International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2019): 7.583

Effect on Brain Wave and Behavioral Changes of Children for Non-Ionizing Microwave Radiation during COVID-19

Dipanwita Das

Assistant Professor of Physics, Dinabandhu Andrews College, Kolkata, India

Abstract: ***The COVID-19 pandemic is become a global phenomenon within a few months of its emergence. The importance for the securitization of the children government declared closing of all the educational institution, face-to-face schooling is considered as a threat from which the communities must be protected. And e learning is considered as the security measure proposed to protect the children. Most of the students don't have personal computer to attend the online classes and thus they are dependent on smart phones of their parents. Many studies show that the stimulated microwave radiation affects the alpha, beta and theta brain waves. These brain waves are responsible for individual's behavior, emotions, and thoughts. These online classes are going on for more than 2-3 hours without the concern of the behavioral changes of the child. In this paper I want to focus the effects of microwave radiation on the brainwave. A proper mathematical modelling for the interaction between the high frequency microwave radiation and ELF is required to develop.***

Keywords: BRAINWAVE, Microwave radiation, EEG, ELF

1. Introduction

The COVID-19 pandemic spreads rapidly from the emergence and became a global phenomenon. On 11th of March the World Health Organization declared a public health emergency of international concern [1]. The characteristic of the virus is such that it spreads rapidly. Initially the spread was mostly from the travel related transmission. Community transmission i.e. the transmission of the disease within a certain region was embattled through social distancing. Social distancing help to slow down the rate of spread of the virus within the community and keeps the rate of infection at a manageable rate so to fight within the existing healthcare system, and gives sufficient time to develop the infrastructure. For the importance of controlling the spread of virus and securitization face to face schooling needs a pause. The International Federation of the Red Cross (IFRC), UNICEF and the World Health Organization (WHO) issued guidance to protect children from the transmission of COVID-19 virus. It includes the closure of schools without restricting the learning procedure by the health of remote learning- online learning or broadcasting the study content and providing essential services for the children and providing the information to protect themselves and their family during this pandemic [2]. The school should support a holistic approach so as to look their physical, emotional as well as the social wellbeing through the remote learning process. The transition from normal classroom learning to online learning can cause mental or emotional stress as it is a new way of learning to them. Excessive use of Wi-Fi or mobile hotspot can cause unusual behavioral changes in the children such as excessive arguments, refusals, opposition, disobedience or more behind that [3]. Microwave frequencies EMFs are much more damaging to the young children [4]. Literature reviews shows that the effect of microwave EMFs are age related. Young children are more sensitive to EMFs [5].

2. Aim of the study

The COVID-19 pandemic has changed the education system dramatically with the rise of distinctive e learning, and teaching is mostly undertaken on digital platform. This sudden shift of learning process from normal classroom to virtual classroom has advantages like increase in the retention of information, and takes less time. Teachers can have fed more during a short interval and children are abide to follow them.

Wondering whether this adoption of online learning will continue to persist in post pandemic period also? And what are the effects on the children either in positive or in negative?

3. Methodology

A narrative review associated with the online learning during this COVID-19 pandemic found to be most appropriate to accumulate or synthesize the intricacies. The narrative review can be very useful in collecting literature and synthesize it. This review can identify the inconsistencies in knowledge. In order to make a point of view in consideration paid more attention to limited information for further in depth research on the subject matter in future. A questionnaire was developed on google form and was send to the parent individually of different locality. The data was collected and analysed.

4. Literature Review

A research based on the report of DNBC (Danish National Birth Cohort), which looked at prenatal and postnatal exposure to cell phone use and the behavioral problems at age 7 years among nearby 13000 Danish children born between 1997 and 1999 [6]. The analysis shows that around 93% of children had recorded no behavioral problems, 3.3% of children are in borderline and 3.1% of children scored as

abnormal. In this database around 35% of children were using a cell phone at the age of seven years, but less than 1% used a cell phone for more than 1h per week. The behavioral problems were observed for the child who has a joint exposure – prenatal and postnatal, compared with the children with no exposure [7].

