

# The Revolutionary Use of Electronic Gadgets in Nigeria: The Public Health Implications

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## ABSTRACT

*Electronic gadgets are instruments which can perform many activities at a time with vast speed, making hard work an efficient one. They are useful for many purposes, can save time, money, provide information, reduce hard work and operate machines. They play vital roles in entertainment, information and communication technology (ICT) and have proved to be useful in almost every sector such as health (E-health), government (E-governance), commerce (E-commerce), banking, agriculture and education. Electronic gadgets include Phones, computers (laptops, palmtops, i-pads and tablets), televisions, radios, refrigerators, GPRS navigation systems, cameras, hospital gadgets such as ECG machines, automated visual field analysers, digital glucometers and automated blood*

*pressure apparatus. There have been several advances in the use of electronic gadgets such as the shift from the use of analogue telephone landlines to smartphones; change from 1<sup>st</sup> generation very big ENIAC computers to laptops and i-pads. This revolution in the use of electronic gadgets has predisposed people to several health benefits and risks as well. Some public health benefits include improved healthcare delivery through the use of gadgets such as mobile phones in teleconsulting and in disaster management. Negative public health implications of the use of electronic gadgets include interference with the natural electromagnetic wave which is necessary for the survival and good health of man, environmental pollution, brain damage, psychological and behavioural*

*disorders, visual impairment, nuisance, cancer, cardiovascular diseases, disparity in the distribution of healthcare services, impairment of cognitive functions, infertility, accidents, injuries and explosions, birth defects and genetic mutations, and muscle and joint pains. Anti-radiation chips and electromagnetic wave neutralizers should be used with all electronic devices in order to protect people from the harmful effects of electromagnetic radiation these gadgets emit. Electronic devices should also be reused, their wastes reduced and/or recycled before sending to the landfill.*

**Keywords:**

Electronic gadgets; Evolution; Public Health; Negative implications; Positive implications

**INTRODUCTION**

Electronic gadgets are instruments which can perform many activities at a time with vast speed, making hard work an efficient one<sup>1</sup>. These gadgets have an input transducer, a processor, an output transducer and work through magnetic waves. Every electronic gadget has a purpose and contains electronic transmitters in order to work. They are information, time and labour-savers and must either make menial tasks or hard work easier, or provide us with information.

**HISTORY OF ELECTRONIC GADGETS**

The invention of gadgets dates almost as far back as the existence of humanity, when people began to make tools for making life easier<sup>2</sup>. Although mechanical gadgets were being made since a long time, it was the advent of electricity that heralded the manufacturing of electronic gadgets and this took gadgets to another level as different uses for electricity were found. Initial examples of electronic gadgets were televisions, radio and quartz watches. After that, inventors went on to discover microprocessors which brought the days of programmable devices such as computers, MP3 players and now the iPhone. Electronic gadgets have gone through a technological revolution due to challenges in areas such as transportation, manpower and communication, and today other electronic gadgets such as ipads, GPRS Navigators and 5D televisions are now available and have become functional necessities of the modern society.

A little over a decade ago there were about 100,000 phone lines in Nigeria, mostly landlines run by the state-owned telecoms behemoth, NITEL. Today NITEL

is dead, and Nigeria has close to 100 million mobile phone lines, making it Africa's largest telecoms market<sup>3</sup>. Across the rest of the continent the trends are similar: between 2000 and 2010, Kenyan mobile phone firm Safaricom saw its subscriber base increase in excess of 500-fold<sup>3</sup>. In 2010 alone the number of mobile phone users in Rwanda grew by 50%<sup>3</sup>. In 10 short years, what was once an object of luxury and privilege, the mobile phone, has become a basic necessity in Africa. Google, for its part, plans to sell 200 million of its Android phones in Africa and it is estimated that by 2016 there will be a billion mobile phones on the continent<sup>3</sup>.

During the early years of mobile phones in Africa, the Short Messaging Service (SMS) was at the heart of the revolution. Today the next frontier for mobile use in Africa is the internet. Mobile phone is fast becoming the Personal Computer (PC) of Africa. In fact there isn't really anything more personal than a mobile phone nowadays. In October 2013, for the first time ever, the number of Nigerians accessing the internet through their mobiles surpassed the number of desktop internet users<sup>3</sup>. The electronic gadget technological revolution was mainly based on two core

technologies: the computer technology and the communication technology, generally referred to as the Information and Communication Technology (ICT). The digital revolution started in the year 1989, as a new information communication technology known as World Wide Web (www) and a hyper-text language for global information sharing (internet) invented by T.M Berners in Geneva and subsequently released in 1991 as the first client browser software for accessing materials on the internet<sup>4</sup>.

