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Abstract

Mobile phones have become very ubiquitous of late, as almost every one of us has a cell phone. In India by March, 2011, 66% of Indian citizens were having mobile phones. But in our concern, a mobile phone also creates radiation when it is in use. This radiation is harmful for the human body.

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 the 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.

EMR from mobile phones, as well as tower-based antennas carrying the signals have been found to develop health problems such as headaches, high blood pressure, 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.

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. 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.

This research paper aims at analyzing the consumer awareness level as regards the Specific Absorption Rate (SAR) of mobile phone users in Rajasthan and its relevance to radiations. The present study is aimed at studying the awareness about SAR, its relevance to mobile phone radiations and its consideration while purchasing mobile phones. The primary data is collected from mobile phone users in different districts of Rajasthan state.

Consumer Awareness of Term 'Sar' in Mobile Phones and Its Relevance to Radiations on Human Body

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Keywords: Consumer Awareness, Sar, Mobile Phone, Radiation, Mobile Phones

Mobile phones have become very ubiquitous of late, as almost every one of us has a cell phone. In India by March, 2011, 66% of Indian citizens were having mobile phones. But to our concern, a mobile phone also creates radiation when it is in use. This radiation is harmful for the human body.

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.

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. 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.

This research paper aims at analyzing the consumer awareness level as regards the Specific Absorption Rate (SAR) of mobile phone users in Rajasthan and its relevance to radiation.

OBJECTIVE STATEMENT

The objective of the study is to analyze the consumer awareness

level about Specific Absorption Rate (SAR) of mobile phone users of Rajasthan and its relevance to radiation on human body. These objectives can be summarized as follows:

1. To study Specific Absorption Rate (SAR) and its awareness among mobile phone users.
2. To study the SAR value limits according to the established standards.
3. To study the factors that influence mobile phone purchase behaviour.
4. To study the level of SAR value consideration while making a mobile phone purchase.
5. To study the impact of mobile phone radiation on human body.

HYPOTHESES:

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 radiation has adverse/harmful effects on human body.

SIGNIFICANCE OF THIS STUDY:

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. The study will provide them with feedback from customers about the impact of mobile phone radiation on them and will help manufacturers to maintain SAR value of the mobile phones accordingly.
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 their 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:** The research will prove informative for academicians, students and readers interested in methods and procedures of consumer behaviour research especially for mobile phones. This research will inform them about the harmful impact of mobile phone radiation.

RESEARCH METHODOLOGY:

Research methodology is a plan, structure and strategy for a proposed research work. It emphasizes upon the systematic methodology in collecting accurate information for interpretation.

RESEARCH DESIGN:

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

SAMPLING DESIGN:

A sampling plan is a detailed outline of measurements to be taken at what times, on which material, in what manner, and by whom. 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:** The respondents were selected by stratified sampling technique from a universe comprising strata based on two criteria namely:

a) Gender:

Male respondents	: 100
Female respondents	: 100

b) Age-group:

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

Our sampling method is convenience sampling.

DATA COLLECTION:

The data were collected through primary and secondary sources.

Primary Sources: Primary data are collected through questionnaire from 200 respondents. It is also collected through one to many chatting on internet, via instant messenger technique.

Secondary Sources: Secondary data have been collected from websites available on Internet, especially those of the mobile phone manufacturers. Besides, the cyber forums also serve as a 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 behavioural study and so it is qualitative as well as quantitative in nature. However, quantification of the subjective data was done using techniques like the rating scale technique. It included a descriptive and exploratory research. Closed ended structured questionnaire was adopted and circulated among the respondents for the collection of primary data.

The data are analyzed using various statistical techniques like tabulation, histograms, pie charts, etc.

SCOPE OF THE STUDY:

The present study is aimed at studying the awareness about SAR, its relevance to mobile phone radiation and its consideration while purchasing mobile phone. The primary data are collected from mobile phone users in different districts of Rajasthan state.

LIMITATIONS OF THE STUDY:

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

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

The published and unpublished secondary data available on Internet have their own limitations as many of them are the author's own views and not a generalized perception. Further, respondents often do not portray a true picture and opinion. The conclusions, therefore, are subject to aforesaid constraints and are only exploratory and suggestive in nature.