Beta waves are the brainwaves (13-38 Hz) are associated with a state of mental, intellectual activity and outwardly focused concentration, basically a state of alertness, logically consciousness and analytical thinking. Study suggests that alertness level was higher when an individual used mobile phone on right ear and in left ear in comparison to without use of phone. This study shows that the total power of beta wave is more when it was used on right ear in comparison to the left ear. Which can leads to physical and mental effect [8].

A study performed on a group of people exposed to the microwave with a power density of 1.6mW/cm^2. It shows a trend in decrease of the EEG energy with the microwave exposure in theta frequency and increase in alpha, beta1 and beta2 rhythm frequencies. At 450 MHz of microwave exposure with 40 Hz and 1000 Hz modulated frequencies, caused changes in the EEG rhythms. These effects are of non-thermal in nature and stronger at modulation frequencies higher or close the EEG rhythm frequencies [9].

Investigators [10] reported EMF effects on EEG, an increase in alpha and beta1 power in EEG. The experimental recordings showed that the microwave exposure with higher modulation frequencies such as 14 Hz and 21 Hz causes a remarkable increase in the average energy of EEG alpha and beta 1 rhythms, and doesn't cause any effect on theta and beta2 rhythms. Also microwave exposure with modulation frequency 7 Hz doesn't produce any change in energy of any EEG rhythm.They concluded that this effect is different from the heating mechanism of microwave radiation.

A study showed that angry emotional reactions are involved the theta waves which are observed on the EEG signal at the right side of the brain. Theta wave is visible when the emotion of anger is observed.While they studied the EEG waves with sad emotion, they found the reaction at the delta waves was insignificant compared to the waves of theta waves. Delta waves associated with the men who have a sense of empathy and intuition while the theta waves are associated with the sad emotions related to the old memory. Reactions occur in the middle part of the brain i.e. on the alpha waves when the subjects are enjoying live video with joy [11].

5. Materials and Methods

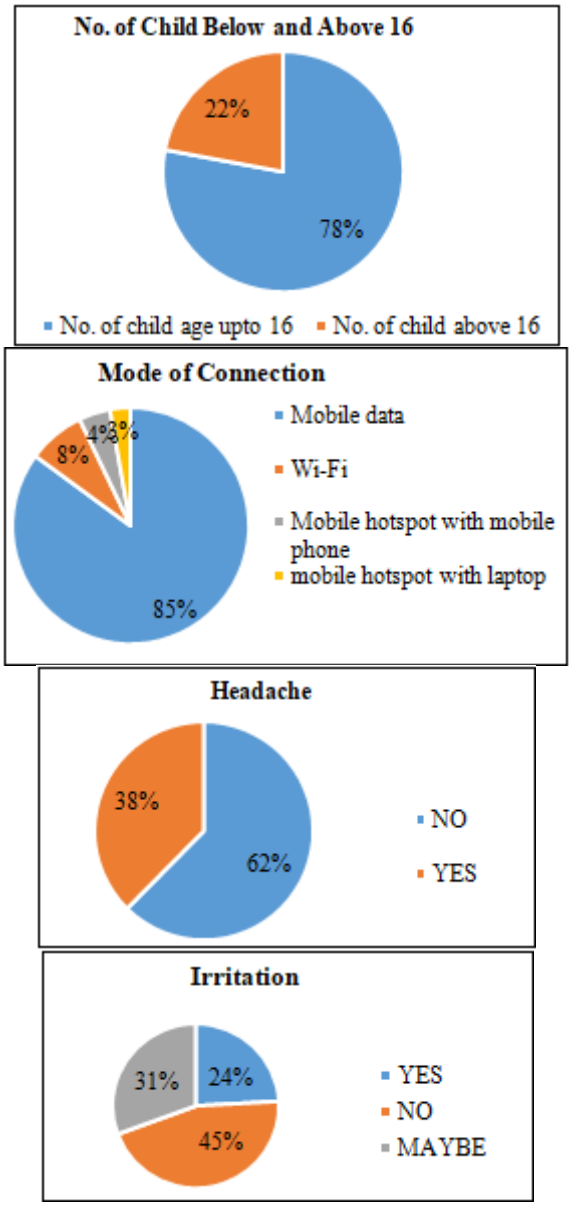
This is a type of observational study. A questionnaire in English was constructed on google form and was send to the parent of different school and different standard. Data was collected and analysed.