Like other technological innovations, from the movable type printing press in the fifteenth century, the telegraph in 1844, and the telephone in 1876, to the rise of radio in the 1920s and television broad casting in 1946, digital technological innovation such as the electronic gadget has sparked speculation about its larger-term impact in various aspects of the society especially public health<sup>2</sup>.

## **TYPES OF ELECTRONIC GADGETS**

Electronic engineers have developed technologies that have turned the world into a small global village. Electronic gadgets exist for every facet of life, from entertainment to education, from work to play and from communication to

governance. The two most common electronic gadgets in Nigeria are phones and computers (laptops, palmtops, i-pads). Others include televisions, refrigerators, radio, electronic cigarettes, calculators, GPRS navigation systems, portable movie players, home theatre music box, Mp3 players, I-pod, cameras, digital pens, printers, hospital gadgets such as ECG machines, auto-refractometers, automated visual field analysers, digital glucometers and automatic blood pressure apparatus.

### **IMPORTANCE OF ELECTRONIC GADGETS**

The general purpose of most electronic gadgets is to make life easier, more fun, or more efficient. These gadgets have become so useful in various facets of life that it is now almost impossible to live without them<sup>5</sup>.

Electronic gadgets are useful in information and communication technology (ICT). This is the convergence of micro-electronics and the art of computing and telecommunications. It involves electronic gadgets such as computers and telephones which have become very vital for computing and communication. ICT has become a global phenomenon of great importance and concern in all spheres of human endeavour and is making its in-road and impact on everything like, commerce, education,

agriculture, business, health and even governance. All these would not have been possible without electronic gadgets. ICT is now applied to the processes of governance to accomplish simple accountable, speedy, responsive and transparent government in the form of E-governance (Electronic governance). The same applies to E-health (Electronic health) where telemedicine and teleconsulting are now practised via mobile phones with the aim of delivering first-line support to patients especially where distance is a critical factor. The ease of use, mobility, powerful computer functions, and communication capabilities now enable phones to act as the computing and communication device of choice for consumers, patients, healthcare providers and others. The use of ICT gadgets like mobile phones in disaster management cannot also be over emphasized. Mobile phones have been finding innovative uses in refugee camps, allowing displaced persons to reconnect with family and loved ones<sup>3</sup>.

Electronic gadgets like phones, computers and calculators have become vital tools and play important roles in education. Mobile phones, cheaper to own and easier to run than computers, have gained ground as

tools for delivering teaching content. It is hoped that mediating education through social networking using these electronic gadget will help reduce the significant numbers of school-age African children who are not receiving any formal education<sup>3</sup>.

Other uses of electronic gadgets include their use in banking (Electronic banking), entertainment, and agriculture by serving as platforms for sharing information, communicating, relaxing and socialising. They also provide information on weather conditions and market prices for products without the need for farmers to travel far.

## **REVOLUTION IN THE USE OF ELECTRONIC GADGETS**

Consumerism and the modern way of living have demanded that our gadgets operate in a certain way as they are expected to save time, labour and make menial tasks easier, provide us with information, be efficient, mobile, mysterious and futuristic.

It is impossible to deny that we are now well and truly in the digital age. Resistance is futile and most electronic gadgets have gone through a stage of revolution and have now become digitalized.

For instance watches became digitalized, and then along came the internet, the radio and televisions have also received the digital treatment as well in comparison to what they used to be in the past.

