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Research Article

A Study of Histological Effects of Chronic Exposure to a 2G Cellphone Radiations (900-1900MHz) on Kidneys of Albino Rats

Purohit Jaya[1*], Sushma K. Kataria[2], Leena Raichandani[3], Kushal[4], Surbhi Raichandani[5]
Dr. S. N. Medical College, Jodhpur, Rajasthan, India

***Corresponding author**
Miss Purohit Jaya
Email: ja.yapurohit@yahoo.com

Abstract: The present study investigates the possible histological effects of isothermal non ionizing electromagnetic field (2G mobile phone 900-1900 MHz) on the kidneys of Albino Rats. Thirty Albino rats of both sexes were divided in to two groups A and B, each group having 15 numbers of rats. Group A served as control and group B was exposed to cell phone radiations of frequency in range of 900-1900 MHz, one hour per day for two months. At the end of two months exposure period, Albino rats were sacrificed using cervical dislocation method and histological alterations in treated group were observed. The kidneys showed sclerotic glomerulus, hyalinized tubules, leukocyticinfilterations in interstitial tissues, congestion as well as dilatation of blood vessels. In conclusion, the results of this study indicated that exposure to isothermal non ionizing radiation could produce histological effects on kidneys. It is suggested that long term use of mobile phones should be avoided with prohibition of keeping phones in pocket or belt cover for longer time.
Keywords: Electromagnetic radiations (EMR), Kidneys, Albino rats.

INTRODUCTION

Over the past decade, the use of mobile phones has significantly increased. Every technological development comes with some element of health concern, and cell phones are of no exception. Various studies have reported the negative effects of cell phone exposure on human health [1].

Humans beings are continuously exposed to electromagnetic fields (EMF) generated from various electrical devices [2]. A cellular phone is basically a radio that sends signals on waves to a base station [3]. All of the electronic equipments that are used in our daily life creates EMF [4]. In recent years histological and physiological studies have increased evaluating the effects of electromagnetic fields on human health [5-7]. Researchers have reported that extremely low frequency EMF induces tissue damage in different organs of the experimental animals [8, 9]. It has been observed that exposure to EMF adversely affects spermatogenesis, Sertoli and Leydig cells of experimental animals [10-12].

Thus we undertook the present study to investigate the possible histological effects of isothermal non ionizing electromagnetic fields (EMFs) on the kidneys of Albino rats.

MATERIALS AND METHODS

Our study was approved by the Animal Ethics Committee of Dr. S.N. Medical College, Jodhpur. Thirty Albino rats of both sexes were obtained from Animal house, Dr. S.N. Medical College, Jodhpur.

Mobile phone radiation exposure

An iron cage (diameter 45cm by 11cm height) was designed for this work. This cage was covered all around by aluminum foil and cardboard sheet to prevent dispersion of radiations from the cage. Roof of this cage was designed to place the mobile phone instrument in such a way the rat would remain at a distance of about 10 cm from the mobile phone instrument. Electromagnetic radiations was emitted from the SAMSUNG GALAXY Y S 5360 of dimensions 104×58×11.5 mm of 97.5g(3.42 oz) SAR US value 0.57W/Kg(head),SAR EU(0.66W/Kg)head in connection with Aircel (Rajasthan, India).

Experimental Animals

The albino rats were used as experimental animals. Albino rats of both sexes (90-200g) were divided into two groups for each parameter under study.

All the animals (Albino Rats) were housed in a standard animal facility with controlled temperature of 25–27 degree Celsius, 5 to 10% humidity. Experimental animals were fed on bread, vegetables and standard rodent pellet diet with provision of recommended

amount of vitamins, minerals and water available ad libitum. These rats were then supplied for the purpose of the current study.

Experimental Design

The experimental animals were divided into two groups A and B which are as follows-

Group A: 15 Albino rats

Group B (Mobile Radiation exposed): 15 Albino rats

Group A served as control and group B was exposed to EMR (2G Cell phone 900-1900 MHz) one hour daily for two months.

