

SAR and Mobile Phone Radiation Hazard. How Aware are College Students in Delhi?

Daminee Saini

Department of Computer Science, Indraprastha College for Women, University of Delhi

Abstract: Mobile phones have become the most common gadget in the world today and are found in the hands of students most of the time. With advancement in mobile technology, usage of mobile phones has increased significantly. Mobile phone functioning uses electromagnetic radiation in the microwave range, which may be harmful to human health. Research has focused on this aspect since the invention of mobile phones and there seems to be a consensus that mobile phone radiations have an impact on human beings. However, no concrete scientific assessment of the impact of mobile phone radiation (MPR) on human beings has been made available. As a result, impact of MPR on human health is a research area requiring greater investigation. The following research contribution attempts to assess the awareness of undergraduate student community about radiation threat posed by the usage of mobile phones. We find that while students are concerned about various specifications of their mobile phones, the knowledge and awareness about MPRs is wanting.

Keywords: mobile phone radiation, human health, student community.

A mobile phone is a portable telephone that can make and receive calls over a radio frequency link while the user is moving within a telephone service area. Mobile phones have become a significant part of our daily life, especially for students for whom it is the key to their virtual world. Mobile phones operation requires electromagnetic radiations in the microwave range. The World Health Organization reviewed studies on mobile phone safety and has classified these radiations as "possibly carcinogenic to humans" (WHO, 2014). WHO places mobile phones in Group 2B, i.e. 'possible' human carcinogen. A categorization in 2B implies that there is convincing evidence that the agent causes cancer in

experimental animals but little or no information about whether it causes cancer in humans (IARC, 2015).

An overview of literature on the impact of mobile phone radiation (MPR) on human beings provides a confusing picture. Dreyer et al. (1999) have reported that exposure to MPR caused cultured human cells to shrink. However, AlOrainy (2003) found no association between brain tumour and MPR. Hardell (1999) found that exposure to MPR made a type of worm more fertile. These studies have indeed at least pointed out that exposure to heat is not the only potential threat to brain cells from mobile phones. Huber (2003) demonstrated that the exposure to Radio Frequency Electromagnetic Fields (RF EMF) emitted by mobile phones has an effect on brain physiology. In India, the Department of Telecom (Government of India) has been running a campaign to inform the citizens that, "most laboratory studies were unable to find a direct link between exposure to Radio Frequency radiation and (human) health" (DoT-GoI, 2012).

Although the debate whether MPRs cause cancer or not is far from over, its initial arguments are convincing enough to urge us to reduce our exposure to MPRs. An obvious way to accomplish this is by choosing a phone with a lower Specific Absorption Rate or SAR. SAR is a measure of the maximum energy absorbed by the unit mass of exposed tissue of a mobile phone user over a given time. SAR values are usually expressed in units of Watts per kilogram in either 1.0 g or 10.0 g of human tissue. The SAR standard value for mobile phones has been set to 1.6 Watts of energy absorbed per kilogram of body weight (1.6 W/Kg averaged over 1.0 g of human tissue). Because there is no conclusive evidence of the impact of MPR on human health (Jokela et al., 1999), the SAR limit has been set due to the thermal effects of MPR (any kind of RF radiation can heat up human body tissue considerably) and not to mitigate other radiation related impacts such as DNA damage or cancer.

Email for correspondence: damineesaini@yahoo.in

The following research contribution is an attempt to analyze the awareness of the student community in Delhi (India) on the issue of MPR and its health impact. Students are prominent mobile phone users and are thus exposed to MPRs greatly. An attempt was made to find out if this section of the society is aware of ongoing debate about MPR and its health impacts and also about regulations such as SAR which are in place. A survey sheet was prepared and 100 students randomly selected from various colleges of Delhi were surveyed during January-February 2017 on their mobile phone usage and awareness. The survey responses were then analysed to assess student awareness towards the health concerns related to their mobile phone usage.

The survey revealed that the most popular mobile brand in the sampled population is Samsung, followed by Xiaomi and Motorola (Fig. 1). Samsung J7 and Xiaomi's Redmi Note 3 were found to be the most popular models.

