrier effect, genotoxic effects, ear problems, etc.
- People do not give any consideration to the SAR value of mobile phone while making the purchase, as most of them do not have any knowledge about it and others who have, don't.
- Adults use mobile phone for longer hours as compared to others. Thus they are more vulnerable to its radiations. The more time you spend talking on cell phones, the greater your risk of developing brain or eye cancer.

- People keep mobile phones very near to their body. It has been proved that keeping the phone very close to the body affects the tissues near it.
- The government report has also identified children, pregnant females and people with implants such as pacemakers as the most vulnerable group. These people should take precautions like keeping the phone away from implants and the abdomen in case of pregnant women.
- Children seem to be the worst hit by the extreme use of cell phones. It has been claimed that there is a 400 per cent increase in risk of brain cancer among teenagers using cell phones for long periods. The younger the child, the deeper is the penetration of electromagnetic radiation as children have thin skulls.
- Children's skulls are thinner and their brains contain more fluid than adults. Electromagnetic radiation travels more easily through liquids. Therefore, radio frequencies travel through children's brains much more easily. This puts children at a greater risk of developing cancer through exposure to EMR.
- Malignant brain tumors are the second leading cause of death in children (under the age of 15) and young adults (under the age of 34), according to NeurologyChannel.com. Brain tumors now cause more deaths among children than any other form of cancer, reports Sydney TV News.
- Headsets, including the ear buds that come with most cell phones today, have been shown to act as antennas, channeling the EMR directly into the ear canal. When you use regular ear buds or ear pieces, you're getting 3 times more EMR than if you held the cell phone against your ear, and you're getting it directly into your ear canal, and therefore into your brain.

- Just a two-minute call on a cell phone can alter the natural electrical activity of the brain for up to an hour.

## **Suggestions**

- The first thing we should keep in mind while buying cell phones is that it has low SAR or specific absorption ratio level.
- There should be some educational programs regarding SAR and its relevance with mobile phone radiations. Talk to others about cell phone safety.
- Do not use your phone more than necessary and keep your calls short. Send a text instead of making a call.
- If you plan to have long calls, using a wired handsfree is the alternative. Avoid Bluetooth and wireless handset.
- Use loudspeaker option when you don't need to talk anything private.
- Try to avoid using your phone if the signal strength is low - find a better location to make a call
- Try to use the phone outdoors rather than inside, or move close to a window to make a call.
- Avoid using a cell phone while in metal enclosures.
- Keep the phone as far as possible from your head.
- Keep the phone away from areas of the body such as eyes, testicles, breasts and internal organs.

- Limit usage as much as possible if pregnant.
- Don't allow children to use cell phones, except for emergencies.
- If using the phone without a headset, wait for the call to connect before placing the phone next to the ear.