



Effect on Heart Rate Variability due to Mobile Usage and Mitigation with Envirochip

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ABSTRACT

Background: Widespread use of mobile phones and digital technology has warranted the research on the possible side effects of the excessive use of the technology. At the same time, it is imperative to find out ways to minimize the damage caused by excessive exposure. Many studies have reported various health problems due to the excessive use of mobile phones and Wi-Fi devices. These problems may range from headache, dizziness, lack of sleep, heart diseases, memory loss, and concentration issues to cancer in extreme cases.

Objective: In this study, we have analysed the effect of Mobile and Wi-Fi radiations on HRV and the efficacy of Envirochip which claims to neutralize the harmful impact of mobile phone and Wi-Fi Radiations.

Methods: The study was done on 77 participants and the data was taken under three conditions (normal reading, reading with mobile phone and the reading with Envirochip fixed on the mobile phone).

Result: It was seen that HRV gets affected by mobile phone radiation and the uses of Envirochip.

Conclusion: The study revealed that there was a reduction in the average HRV of the participants when they were talking on the mobile phone and an increase in the average HRV of the participants was seen when Envirochip was fixed on the mobile phones and the nearby Wi-Fi devices. However, a study on larger sample size is required to validate the finding of this pilot study.

Keywords: Hear Rate Variability (HRV); Mobile phone radiations; Environics; Radiofrequency Radiations (RFR); Envirochip

Abbreviations: HRV: Hear Rate Variability; RFR: Radiofrequency Radiations

INTRODUCTION

There is sufficient scientific evidence that suggests that the use of increasing digital technology, especially mobile phones, and wireless devices, has a significant impact on mental health, brain function and sociocultural behaviour. The evidence is of course, is often conflicting: both harmful and beneficial effects, as well as null associations have been reported in literature [1,2]. The pandemic has only increased the quantum of digital technology usage, with both work and entertainment being online. However, the causal clinical or practical significance of increased use of digital and wireless technology has not been studied extensively. Therefore, it is imperative to be aware of the possible health hazards so that we can use technology responsibly and avoid potential problems.

Many researchers have conducted studies to analyse the impact of mobile emissions on Heart Rate Variability and have found

variation in the HRV due to the radiofrequency radiations emitted from the mobile phone [3-6]. According to Alassiri, et al., exposure to the mobile phone radiations reduced the Heart Rate Variability in the students when the phone was near the apex of the heart in ring and vibration mode [7]. There are also a few studied which have suggested that there are changes in the HRV due exposure of mobile radiations, however these changes are either not statistically significant or may be attributed to other factors [8,9].

To the best of our knowledge, this is the first study globally to study the impact of mobile phone usage on heart rate variability, and its mitigation by the Envirochip.

METHODOLOGY

The study was performed on 77 healthy subjects having age between 18-60 years. The study was conducted at tertiary care apex hospital

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in North India. The protocol of the interventional exploratory study was approved by the Medanta Institutional Ethics Committee (CDSCO: ECR/282/Inst/HR/2013/RR-20), Gurugram, and the study was carried out in accordance with the tenets enshrined in the Declaration of Helsinki. A voluntary, written, informed consent was obtained from all subjects. The study was registered with the Clinical Trial Registry of India (CTRI/2021/08/036047 [Registered on: 31/08/2021]).

Study participation was voluntary, and all the enrolled subjects were healthy, and had no short term or chronic ailments. The subjects were asked to not have coffee/tea, food, or snacks before 30 minutes from the time of data collection and the data was only taken once they had confirmed compliance. The subjects were encouraged to relax, and any subjects disclosing higher stress levels than normal at that point in time were excluded from the study. None of the participants had any history of neurological or cardiological diseases.

The included subjects HRV data was recorded in three states: Normal data at rest, data while subjects were speaking on the mobile phone and the data while the subjects were speaking on the mobile phone with Envirochip fixed at the back of the Mobile phone at the predefined location. The RFR emanating from the nearby Wi-Fi devices, computers, and laptops were also corrected by fixing the Envirochip before recording the HRV.