DATA INTERPRETATION

TABLE-1: Brand preferred while purchasing a mobile phone

SAMSUNG	NOKIA	BLACKBERRY	MOTOROLA	IPHONE
44	132	14	6	4
22%	66%	7%	3%	2%

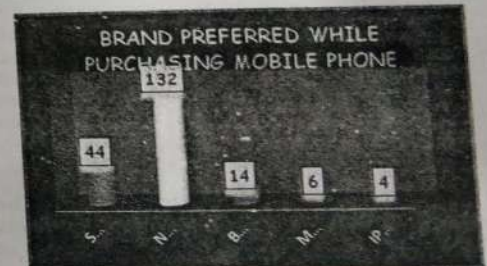


FIGURE -1

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Table 1 shows the brand preferred most while purchasing a mobile phone. It is found that Nokia is preferred the most followed by Samsung. Other brands have a very low preference.

TABLE-2: Does radiation emitted during the usage of mobile phones lead to any harm

YES	NO
134	66
67%	33%

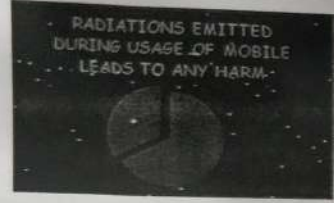


FIGURE -2

Table 2 shows that 67% of the respondents feel that radiation emitted during the usage of a Mobile phone leads to some harm. Problems reported were heart problems, headache, blood brain barrier effect, ear problems, etc.

TABLE-3: Awareness of the term 'SAR' associated with a mobile phone

YES	NO
10	190
5%	95%

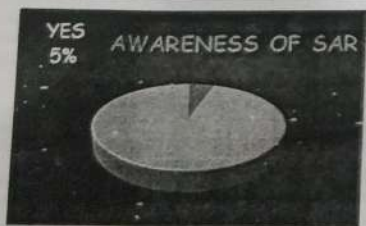


FIGURE -3

Consumer Awareness of Term 'Sar' in Mobile Phones and its Relevance...

Table 3 shows the awareness about the term SAR associated with mobile phone. It was found that only 5 % people were aware of it. People who are highly educated and the mobile phone shopkeepers are the ones who are aware of the term SAR.

TABLE-4: SAR value considered while purchasing mobile phones

YES	NO
6	194
3%	97%

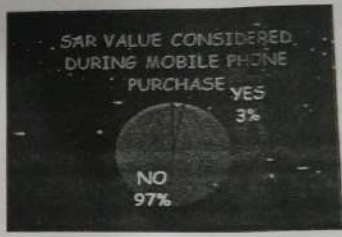


FIGURE -4

Table 4 shows SAR value consideration at the time of purchasing a mobile phone. It is found that only 3 % people consider SAR value while purchasing a mobile phone. And this SAR value is considered after considering other attributes like brand, memory, price, sound quality, looks, etc. Rest of the people are not aware of the term SAR as mentioned in table 5.

Most preferred attribute of a mobile phone considered while making a purchase
Through the survey it was found that people consider brand as the most important factor while making a mobile phone purchase. Sound quality and features are considered next followed by price and memory.

TABLE-5: Awareness among people about the precautions

YES	NO
122	78
61%	39%



FIGURE -5

Table 5 shows the awareness among mobile phone users about the precautions to save themselves from the harmful impact of mobile phone radiation. Graph 10 shows 61% of the people are aware about it. The precautions used most are:

- Kept at a little distance from the body.
- Use of headphones while talking.
- Used less while charging.
- Used less while driving.

FINDINGS AND CONCLUSIONS

Through this survey, it was analyzed that only 5% people are aware of specific absorption rate of mobile phones. General public doesn't have any knowledge about this term SAR and its relevance to mobile phone radiation. It was also found that only 3% of them consider SAR value while purchasing a mobile phone. Others don't as most of them have no awareness of it.

It has also been concluded that Nokia mobile phones are most preferred mobile phone brands followed by Samsung and Blackberry. Though Samsung's market share has increased recently, still Nokia dominates the market. Brand is considered the most dominating factor that consumer's prefer while purchasing a mobile phone. Sound quality and features are considered next followed by price and memory. Other features are considered least.