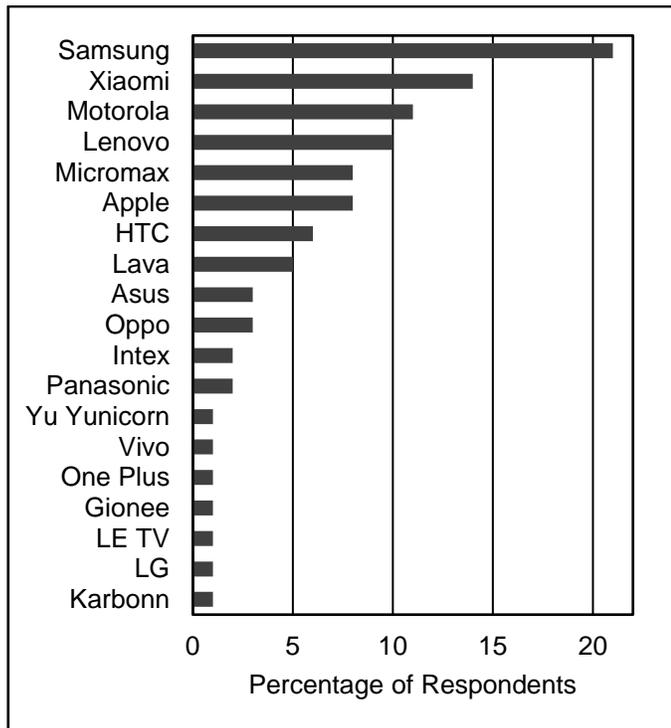


Figure 1. Popularity of mobile phone manufactures in the surveyed population.

According to the surveyed population, the most popular specification or feature of a mobile phone is camera. 36% of the respondents stated 'better camera' to be the reason why they bought the phone they are using. More 'powerful RAM' and 'cost effectiveness' were other top factors respondents considered before purchasing the phone they are currently using. 50% of the respondents

were found to have changed up to two phones, 45% were found to have changed up to 3-5 phones and 5% were found to have changed 6-8 phones since the purchase of their first mobile phone.

The survey revealed little awareness about the concept of SAR value in the respondents. 88% of the respondents were not aware of what is an SAR in terms of MPR and 89% of the respondents were not aware of any radiation limit (permissible value) that has been assigned for MPR (Fig. 2).

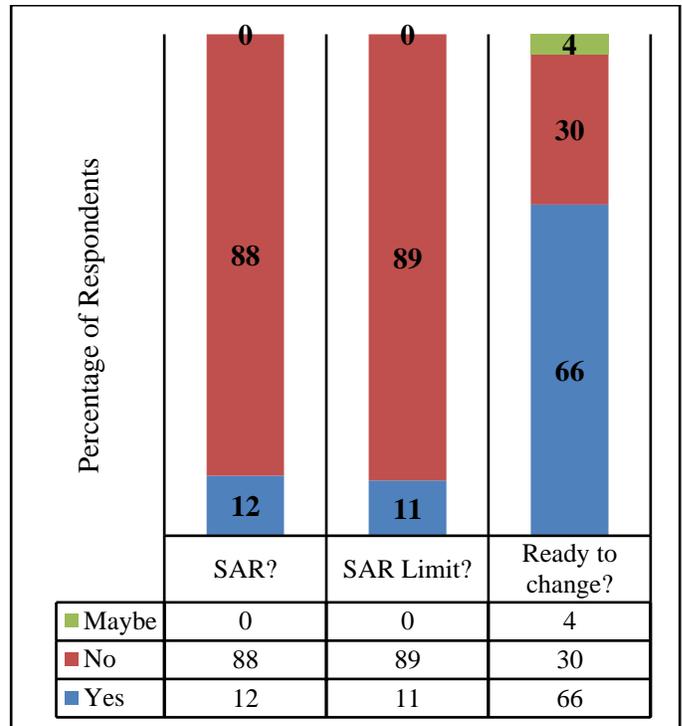


Figure 2. Awareness of respondents about SAR (SAR?), prescribe standard of SAR (SAR Limit?) and willingness to change mobile phone if it is found to emit high MPR (Ready to change?).

Interestingly, 66% of the respondents were found to be willing to change their mobile phone if they found that it is emitting radiations beyond the permissible value Fig. 2). 30% of the respondents, who did not show willingness to change their mobile phone in case it was emitting radiations beyond the permissible value cited additional financial cost to be the reason for their choice. One student in the surveyed population had changed the phone from a high SAR value phone to a lower SAR value phone, after becoming aware of the meaning of SAR.

The impact of MPR has to be directly proportional to the amount of time mobile phone users spend on the mobile

phone or the amount of time for which they keep it close to their body. Almost half the surveyed population was noted to be spending more than 16 hours per day with the mobile phone close to their bodies (Fig 3). Only 23% of the surveyed population reported spending less than 8 hours per day with their mobile phones.