HRV data was taken with the help of Elite Cor Sense HRV Monitor (EliteHRV, USA) and the Elite HRV application compatible with any Mobile phone. It measures the heart rate variability through pulse detection using a gold-standard 500 hertz multi wave sensor array, for the assessment of parasympathetic modulation. The device uses a Bluetooth connection to transmit data to HRV apps. Even though researchers have demonstrated differences between the data obtained from the Elite HRV and Kubios HRV 2.2, they agree that the Elite smartphone HRV application may be a reliable platform is comparable to a hospital grade 5-lead EKG/ECG for HRV [10]. The device comprises 3 multi-wavelength LED emitters, 5 large visible spectrum photo detectors, 1 infrared detector and rechargeable lithium-ion battery of 150 mAH. The device has been calibrated for measuring the relevant biomarkers and compensates for variations in skin tone as well as circulation factors.

Mobile phone and Envirochip application

A standard android mobile phone Redmi Note 4 (golden) of 4100 mAh battery was used and the Envirochip (Synergy Environics Ltd, India) was fixed at the backside of the mobile phone and participant's laptops at the specified location (Figure 1). Same mobile phone was used for all the participants to eliminate the possibility of any deviation in the subject's conditions due to the device (Figure 2). The Envirochip, when fixed at a certain location on the electronic devices, is known to work by changing the nature (waveform) of emitted RFR from systemic to random, rendering them non-bio-effective and neutralizing the harmful impact of the mobile phone emissions on the human body (Figure 3).

Experimental design

After the data collection form was filled by each participant, following informed consent, HRV data was recorded. Data was taken in three conditions (Norma data, data with mobile phone, and data with Envirochip on the Mobile phone). Three readings were taken for each condition to ensure reproducibility and validity of the data collected.

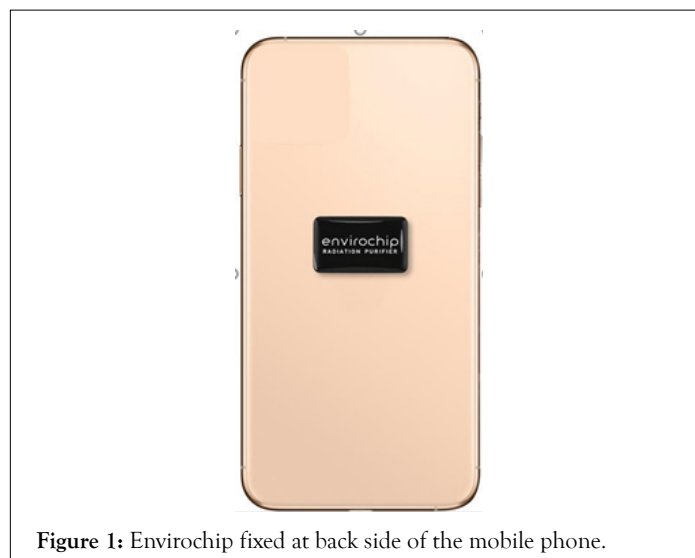


Figure 1: Envirochip fixed at back side of the mobile phone.

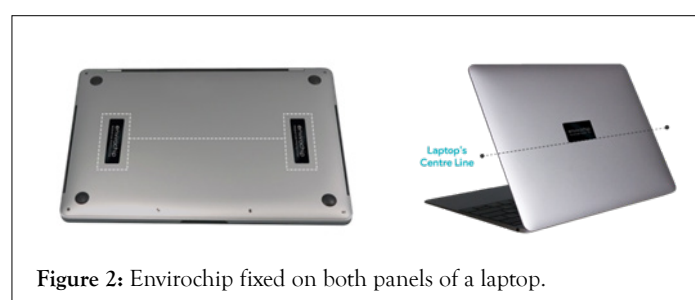


Figure 2: Envirochip fixed on both panels of a laptop.