Through the study it was seen, that people in the 16-25 age group use mobile phone for longer



hours as compared to other age groups and are most prone to quick change in handsets. It was found that most of the people feel that radiation emitted during the usage of a mobile phone leads to some harm. People have reported some kind of uneasiness in body after long hours usage of a mobile phone. Problems were headache, ear pain, stress, etc. It was seen that most of the people keep mobile phones within half a meter from the body i.e. very near to body. College going students keep them very close to body as compared to people in higher age groups.

Though people are aware of the precautions to save themselves from mobile phone radiation, they apply them very rarely in routine. Precautions mainly used are

- Kept away from body
- Less use while charging
- Less use while driving

SUGGESTIONS

The first thing we should keep in mind while buying a cell phone is that it has low SAR or specific absorption ratio level, which determines the level of radiation that a phone emits and the lower the level the better it is. SAR is a value that corresponds to the rate at which radio waves are absorbed by the body of a person using a wireless handset. The lower the SAR number, the better it is. Many cell phone manuals indicate the SAR number of that particular model.

There should be some education programmes regarding SAR and its relevance to mobile phone radiation. Talk to others about cell phone safety.

While using the phone we should try to keep the conversation short and should send texts whenever possible. If you plan to have long calls, using a wired handset is the alternative, though a Bluetooth headset also produces less radiation than a phone held directly to the ear does. Use loudspeaker option when you don't want to talk anything private. Always keeping the phone near your ears may cause problems for the ears as well as your brain.

Another very important point to remember is that cell phones emit more radiation in areas where the network signal is weak, as the mobile phone tries to search for the network. So it's best to avoid phone calls in such areas. Try to use the phone outdoors rather than inside, or move close to a window to make a call, avoid lifts, basements etc. While at home or in office you can always use a landline or wired phone, which doesn't emit any radiation at all.

Avoid making calls when travelling fast. A cell phone automatically increases power when it is moving at high speeds (such as in a car, train, subway, or plane) as it attempts to connect to the next cell phone base station.

The electromagnetic fields are the strongest when your cell phone is connecting. If you don't want to use the speakerphone, put it up to your ear after the connection has been made (use the speakerphone while it's connecting).

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Even for healthy adults it is advisable that they should keep the phone away from sensitive parts of their body such as eyes, chest and testicles.

Don't allow children to use cell phones, except for emergencies. It's wise to teach your children why you don't want them to use cell phones. Avoid using a cell phone if you are pregnant. Don't use a cell phone with a baby or a young child on your lap or in your arms. The developing organs of the fetus or child are the most sensitive to any possible effects of electromagnetic radiation (EMR) exposure.

Cordless phones aren't safe either. The base of any cordless phone emits high levels of EMR, even when the phone is not being used.

By moving the cell phone just 5 cm (approximately 2 inches) away from your head while talking on it, you reduce by 75% the electromagnetic radiation that reaches your head. EMR decreases in direct proportion to the distance the source is from your body.

A headset is a cell phone accessory that can considerably reduce radiation exposure to the brain. Not a Bluetooth headset or a wireless headset but a headset that plugs into the phone, eliminates cell phone radiation near your brain.

Avoid Bluetooth and wireless headset: These cell phone accessories produce their own radiation along with the radiation produced by the cell phone. The use of these accessories must be avoided.

Use an air tube headset with ferrite beads. This type of headset is believed to be safer, because EMR can't travel up the air tube like it does on a regular wired earphone. Unlike regular headsets, the air tube headset doesn't act as an antenna.

APPLICATION OF RESEARCH AND SCOPE FOR FURTHER STUDY

In order to back up and strengthen the outcomes and conclusions in this study, it is important that there is further research in mobile phone radiation and its awareness. Suggestions for further researches include:

- Research involving more multinational companies involved in manufacturing safe radiation free mobile phones.
- Research from the angle of ethical and social responsibility of people and mobile phone manufacturing companies.
- Research on investigating more kinds of precautions to save people from mobile phone radiation.

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