Evolution of some top electronic gadgets such as the telephone, television and computers has truly changed our lives and the way we interact with other people and with our environment in recent times<sup>6</sup>. Due to the utmost need to communicate often with people and loved ones, telephones have evolved from the analogue land line telephones with long wire connections and poles to digital, mast powered global satellite mobile phones (GSM). Phones became mobile and could now be carried around from place to place. With time, these mobile phones stopped making calls alone like the old brick cellular mobile phones but began to take photos and allow us to play Snake games. Androids, iPhones and Smartphones have literally redefined the way we live now<sup>6</sup>. Presently, mobile phones do not just take photos, they now record videos, voice notes, music, receive and send electronic (E-mail) mails and contain Microsoft office tools for working on documents. They can talk to each other, to

laptops, to televisions – to pretty much anything with a digital pulse through bluetooth, infra-red, USB, HDMI and other routes of connection. You can watch films on them, have instant access to YouTube and facebook, play proper games, and store all of your music, documents and more.

Again we all remember a time when we had the old black and white box televisions with double wooden sliding doors. Well not anymore. Flat screen, digital, and now 3D televisions are literally staring us square in the face. Recently, 5D technology has been incorporated in most cinemas thus increasing the number of men and women visiting the cinemas on a daily basis.

Miniaturization is a common theme in the evolution of computers. Thousands of archaic vacuum tube powered early electronic computers like the 1940's ENIAC are the great-grand-daddies of today's slim, trim desktops and laptops, tablets and ipads<sup>6</sup>. Furthermore, recently evolved computers such as laptops have webcams installed in them. It means that applications such as Skype can now run on these gadgets because of the in built webcam thus allowing meetings to be held over long distances, and availing friends and family opportunity to stay in touch in a more personal way than just being able to hear one another's voice<sup>6</sup>.

In addition, most health care tools have presently become automated electronic gadgets. A very good example is the blood pressure monitor which has gone from being manual, to an automated electronic device which is driven by cell batteries. Other areas of importance in the evolution of electronic gadgets include the evolution from the old polaroid mechanical film cameras to the digital cameras which make use of electronics. One advantage of this is that one is no longer limited by the capacity of film media when taking pictures as countless photos can now be taken on a digital camera without it getting full or requiring to be developed. One can also view the pictures instantly, upload and print them too within an instant. Another one is the evolution of radios from the stereo record radios to the present home theatres and iPods; deviation from paper road maps to electronic GPRS navigators; from the conventional family refrigerator to the USB desktop fridge of today and from paper to electronic cigarettes (E-cigarettes) which are battery-powered devices<sup>7</sup>, look like cigarette, but do not burn tobacco<sup>8-10</sup>. These e-cigarettes are vaporizers which simulate tobacco smoking by producing an aerosol that resembles smoke<sup>11, 12</sup>. They were produced for the sole

purpose of helping people quit smoking tobacco<sup>13, 14</sup>.

## **PUBLIC HEALTH IMPLICATIONS OF THE USE OF ELECTRONIC GADGETS**

The question about whether electronic gadgets are a boon or a curse to the society and public health in general has been asked severally<sup>15</sup>. The answer to this question depends extensively on how and where these electronic gadgets are used. In today's busy and hectic life they are an absolute necessity to connect better, work with an enormous speed and make hard work efficient.

For instance a device like the mobile phone is widely used in today's fast life. It saves ones time as well as money. The features in mobile phones are just endless and are very useful. One can store his datas in it and get them easily when needed, now no need to carry phone directory or camera or mp3 player because one can enjoy all these in just a single phone. Cell phones are so used that we even fail to realise how important they are.

An individual's typical day starts with the alarm set in his/her cell phone the previous night; some individuals even enjoy morning songs on the radio facility of their cell phones, then they look at the day planner in their phones and get a reminder such as "Today is your friend's birthday"! Birthdays surely need gifts, thus they quickly use the online shopping facility on their phone and order something for their friend via internet. This is all thanks to mobile phone. Now it's party time, and they play some heart throbbing music on their cell phones, take pictures and even store those incredible moments with friends in the same multimedia device, mobile Phones. Such leverage as expressed above highlight some of the merits of an electronic device such as the mobile phone.

There is however both positive and negative public health implications of the use of electronic devices.

### **Positive public health implications**

- Improved healthcare delivery: Smartphones and tablets can be used as medical devices and screens for ultrasound scans. This will aid in providing better and improved healthcare services to individuals.