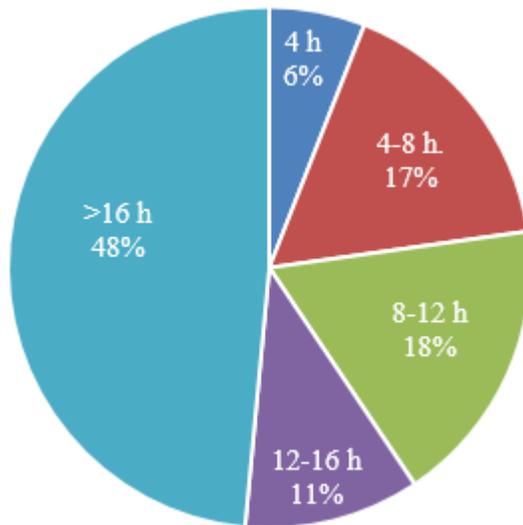


Figure 3. Duration in hours (h) spent with mobile phone close to the body.

Regulations notified by the Government of India require every mobile phone to display the SAR value of the model so the consumers can make an informed decision before each purchase (DoT-GoI, 2012). This information can be retrieved by dialing the following Unstructured Supplementary Service Data (USSD) code on individual mobile phone: *#07#. Some old mobile phone models do not have this code enabled.

The surveyed population carried new or (software) updated mobile phones and was asked to check their mobile phones SAR value using this USSD code. The USSD code was shared with those who were unaware about how to find the SAR value of their mobile phones. 68% of the sampled population was found to carry a mobile phone with SAR value less than 1.50 W/kg (Fig. 4). 4% of the mobile phones of the sampled population noted SAR value between 1.50 W/kg and 1.59 W/kg.

The permissible level for SAR in India is 1.60 W/kg. Interestingly, 28% of the mobile phones of the sampled population either did not respond to the *#07# USSD code or simply returned a message that the phone was complying to the SAR regulation (Fig. 4). All these mobile phones were either new or had their software

updated to the most recent version. The users of these mobile phones therefore cannot find out how exposed they are to MPR and if their mobile phone is compliant to the SAR standard value of 1.60 W/kg. They had also not checked while purchasing the mobile phone.

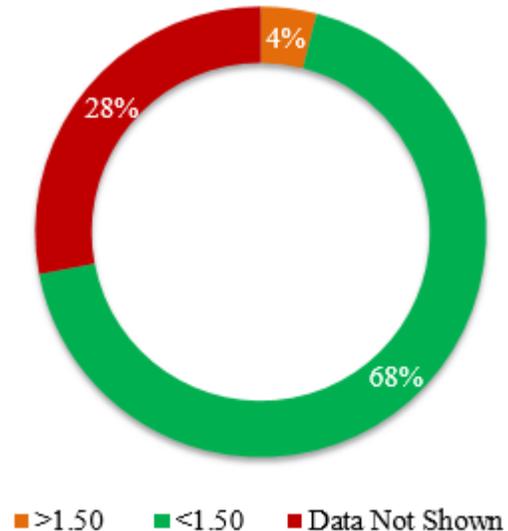


Figure 4. Real time SAR values of mobile phones being used by the surveyed population.

Mobile phones are a relatively recent phenomenon and research has only begun to find out the impact of consistent exposure to MPR on human health. Most research focuses on short-term impacts and for some obvious and not so obvious reasons, research on long-term impacts of MPR on human health is wanting. Some researchers have hinted that long-term use of mobile phones is bound to cause diseases such as Alzheimer's, migraine, infertility, cancer, eye defect, insomnia, depression, electromagnetic hypersensitivity and interface Maregu (2016). There is thus an urgent need to take the issue of MPR more seriously and establish any harmful effects it may have on human population in the long run.

There is also a need for creating awareness among the youth on MPR exposure and its regulation measures such as prescribed standard SAR values. This may be achieved through Government's intervention of disseminating relevant information through mass media. Parents also have a role to play in selecting a mobile phone for their children. Thus, such a media camping should target all sections of the society. The Government also needs to ensure that every mobile phone company displays the SAR value of individual mobile phone models and rules may be framed for taking action against those mobile phone companies who are hiding this information.

Acknowledgement

The author would like to acknowledge the mentorship of Dr. Govind Singh from the Department of Environmental Studies, Indraprastha College for Women, University of Delhi for the ongoing research project with the same title.

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