At the end of exposure time of two months, both control and exposed group animals were sacrificed by cervical dislocation method. For histological study, kidneys were excised and cut into small pieces to allow good fixation in a 10% formalin solution. After dehydration, clearing and paraffin embedding, sections of 5 µm thick were cut and stained.

Statistical Analysis

Chi square test and paired t test was applied to compare the histological changes in glomerulus, renal tubules, interstitial tissues, blood vessels of exposed group with control group. p value<0.05 was taken statically significant.

RESULTS

Histological examination of the kidneys from the control group showed a normal appearance of glomeruli, renal tubules and interstitial tissues. However, kidney sections exposed to electromagnetic radiations for two months revealed congested and dilated blood vessels, leukocytic infiltrations in interstitial tissues, hyalinized tubules with cytoplasmic vacuolation and sclerotic glomerulus with pyknotic nucleus.

In 2G exposed group animals histological changes in glomerulus, renaltubules, interstitial tissues and renal blood vessels was statistically highly significant (p value <0.05) (Table 1-4).

Table 1: Histological changes in Glomerulus of Control & EMR exposed groups

Experimental group	Histological changes		
	Normal	Sclerotic changes	Total
Control	15(100)	0(0)	15 (100)
EMR	3(20)	12 (80)	15 (100)

X^2=20, p Value=0.00

Table 2: Histological changes in Renal Tubules of Control & EMR exposed groups

Experimental group		Histological changes		
	Normal	Hyalinization	Cytoplasmic vacuolation	Total
Control	14(93.33)	1 (6.67)	0 (0)	15 (100)
EMR	1(6.67)	4(26.67)	11(73.33)	15 (100)

X^2=26.80, p Value=0.00

Table 3: Histological changes in Renal Interstitial Tissues of Control & EMR exposed groups

Experimental group	Histological changes		Total
	Normal	Infiltration	
Control	15(100)	0(0.0)	15(100)
EMR	11(73.33)	4(26.67)	15(100)

X^2=4.61, p Value=0.03

Table 4: Histological changes in Renal Blood Vessels of Control & EMR exposed groups

Experimental group	Histological changes		
	Normal	Congestion	Dilatation
Control	9(60)	6(40)	1(6.67)
EMR	4(26.67)	10(66.67)	3(20)

DISCUSSION

Electromagnetic radiation (EMR) from mobile phones exposure can cause detrimental effects on DNA and can cause tissue injuries [13, 14]. A lot of studies have been carried out in relation to 900 MHz radiofrequency radiation (RF) emitted from mobile phone on animals tissue to investigate long term exposure to MPR on amyloid protein deposition in animals tissues [14, 15].

The present findings indicate that when albino rats of age group 40-120 days was exposed to cell phone

radiations they showed sclerotic glomerulus, hyalinised and vacuolated cytoplasm around renal tubules, lymphocytic infiltrations around interstitial tissues and congestion of renal blood vessel.

Similar observations had been reported by Ozguner *et al*. [16], Ongeley *et al*. [1], Bayazit [17] reporting that the exposure to electromagnetic radiation (EMR) induces some atrophied glomeruli, leucocytes infiltration between the kidney tubules and the vacuolation of some tubules.

Earlier studies have reported similar tissue changes using lower frequency EMR [11, 18].

Al-Glaib *et al*. [19] reported that repeated exposure to the electromagnetic radiation (EMR) emitted from mobile phones is able to induce renal tissue damage. The degree of damage increased with increase the time of exposure to MPR.

Mobile phone electromagnetic radiation may be mainly absorbed by the kidney in belts form caused renal tubular injury and renal impairment in rats [16, 20]. Amyloid protein deposition is seen within the glomerulus and convulated tubules in kidneys of infant mice exposed to MPR ¾ hour a day for one month. Amyloid protein represents more deposition after one month of stopping exposure. Although, renal amyloidosis showed symptoms of renal dysfunction due to the deposition of amyloid protein in the kidney [22]

CONCLUSION

In conclusion, the results of this study indicated that exposure to isothermal non ionozing radiation could produce histological effects on kidneys of Albino rats. It is suggested that long term use of mobile phones should be avoided with prohibition of keeping phones in pocket or belt cover for longer time.

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