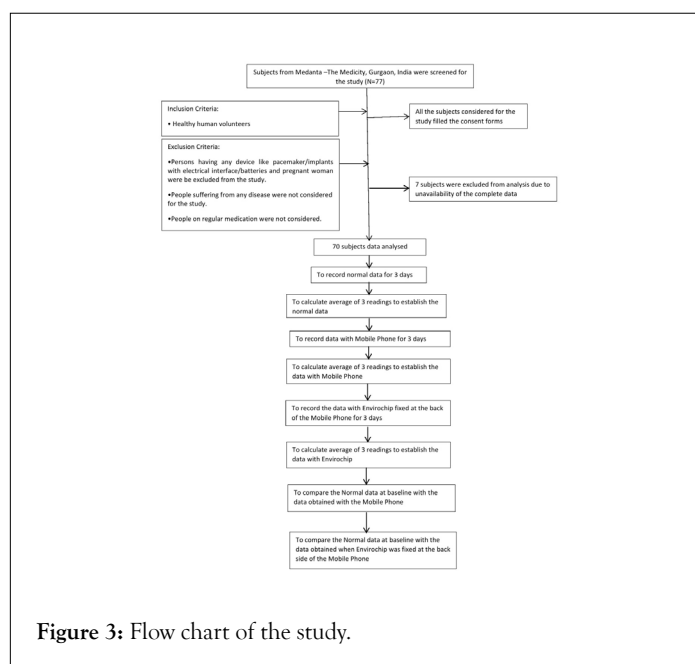


Figure 3: Flow chart of the study.

Normal HRV was established by taking average of three readings taken at baseline in all the subjects. Second set of data was taken when the subjects were speaking on the mobile phone (average of three readings). The final set of data was taken when the subjects were speaking on the mobile phone with Envirochip fixed on it (average of three readings).

Statistical analysis

Descriptive statistics were used to describe the characteristics of the participants, including frequencies and percentages for the categorical variables and means, ranges, and standard deviations for

the continuous variables. The Paired t-test and repeated measures ANOVA were applied to compare two and more parameters in a group respectively. A significance level ($p < 0.05$) was set for all the statistical analyses. STATA 15.1 software was used to analyze the results.

RESULTS

Out of 77 subjects enrolled in the study, 70 subjects were taken for the final analysis. Seven subjects were excluded due to absenteeism, incomplete data or COVID restrictions.

The average age of the subjects was 31.5 ± 7.7 years (18-60 years), and 57% subjects were males. It was seen that the average HRV of 70 subjects at baseline was 57.89 ± 6.22 (45-78). When the subjects were speaking on the Mobile phone, the average HRV was found to be 54.81 ± 5.50 (42-71) and when they are using the Envirochip the HRV was 62.36 ± 4.79 (50-78) (Tables 1-4). This change was found to be statistically significant improvement ($p = 0.000$). It was found that there was a reduction of 5.3% when the mobile phone was used and there was an improvement of 7.7% when Envirochip was fixed at the backside of the Mobile phone, which is statistically significant, and is also significant clinically.

Table 1: Mean distribution of HRV data at baseline and with mobile phone.

	Normal-HRV reading	Mobile without chip HRV Reading	P-value
	Mean \pm SD (N=73)	Mean \pm SD (N=73)	
Overall	57.96 \pm 6.13	54.85 \pm 5.45	0.0001
Gender			
Male	58.51 \pm 4.91	55.1 \pm 4.83	0.0003
Female	57.29 \pm 7.37	54.49 \pm 6.19	0.036

Table 2: Mean distribution of HRV data at baseline and with Envirochip on the mobile phone.

	Normal_HRV reading	Mobile with chip HRV Reading	P-value
	Mean \pm SD (N=70)	Mean \pm SD (N=70)	
Overall	57.89 \pm 6.22	62.36 \pm 4.79	0
Gender			
Male	58.54 \pm 5.01	61.54 \pm 4.84	0.0014
Female	57.13 \pm 7.42	63.33 \pm 4.61	0

Table 3: Mean distribution of HRV in three groups.

	Normal-HRV reading	Mobile without chip HRV Reading	Mobile with chip HRV Reading	p-value
	Mean \pm SD (N=73)	Mean \pm SD (N=73)	Mean \pm SD (N=70)	
Overall	57.89 \pm 6.22	54.81 \pm 5.50	62.36 \pm 4.79	0

Table 4: Participant characteristics.