Phones are also presently used for teleconsulting especially for reaching patients in emergency health situations when distance is a barrier. Also simple text-messaging solution using mobile phones was all 28-year-old Ghanaian doctoral student, Bright Simons needed for his innovative plan to tackle counterfeit medicine in African countries<sup>3</sup>. This technology is now being applied in Nigeria with the help of mobile phones. The World Health Organization estimates that nearly 30% of drugs supplied in developing countries are fake and adulterated. In 2009, nearly 100 Nigerian babies died after they were given teething medicine that contained a solvent usually found in antifreeze. Simons' pioneering idea to help curb counterfeit drugs was to put unique codes within scratch cards on medicine packaging that buyers can send via SMS to a designated number to find out if the drug they have purchased is genuine or not<sup>3</sup>.

- Prevention of occupational injuries through efficient physical and organizational ergonomics and work design: The remodelling of work

environment by providing electronic and mechanical devices that will help make work efficient has helped reduce the level of occupational injuries among workers. A large number of activities in many industries are now controlled by electronic gadgets. For instance, electronic gadgets have been produced to operate many machines and reduce the level of risk associated with handling of such machine by individuals<sup>16</sup>. They also reduce body & mental work and thus promote general wellbeing.

- Tool for disaster management: Mobile phones have been finding innovative uses in refugee camps, allowing displaced persons to reconnect with family and loved ones. An NGO, Refugees United, has teamed up with mobile phone companies to create a database for refugees to register their personal details<sup>3</sup>. The information available on the database allows them to search for people they've lost contact with. Most electronic gadgets provide information about situations such as climatic changes, natural disasters and help in the management of public health disasters<sup>3</sup>.



The manner in which and where people use electronic gadgets determines to a large extent their public health implications. The above points indicate how useful electronic gadgets have become in our daily lives, thus calling them a "curse" would be totally absurd and preposterous. However, improper use by people and lack of awareness of the adverse effects associated with the use of electronic gadgets are key elements in the occurrence of detrimental public health impacts.

### **Negative public health implications**

- Interference with natural low frequency electromagnetic waves (Schumann waves): All life is bathed in natural low-frequency electro-magnetic fields which are generated principally by the sun and electric thunderstorm activity in the equatorial regions of the Earth. These natural Schumann waves are necessary for the survival and good health of humans. Living beings were created to live in harmony with this natural electromagnetic force and have evolved to use this natural electromagnetic environment as a mechanism for maintaining biological health. However, most of the electric fields that envelop us these days are not naturally occurring. We have become surrounded by a cocktail of different man-made

electromagnetic waves which interfere with the natural electromagnetic or Schumann waves<sup>17</sup>. Electronic gadgets such as cell phones, radios, microwave ovens, and radars all create this man-made electromagnetic radiation. We cannot see these damaging artificial electromagnetic fields (EMF), but may frequently feel them in the form of stress, headache, sleeplessness, moodiness and other chronic and debilitating illnesses. For instance, just the way one feels after sleeping with the television turned on. Our exposure to EMFs has been shown to actually affect the way our body cells communicate with one another and therefore affects our own ability to function properly. These pulsating frequencies actively destroy our body's healthy cells and cause blockages in the flow of our body's vital energy which can lead to chronic diseases.

To achieve perfect health, both natural and man-made signals must be in balance. However, it is clear we have created an environment that is literally 'out of tune' with Nature itself. The modern world around us is literally

depleting us of our natural energy stores, and is also affecting many of our wildlife's natural migratory patterns and ability to breed and survive. The present revolution in the use of electronic gadgets has made these man-made electromagnetic radiations to outweigh the natural ones in our environment, giving rise to several public health problems.

- Environmental pollution: Little or no thought has been given to the physical final end result of used electronic gadgets, devices of varying size, weight and complexity, which will be obsolete after a while. Pervasive use of these gadgets brings with it dangerous wastes such as lead, cadmium, mercury, beryllium, tantalum, arsenic, copper and hexavalent chromium. These persistent, bioaccumulative, and toxic chemicals (PBT's), are persistent in that they linger in the environment for a long time without degrading, increasing the risk of exposure to human beings. These chemicals are present mostly in mobile phones and other wireless devices, are highly toxic and can have seriously harmful effects to public health<sup>18</sup>. For

instance, beryllium and cadmium have been associated with irreversible and fatal scarring of the lungs. Today the growth of electronic waste (e-waste) is about 3 times that of other municipal waste and it is common sight to see mountain of obsolete gadgets around the surrounding in Nigeria<sup>18</sup>.

