

Prevalence of Ringing Delusion among Mobile Phone Users

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ABSTRACT

The exponential application of mobile technology has led to a concern about implications of electromagnetic radiation on human health. As we are aware that mobile phone radiates EMR when users communicate to others and that time subscribers of the device are regularly exposed nearby 40% - 50% of total mobile irradiation. We analyzed the risk of "Ringing Delusion" among normal users, moderate users and heavy users when compared to low users. Although the "Ringing Delusion" has not been added in medical terminology but we found frequently such kind of symptoms among mobile phone users. "Ringing Delusion" may be considered as an imagination of ringing voice from cellular phone. The risk was also compared between urban and rural, male and female and adult and children population. The information was gathered through well designed questionnaires for cellular user's demographic and social characteristics, adopted safety measures and calling duration. Prevalence of "Ringing Delusion" among rural users was higher than the urban users. A trend for the risk was also observed in male users in comparison to female. Study may support innovators to re-examine health effects of mobile phones.

Keywords: Extensive User; Mobile Phone; Ringing Delusion; Survey Study; Questionnaire; Sensitivity

1. Introduction

The mobile communication has been a blessing to all human beings and exponential application of mobile phone is a matter of health debate among clinicians and technocrats. Particularly adolescent and children are more fascinated to make use of the mobile phones. Developing phase of the children's brain and its hypersensitivity to microwave tends to concern about the possibilities of the symptoms by mobile irradiation. Ringing delusion is one of the common symptom or sensation which has been frequently reported by mobile phone users. Although we have not found the term "Ringing Delusion" in medical terminology but we may define or understand such kind of delusion as psychological sensitivity in which a mobile phone user feels ringing voice of the device suddenly, but in actual there is no ringing of the device. In the race to adopt new technologies, we often ignore the ill effects of the technology and do not realize about it. Presently people are adopting the wireless communication devices for varied purposes. They feel comfortable when they communicate to others through wireless communication devices in the air instead of wire. Most of these devices work in the radio frequency/microwave range. Microwave may cause thermal effects at high exposure levels. Research about the possibility of radiofrequency fields, associated with mobile phones indicated to cause other adverse health effects

due to over usage. Our previous study [1] has concluded that the extensive users, they hold mobile phone for a period above 3 years, were more attentive for "headache" symptom in comparison to normal users.

An established effect from mobile irradiation, even small, could affect public health [2]. The effects of microwave through the mobile phones may produce accumulated adverse effects over time. The increasing popularity of wireless communication/cell phone has caused a concern over possible adverse effects of this energy on the human health. Over the past few years, several studies have suggested that radiation emitted by a cell phone can interact with brain activity and behavior [3-7], gene expression and DNA [8-13], cell growth, proliferation and tumours [14-20], hormones, proteins and enzymes [21-27]. There are studies not support the health hazard from radiofrequency radiation [28-33], but this does not prove the non-existence of the hazard. This paper is an attempt to make the reader aware of possible threat to human life and ecosystem, caused by mobile devices and wireless communication systems.

Electric currents exist naturally in the human body and are an essential part of its physiology. All nerves relay their signals by transmitting electric impulses. Most biochemical reactions *i.e.* associated with digestion and transmission of impulses in brain activities electric processes. The effects of external electromagnetic fields on the human body depend on the electromagnetic field

frequency and their magnitude or strength. The frequency simply describes the number of oscillations or cycles per second. At low frequencies electromagnetic field passes through the body while at radiofrequencies the fields are partially absorbed and penetrate only a short depth into the tissue. Low frequency electric fields influence the distribution of electric charges at surface of conducting tissues and cause electric current to flow in the body. Low frequency magnetic field induces circulating currents within the human body. The strength of these induced currents depends on the intensity of the outside magnetic fields and the size of the loop through which the current flows. When sufficiently large, these currents may cause stimulation of nerves and muscles. At radiofrequencies, the fields penetrate a short distance into the human body. The energy of these fields is absorbed and transformed into the moving molecules that result in a temperature rise. The levels of radiofrequency field to which people are normally exposed in our environment are lower to produce significant heating effect. Wireless communication devices emit radiofrequency radiation (includes electromagnetic waves, ranging from 300 KHz to 300 GHz frequencies) and have different interactions and modulations which give rise to biological effects. The human body significantly absorbs electromagnetic radiation (when the frequency exceeds about 15 MHz) and the rate of absorption varies for different parts of the body. In the frequency range of 70 - 100 MHz, which overlaps the TV and FM radio broadcast frequencies, the body acts as an efficient radiation antenna strongly absorbing these wave lengths. The different frequencies of radiofrequency radiation have widely differing wavelengths which result in different coupling by the body. KHz waves are very long, approximately 300 meters and have maximal coupling. The higher MHz and GHz waves are centimeters/millimeters in length respectively and yield exposures in localized deposition areas of skin, eyes, testis, head or superficial layers of the body. Thus, energy deposition into the body is complex and varies across the radiofrequency spectrum. Once radiofrequency radiation is coupled to the body, it can interact to cause biological effects. It is general agreement that if sufficient energy is absorbed it can cause heating by the rapidly alternating field agitating dipolar molecules particularly water and cause deleterious effects like warming food in a microwave oven. The present safety standards for radiofrequency radiation are largely based on preventing these effects from heating, the lower frequency (below to 10 MHz) may cause currents of biological significance. In this study we tried to evaluate the risk of the common sensitivity "ringing delusion" among the normal, moderate and heavy users when compared to low users in different ethnicities. Further, to examine the risk of the ringing delusion among urban and rural, male and female,