6. Results

141parents responded to the questionnaire. Some of them have one child and some have two. The age of their children ranged from 4 years to 28 years. The no, of child in the age group 4-16 years are 159 out of 204i.e. 78% of them are below 16; 60 females and 99 males. Results showing that only 7.8% of child are using Wi-Fi connection with laptop or computer, 85% of child are using mobile data with mobile phone, 4.25% child are using mobile hotspot with mobile phone and 2.8% children using mobile hotspot with laptop for their online classes. Children's are spending 4 hours on average every day for online classes and they remain online for submission of assignments and homework's for about 3 hours.

When asked that if their child gets headache symptoms after the start of the online classes, 37.6% parents says yes and 62.4% parents says no.

When asked that their child's are getting irritated during these days, 24% says yes, 45.4% says no and 30.5% says maybe. Two of them reported as suffering from eye problem after starting the online classes, and the behavioural changes like shortness of temper, sleeping disorder also decrease in attention in few cases are observed.



7. Discussion

AT this present COVID-19 situation to avoid the spread among the children most of the educational institutions forced to shift to an online mode of pedagogy from their traditional method. During this pandemic situation it is really necessary to keep the children engage with some activities and since the institutions are closed since 17th of March 2020 in India, so they do not get fatigued and their study must go on without too much interruption. Online mode of learning is easily accessible to the remote areas also. It is considered cheaper in comparison to the transportation and accommodation. In this situation it is quite obvious to face psychological problems like stress, anxiety, depression, lack of concentration. To continue the teaching learning processes institutions are using different online tool to take live classes of which google meet is very popular. The anytime anywhere feature of learning is really beneficial during this pandemic. The e learning at least not keep the children deprived of getting education at the time when they are stuck at their home to maintain social distancing. Educators facing tremendous stress as many of them did not have personal computer at home and due to lockdown they could not even go for buying it. The situation is similar for the students also. India's schools began shutting down in mid of March, but till now students are attending their classes on mobile phone with mobile phone data or personal hotspot. Review says that the EMR affects the brainwaves. As mobile phones are skull oriented and most of the students doing their classes using headset, its worse radiation effects are increasing on the brainwave. Mobile phones produce the non-ionising electromagnetic radiation in the frequency range 300 MHz -300 GHz [12]. The radiation absorption rate of human body is measured through the Specific Absorption Rate (SAR). In India, SAR value for phones is set at a maximum of 1.6W/kg, standard by Federal Communications Commission (FCC). As the review says the experiments are mostly done for less than half an hour with stimulated emission of microwave radiation, the beta waves and alpha waves of EEG are gets affected. Alpha wave (8-12 Hz) refers to activities related to rest and quiet. the wave of emotions those are very happy in the Alpha wave, which involves the flow of energy and creativity and fresh feel. Beta waves, frequency ranges 12-30 Hz, are the brain waves of our normal waking consciousness, of logical and analytical thinking. High frequency beta wave (20-30 Hz) is seen with restlessness, stress, anxiety while low frequency beta wave (12-20 Hz) is seen with awakened mind, when thinking feels clear, alert, creative and to the point [13]. Theta waves (3-8 Hz) mean of deep relaxation and stress relief or linked to pressure on human emotions. These waves produced during light sleep, may also produce during very deep meditation or extreme relaxation. Experimental analysis shows that stimulated microwave radiation affects these alpha, beta and theta brain waves which in turn may affect their cognitive behavioural hazards. All these analyses were doe for a very less duration but the online classes that are running for 2-3 hours or sometimes even more than that. After the end of the online sessions the children are forced to do their projects and other activities also using their gazettes. Experimental studies have exposed that the electromagnetic radiations are more probable to penetrate the little children as related to the adult, children's skulls are thinner and brain is lesser in size in comparison to the adult.