- Accidents, injuries and explosions: The use of mobile phones- making calls or texting while walking or driving on the road is one of the biggest hazards associated with cell phones and a leading cause of road accidents. Liquids used in e-cigarettes also pose a huge risk to public health. Injuries, fire outbreaks and explosions have resulted from them<sup>19</sup>. Less serious adverse effects associated with e-cigarettes include throat and mouth inflammation, cough, nausea, and vomiting. The number of poison cases associated with e-cigarette liquid has increased so much over the course of its invention. With the rise in e-cigarette use, accidental nicotine poisoning has increased, especially among children, due to ingestion or skin exposure to e-cigarette liquids<sup>19</sup>.

➤ Brain damage: Such as failing memory, brain foginess, poor brain integration, low IQ, attention deficit disorder (ADD) and difficulty concentrating can all result from the use of electronic gadgets. The damaging effect of technology on our body and minds heralded by the revolution in the use of electronic gadgets is a huge problem. Technology has crept into every corner of our lives from obsessive texting and pinging to checking emails on our ipads more often than most of us even lose sleep because of this. You drive while talking on the cell phone, text while listening in on a conference call or surf your ipad while watching television. This system of multitasking is now a new norm in the society, but though it feels like we are more efficient, studies have shown that an enormous brain damaging effect is associated with such habits as a person's attention and performance levels drop once he stops one activity to pick up another<sup>20</sup>.

The great reliance on information from electronic devices such as computers and smartphones and their incessant use in carrying out tasks like

computing and statistical analysis has resulted in failing memory, brain dormancy and low IQ as people now rely so much on these gadgets to perform their work in place of brain work. It has been shown that people tend to juggle up their memory and retain facts better when they know they cannot get facts or help from computers or phones but the reverse is usually the case when they know they can always get whatever aid they require from these gadgets<sup>20</sup>. Today virtually any information is accessible on the internet thus encouraging people the more to depend greatly on this so called 'internet of things' rather than putting their brains to work as it ought to be.

➤ Psychological disorders and behavioural changes: Emotional instability, addictions, sleep disorder, depression, online addictions, high level of codependence and social media distractions are all part and parcel of smartphone and computer use. The psychological trauma most couples go through since the advent of smartphones cannot be over emphasized. It is a common scene today to see couples

going through divorce suits on the grounds of infidelity simply because one party received a love SMS or nude picture on his or her phone from an opposite sex. Most couples have fallen into a state of depression just because they saw an item which hints infidelity in their spouse's phone while snooping on them. The advent of smartphones with a lot of dating sites and social networks accessible through them has also helped most coquettish individuals master the act of infidelity.

In addition, the rise in use of smartphones and ipads has guaranteed people frequent access to the internet and social networks such as facebook, BBM, skype, 2go, twitter, badoo, whatsapp and yahoo messenger. These have brought about an increase in internet crime rate, cyber bullying and the rate of suicide especially among youths as they are now more exposed to the negative effects of high level uncensored socializing and online sharing<sup>20</sup>. The trend is so common that most people even lose sleep while fiddling with their smartphones and ipads or tablets.

The high level of use of mobile phones today has indeed deprived people of their personal liberty turning them into digital slaves whose mental stability depend entirely on the use of such electronic facilities. Most adults now need numerous facebook friends and twitter followers to feel validated. They now spend most of their time daily on the internet and social networks sharing virtually every activity going on in their lives, posting pictures of exotic family vacations, weddings and child dedications on online platforms. People now spend more time chatting over the phone and internet rather than having the usual person to person meetings and conversations. Some have lost touch with their environment and people around them while constantly fidgeting with their gadgets. These are all psychological and behavioural disorders and were not the original intentions of the founders of these facilities. We need to look up, away from mobile phones and computers, and see the beautiful world around us. The revolution in the use of electronic gadgets like smartphones and ipads have also made people lose touch of what should be

ideal and forget that they could be sharing so much more information than is necessary. The question presently is “how much information are we sharing about ourselves on social networks?”

Another source of concern in the revolutionary use of electronic gadgets in Nigeria is the recent innovation of electronic cigarettes which now unfortunately serves as a gateway to lifelong addiction to nicotine and conventional cigarettes<sup>21, 22</sup>. They carry a risk of addiction in those who do not already smoke and may promote continuation of addiction in those who already do<sup>23, 24</sup>.