adult and children population were the main objects of our study.

2. Methodology

The risk assessment of the "Ringing Delusion" among normal users and extensive users was analyzed through a survey study. Randomly selected 659 mobile phone users in the country were enquired by survey questionnaire for their demographic and socio-economic characteristics, utilization pattern, safety measures, and utilization of the device.

The questionnaire was pre tested on some individuals and modifications were done before final administration to the subjects. The questionnaire was filled by a single experienced investigator so that there was no chance of intra observer error. The details of study parameters are described in **Tables 1-3**.

3. Data Analysis

The information for each subject from the questionnaire was transformed into Micro Soft Excel sheet and cross tabulated using SPSS 15.0 soft ware. The significance

Table 1. Demographic and social characteristics.

S. No.	Characteristics	Classifications
1.	Gender	Male
		Female
2.	Educational Level	Primary School
		Secondary School
		Higher Secondary School
		University (UG or PG)
		Doctoral Professional Education (Engineering/ Management/Medical Course)
3.	Income (Monthly in Rs)	No Income
		≥Rs 5,000
		<Rs 5,000 - Rs 10,000>
		≤Rs 10,000 - Rs 20,000> ≤Rs 20,000
4.	Family Detail	No of Family Members
		No of Mobile Telephone User
		No of Teenagers/Children (Below 20 years)
		No of Children (Who has own Mobile Telephone)

Table 2. Mobile phones utilization patterns.

S. No.	Characteristics	Classifications
1.	Frequency of use	Non-regular use (<1.5 years)
		Regular use (>1.5 years)
2.	Life-time years of use	≤1.5 years - 3 years>
		≤3 years - 5 years>
		≥3 years
3.	Number of calls per day	Dialed calls
		Received calls
4.	Hours of use per day	≥1.5 hours
		<1.5 hours - 3 hours>
		≤3 hours - 5 hours>
		≥5 hours
5.	Mode of use	Ringling mode
		Vibration mode
		Both (Ringling + Vibration) Mode
6.	Technology used in cellular telephone	GSM handset
		CDMA handset
		Both (GSM + CDMA) handset

prevalence of signs and symptoms in relation to age, sex and duration of use of mobile phones was tested using Chi Square Test. Fisher’s exact test was used where expected cell frequencies were less than five. The level of significance was considered for $P < 0.05$.

4. Results

In this study, randomly selected 659 mobile phone users of age, from 14 to 62 years, were enquired as per designed questionnaire. Ringling delusion may realize a delusion of ringling voice from mobile phones but in reality there were no ringling from the device at same time. In point of fact the term ‘ringling delusion’ was adopted only in case of mobile phone users. Near one fourth participants (163) of the survey were found to be associated with self reported ringling delusion (**Table 4**). Prevalence of ringling delusion among 659 mobile phone users was analyzed among NU, MU and HU when compared to LU. Number of mobile phone users belonging to LU, NU, MU & HU were 217 (32.9%), 140 (21.2%), 209 (31.7%) & 93 (14.1%) respectively. Overall ringling delusion was associated to 24.4% of LU, 22.1% of NU, 24.4% of MU and 30.1% of HU. The significant association was not found within these individual groups in

Table 3. Adopted safety measures.

S. No.	Characteristics	Classifications
1.	Which ear side user holds their cell phone during call?	Left ear side
		Right ear side
2.	Do you use safety device during talking on mob phone?	Ear phone
		Blue tooth
		Speaker mode
		No device
3.	Where you hold your mobile phone generally?	Mobile holder in belt
		Left side shirt pocket
		Right side shirt pocket
		Left side pant pocket
		Right side pant pocket
4.	Do you switch off your mobile phone in nights?	Hanging in neck
		In bag
4.	Do you keep your mobile phone near head during sleep?	Yes/No
5.	Do you keep your mobile phone near head during sleep?	Yes/No

overall analysis for ringling delusion. The similar results were found in male, female and children population when compared to each other. The children participants in this study were found inadequate. Only 35 children mobile phone users participated in the survey and 5 users of them were only reported ringling delusion. Furthermore, there was no significant association found for ringling delusion among all groups of children and adult users. Also, no risk was observed among urban and rural users for ringling delusion. However, a trend was observed within HU of urban areas (0.098) when compared to LU of same ethnicity (**Table 4**). Consequently study revealed that there was no association found for the symptom ringling delusion among mobile phone users in Indian population. But study should reexamine in different ethnicities among similar population.