8. Limitations

Studies do have certain limitations, and in this study it was the single method used to collect data. The results found in this study could not be verified by other means. The result should be viewed as an outline of the effect of e-learning on the brainwave of the children during the COVID-19 pandemic. This exploratory finding presents a solid platform for further in depth research on the subject matter.

9. Conclusion

In this unprecedented situation children are separated from their friends and loved ones, their teachers, and adjusting in a new routine make an impact on their behavioral activities. These changes may increase stress. In addition to this struggling life the effect of microwave radiation on the brainwave of the child may show up as disruptive behavior, noncompliance, and tantrums. Before it's too late there is a need of policy making for conducting the online classes for the safety of children, especially children below the age of 12 years.

References

[1] https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020#:~:text=WHO%20has%20been%20assessing%20this,be%20char
[2] https://www.who.int/news-room/detail/10-03-2020-covid-19-ifrc-unicef-and-who-issue-guidance-to-protect-children-and-support-safe-school-operations
[3] https://indianexpress.com/article/parenting/learning/online-classes-stress-how-parents-can-help-kids-cope-6465310/
[4] Aynali, G., Nazıroğlu, M., Çelik, Ö., Doğan, M., Yarıktaş, M., Yasan, H., 2013. Modulation of wireless (2.45 GHz)-induced oxidative toxicity in laryngotracheal mucosa of rat by melatonin. Eur. Arch. Otorhinolaryngol. 270, 1695–1700. http://dx.doi.org/10. 1007/s00405-013-2425-0
[5] http:// dx.doi.org/10.1016/j.etap.2015.08.015.
[6] Divan HA, Kheifets L, Obel C, et al. Prenatal and postnatal exposure to cell phone use and behavioral problems in children. Epidemiology 2008;19:523e9
[7] https://www.researchgate.net/publication/49665228 Cell phone use and behavioural problems in young children HozefaA Divan,1 Leeka Kheifets,2 Carsten Obel,3 Jørn Olsen2,3
[8] ANALYSIS OF MOBILE PHONE RADIATIONS EFFECT ON BETA WAVE OF EEG SIGNAL RAGHU NANDAN1 , SANDEEP KAUSHAL http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.683.830&rep=rep1&type=pdf
[9] Effect of modulated microwave radiation on electroencephalographic rhythms and cognitive processes Hiie Hinrikus, Maie Bachmann, Jaanus Lass and Viiu Tuulik

file:///E:/Hazards%20of%20Wi%20Fi/eng-2008-2-91-106.pdf
[10] Non-Thermal Effect of Microwave Radiation on Human Brain HIIE HINRIKUS*, MAIE BACHMANN, RUTH TOMSON and JAANUS LASS Biomedical Engineering Center, Tallinn University of Technology, 5 Ehitajate Rd, 19086, Tallinn, Estonia file:///E:/Hazards%20of%20Wi%20Fi/Hinrikus-Env.2005.pdf
[11] Human Emotion Detection Via Brain Waves Study by Using Electroencephalogram (EEG) W Omar Ali Saifuddin Wan Ismail#1., M. Hanif#1, Noraini Hamzah*2 file:///E:/Hazards%20of%20Wi%20Fi/HUMAN%20EMOTION%20DETECTION%20VIA%20BRAIN%20WAVE.pdf
[12] microwave radiation and its effect on human body: a review Dipanwita Das https://www.ijirmf.com/wp-content/uploads/IJIRMF202001019.pdf
[13] ANALYSIS OF MOBILE PHONE RADIATIONS EFFECT ON BETA WAVE OF EEG SIGNAL RAGHU NANDAN1 , SANDEEP KAUSHAL2 International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 3, Issue 12, December 2014 file:///E:/Hazards%20of%20Wi%20Fi/10.1.1.683.830.pdf