- Visual impairment: About 4% of eye patients suffered eye strain due to computer vision syndrome (conditions related to “near work”), while 45% complained of neck and back pain associated with computer or handheld device use<sup>20</sup>. Close and prolonged computer work can cause photophobia (light sensitivity), dry eye, blurred vision, diplopia (double vision), fatigue, headache and even induced refractive errors such as astigmatism.

- Nuisance: The innovation of musical gadgets with high pitch woofers has been a major source of noise pollution in Nigeria. Today, not only night clubs but also individuals in their homes play very loud music and thus disturb the entire neighborhood. The use of iPods, MP3 players and other musical gadgets which blast music through ear buds for long stretches causes wear and tear to the ears, and restlessness and annoyance to people around.

The presence of electronic devices in our bedrooms has unconsciously become a great source of nuisance to us, having a major implication on the quality of our sleep. Certainly such devices can keep us awake by making noise, interfering with our sleep-wake cycle, or circadian rhythm in far more insidious and damaging ways than we can imagine. Light from electronic gadgets will interfere with our sleep since the quality of our sleep has a lot to do with light because light serves as the major synchronizer of the sleep master clock in our brains<sup>25</sup>.

- Cancer: The radiofrequency electromagnetic fields produced by

mobile phones have been classified as possible carcinogens to humans<sup>26</sup>. Unlike traditional land line phones, cordless phones of today emit radiofrequency radiation, and people tend to have longer conversations on their cordless phones than they do on their cell phones. All these pose a threat to the general wellbeing of mobile phone users<sup>27, 28</sup>. Apart from wireless devices that users carry with them, wireless transmission towers for radios, televisions, telecommunications, radars and many other applications too emit radio frequency radiation. These radio frequency radiations do accumulate over time and may cause cancer with time<sup>29-31</sup>. Other electronic devices such as remote controlled garage door openers, remote controlled car door lock and unlock devices, wireless microphones and wireless computer-Internet connection packages all utilize small radio transmitters and associated receivers that operate at considerably high radio frequencies and can be carcinogenic over time. Electronic cigarettes have also been shown to contain carcinogenic chemicals that

make them as harmful as normal tobacco<sup>32</sup>.

- Cardiovascular diseases: It is common knowledge that the longer one sits either in front of a computer, a television or a cinema, the greater the likelihood that the person will die earlier from cardiovascular related diseases such as obesity and heart problems due to several hours of physical inactivity<sup>20</sup>.
- Disparity in the distribution of health care services: High level of inequality in the distribution of health care services in different areas and among different groups of people is a major problem that has risen because of the introduction of E-health (Electronic health) in Nigeria<sup>33</sup>. For instance most individuals especially the poor and uneducated might not benefit from a telemedicine or teleconsulting package due to their inability to buy a smartphone and lack of knowledge on how to operate them.
- Impairment of cognitive functions: A number of studies have investigated the effects of radiofrequency fields on brain electrical activity, cognitive functions, sleep, heart rate and blood pressure in

most electronic gadget users and have found evidence of adverse health effects from exposures to radiofrequency fields at levels above those that cause tissue heating<sup>34</sup>.

- Infertility: Tissue heating is a principal mechanism of interaction between radiofrequency energy and the human body. This mechanism has been associated with the use of electronic gadgets such as laptops where the tissue heating is held responsible for increasing cases of low sperm count in men<sup>35</sup>. Keeping the cell phone in a trouser pocket may also negatively affect spermatozoa and impair male fertility<sup>36-38</sup>. It may lead to oxidative stress in human semen causing sperm cell DNA fragmentation<sup>39, 40</sup>. Mobile phones communicate by transmitting radio waves through a network of fixed mast antennas called base stations. The indiscriminate mounting of these telecommunication masts close to residential areas has also been reported to be one of the causes of the increased prevalence of infertility and sub-fertility today<sup>41</sup>.