Factor	Level	Value
N		77
Age, mean (SD)		31.5 (7.7)
Gender	Female	33 (43%)
	Male	44 (57%)
Normal_R, mean (SD)		58.0 (6.3)
Mobilewithoutchip_R, mean (SD)		54.9 (5.5)
Mobilewithchip_R, mean (SD)		62.4 (4.8)

DISCUSSION

The World Health Organization has classified Mobile phone radiation on the IARC (International Agency for Research on Cancer) scale into Group 2B-possibly carcinogenic based on an increased risk for glioma, a malignant type of brain cancer. The IARC working group also concluded that Radio Frequency (RF) radiations from the devices that emit non-ionizing RF radiation in the frequency range 30 kHz-300 GHz, is a Group 2B, i.e., 'possible', human carcinogen [11].

Since mobile phone are kept close to the head, the emitted radiations are absorbed the brain resulting in neurological problems [12]. There are several other studies that have indicated that RF radiations from the Mobile radiations can have an impact on brain function and behavior [13-19].

Mobile phones have become an extremely useful device in our daily life. The signal carries essentially no power when the user is not talking or receiving the data, but when the user communicates, the power of this pulsed electromagnetic field reaches its maximum.

Heart Rate Variability (HRV) as the name suggests is the measure of the time variation between two heartbeats. HRV can be considered as a non-invasive marker of Autonomic Nervous System (ANS) activity because the autonomic nervous system regulates heart rate during sinus rhythm (Sinus rhythm refers to the rhythm of the heartbeat, determined by the sinus node of the human heart).

Heart rate is governed by the two branches of the autonomic or involuntary nervous system. The Sympathetic Nervous System (SNS) and the Parasympathetic Nervous System (PNS), the Sympathetic Nervous System activates stress hormone production and accelerate the heart's contraction rate and cardiac output and decreases HRV, which is required during exercise and stressful situations. Whereas the Parasympathetic Nervous System (PNS) releases the hormone acetylcholine to slow the heart rate and increases HRV to restore homeostasis after a stressful event. This natural control mechanism between the two systems allows the heart to quickly respond to different situations and needs.

Although HRV is significantly affected by age, gender, pathological, physiological, genetic, environmental factors, lifestyle, as well chronic diseases [20-23]. It has been found that a low HRV is associated with health problems and a higher risk of death [24,25].

Conversely, higher HRV is an indicator of a healthy condition and has been found to be associated with reduced morbidity and mortality and improved psychological well-being and quality of life [26-28].

In this study, we have measured the Heart Rate Variability (HRV) of the participants in different conditions to analyze the impact of mobile phone emissions on HRV and the efficacy of Envirochip in neutralizing these effects and improving HRV of the participants. The proposed mechanism of action of the Envirochip is that it changes the nature of electromagnetic radiations transmitted to the body from the Mobile phones, making them non-bio-effective and hence neutralizing their harmful impact on our HRV and improving them, possibly due to increased resonance.

This study was conducted on 77 participants to analyze the change in HRV of the participants when they were talking on the mobile phone with and without Envirochip. The result of the study revealed that there are considerable changes in HRV parameters due to mobile phone radiation which contrasts with the study findings of Magiera et al., who claimed that there is no consistent evidence for the negative impact of mobile and Wi-Fi Radiations on brain activity, sleep, heart rate, cognitive function, and blood pressure [29].

Due to the increasing popularity of Mobile phones and their proximity to the human body (especially head) while talking and the development of mobile phone technologies which entails an increase in the number of base stations, the emission hazard posed by the same is a definite risk. The results of this exploratory pilot study indicate that further research is warranted on a larger population to better understand the impact of mobile phones on HRV, and its potential mitigation using the Envirochip.

CONCLUSION

The present study has shown that there is a statistically significant change in Heart Rate Variability due to continuous exposure to the Radiofrequency Radiations emitted by mobile phones. HRV of the participants decreased when they were talking on their mobile phones and a similar trend was seen in both male and female participants. When Envirochip was fixed on the mobile phone, the HRV of the participants increased during mobile phone usage. This implies that the Envirochip may neutralize the negative impact of mobile phone emissions on HRV and further improve the same.

CONFLICTS OF INTEREST

The authors declare no competing interests.

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