5. Conclusions

We can intensify this research for the ringling delusion as:

- 1) Prevalence of ringling delusion was higher in rural than the urban mobile phone users but a trend for the risk of symptom was found in male mobile phone users when compared to female mobile phone users.
- 2) Prevalence of ringling delusion was higher in rural. Than the urban mobile phone users but a trend for the risk of symptom was found in male mobile phone users adult mobile phone users.
- 3) Prevalence of ringling delusion was higher in rural

Table 4. Prevalence of ringing delusion.

Participants		Low User	Normal User	Moderate User	Heavy User
Overall	MP users (659)	217 (32.9%)	140 (21.2%)	209 (31.7%)	93 (14.1%)
	Cases of Ringing Delusion (163)	53 (24.4%)	31 (22.1%)	51 (24.4%)	28 (30.1%)
	P-value	-	0.620	0.996	0.297
	OR (95%CI)	Reference	0.880 (0.531 - 1.458)	0.999 (0.642 - 1.554)	1.333 (0.776 - 2.289)
Male	MP users (460)	145 (31.5%)	93 (20.2%)	155 (33.7%)	67 (14.6%)
	Cases of Ringing Delusion (121)	39 (26.9%)	22 (23.7%)	41(26.5%)	19 (28.4%)
	P-value	-	0.577	0.931	0.824
	OR (95%CI)	Reference	0.842 (0.461 - 1.539)	0.978 (0.586 - 1.631)	1.076 (0.564 - 2.052)
Female	MP users (199)	72 (36.2%)	47 (23.6%)	54 (27.1%)	26 (13.1%)
	Cases of Ringing Delusion (42)	14 (19.4%)	9 (19.1%)	10 (18.5%)	9 (34.6%)
	P-value	-	0.968	0.896	0.122
	OR (95%CI)	Reference	0.981 (0.386 - 2.492)	0.942 (0.382 - 2.319)	2.193 (0.810 - 5.942)
Children	MP users (35)	16 (45.7%)	9 (25.7%)	10 (28.6%)	NF
	Cases of Ringing Delusion (5)	4 (25.0%)	NF	1 (10.0%)	NF
	P- value	-	NF	0.361	NF
	OR (95%CI)	Reference	-	0.333 (0.032 - 3.515)	NF
Adult	MP users (624)	201 (32.2%)	131 (21.0%)	199 (31.09%)	93 (14.9%)
	Cases of Ringing Delusion (158)	49 (24.4%)	31 (23.7%)	50 (25.1%)	28 (30.1%)
	P-value	-	0.882	0.862	0.300
	OR (95%CI)	Reference	0.962 (0.574 - 1.611)	1.041 (0.661 - 1.639)	1.336 (0.773 - 2.311)
Urban	MP users (489)	159 (32.5%)	97 (19.8%)	160 (32.7%)	73 (14.9%)
	Cases of Ringing Delusion (110)	34 (21.4%)	19 (19.6%)	34 (21.3%)	23 (31.5%)
	P-value	-	0.731	0.977	0.098
	OR (95%CI)	Reference	0.896 (0.478 - 1.679)	0.992 (0.580 - 1.695)	1.691 (0.907 - 3.152)
Rural	MP users (170)	58 (34.1%)	43 (25.3%)	49 (28.8%)	20 (11.8%)
	Cases of Ringing Delusion (53)	19 (32.8%)	12 (27.9%)	17 (34.7%)	5 (25.0%)
	P-value	-	0.601	0.833	0.518
	OR (95%CI)	Reference	0.795 (0.335 - 1.883)	1.090 (0.488 - 2.437)	0.684 (0.216 - 2.163)

N.B.-LU: Low User (≤ 500 hours); NU (>500 and ≤ 1000 Hours); MU (>1000 and ≤ 5000 Hours); HU (>5000 Hours); MP: Mobile phone; NF: Not Found cases; Data was analyzed using binary logistic regression test; P-value < 0.05 was considered as significant; OR: odds ratio; CI: confidence interval.

than the urban mobile phone users.

4) The ringing delusion was complied higher by male than the female mobile phone users.

5) An association was found for ringing delusion among mobile phone users who put mobile phone near head compare to those who did not put mobile phone near head during sleeping in night.

6) Among urban population, risk for the trend for ringing delusion was observed in HU than the LU.

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