- Birth defects and genetic mutations: A study of more than 13,000 Danish children suggests that cell phone exposure could affect children's behaviour<sup>42</sup>. The children in the study who were hyperactive or had emotional or behavioural problems, including trouble getting along with other kids, were much more likely to have mothers who used cell phones during pregnancy and/or during their children's first seven years of life. It is also likely that women exposed to high levels of electromagnetic waves during pregnancy have much greater risk of giving birth to autistic children<sup>43</sup>. Developing organisms are usually more vulnerable to radiation due to the increased proliferation of juvenile cells at this stage of life<sup>44</sup>. Thus electromagnetic waves cause incomplete or problematic development of a child's brain, inhibiting modulating normal electromagnetic brain activity.

According to Goldsworthy<sup>43</sup> there has been a 60-fold increase in autism in recent years, which cannot be explained by improved diagnosis and can only be explained by changes in the

environment. This increase corresponds in time to the spread of mobile telephone, wireless modem (Wi-Fi) and the low frequency fields from wiring and appliances.

- Other health implications include: Muscle and joint pains, sore wrists and thumbs resulting from typing on a computer and texting on smartphones, reduction in life expectancy as a result of exposure to toxins, fatigue, hormonal imbalance, headaches, vertigo, immune weakness, nervousness and irritability, chest pains, weight gain, bone disorders and reduced bone density, metabolic disorders and constipation<sup>45, 46, 17</sup>.

## CONCLUSION

The most important issue in the use of electronic gadgets is how and where they are used. This is a key factor in determining how useful or detrimental they are to public health. Anti-radiation chips and electromagnetic wave neutralizers should be used with all electronic devices to protect people from the harmful effects of electromagnetic radiation that these gadgets emit. Electronic wastes (e-waste) should be reduced, reused and/or recycled before

sending to the landfill. This will help reduce the amount of e-waste going into the environment and also provide some other useful resources. For instance, mobile phones and printed circuit boards of various electronic devices contain valuable materials such as gold, silver, palladium and platinum. These should be recovered, reused and recycled. Furthermore people should be encouraged to use their innate capabilities most of the time rather than relying so much on electronic devices so as to prevent memory loss and brain damage.

To curb vision loss, time spent continuously in front of the computer should be limited. A computer user should look away from the screen every 20 minutes for 20 seconds. For ideal viewing distance, the monitor should be about 20-28 inches away from the individual's body and the top of the monitor should be at eye level to avoid looking down the screen by some angle and developing neck and back strain. Anti-reflective lenses should be worn during long working hours on the computer in order to protect the eyes.

Better strategies should be adopted by people during the use of electronic gadgets in order to reduce exposure to



electromagnetic waves. For instance electronic curfew should be set; time should be set for various activities involving the use of electronic gadgets such as phones and computers and the duration of time spent on each should be limited as well to avoid addictions. Quiet moments should be planned for, when all electronic devices will be put away to allow for high quality thinking and relaxation of the brain, body and mind. Families or couples on a date should insist that everyone turns off their phones at dinner or such dates and spend time together thereby excluding media distractions and fostering interpersonal communications and relationships. Making phone conversations shorter or using the loudspeakers would also help reduce the duration and magnitude of exposure to electromagnetic waves. Long phone conversations should be done using plug in earpiece and outside vehicles to reduce the impact of these waves on the body. It's essential to also keep away from wireless devices and appliances. The use of cabled equipment is much healthier, therefore you should absolutely minimise your use of mobile, cordless phones, wireless network (Wi-Fi) appliances and wii games. People should avoid living close to mobile phone

masts and towers, electrical pylons and high tension wires, and also avoid using a microwave completely. They should review and change their sleep environment ensuring it is free from all electrical and electronic appliances. Mobile phones and televisions should be put off overnight. This is really important because the body's immune resistance is considerably lowered during sleep because it has to rest and repair itself. The body therefore becomes much more sensitive to electromagnetic fields during sleep. Metal bed frames, bedsprings and amalgam fillings should be avoided. Amalgam fillings in the teeth become 'hot antennas' that help amplify the radiation within the head, so they should be replaced with tooth-coloured composite fillings. Regularly detoxification of the body should also be done at least 2-3 times a year. This is because when exposed to electromagnetic forces, the micro-organisms in the body create even more neurotoxins as a type of survival response.

Scientists and engineers should develop better and safer wireless systems and devices to ensure environmental protection. They should also include information on best safety practices with the use of their

electronic gadgets. Computers should be designed for very long term use and with sufficient data space in order to reduce the computers going to landfills so soon.

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