A Review on the Impact of the Electromagnetic Radiation (EMR) on the Human’s Health

Mohammadreza Aghaei¹, Yasmin Hanum Md Thayoob ², Sara Mahdaviasl¹, Soodabeh Darzi¹, Mohammadnoor Imamzai¹

¹ Faculty of Electrical Engineering, Universiti Tenaga Nasional
² Programme Head Electrical Engineering Postgraduate Programmes, Universiti Tenaga Nasional

Aghaei1984@gmail.com

Abstract: In recent years, due to technology advances human life are subjected to high level of Electromagnetic emission, Effects of the Electromagnetic Radiation (EMR) on the humans health is one most significant concern in the world. The present paper recognize of the possible health hazard on the humanity by exposure of Electromagnetic radiations (EMR). Potential of electromagnetic radiation can radiate through transmission lines which are very close to human’s life. The effects of the radiations are classified to two main categories that are known as ionization and non-ionization radiation may have ionization radiations have high energy that impact on the atoms in the cells, and lead to change their natural status, however they can be too dangerous and lethal, and they will lead to cancer and other diseases. On the other hand non-ionization radiations that consist of electromagnetic radiation such as communication waves, microwaves, electrical waves. This kind of radiation cannot change structure of atom; they just impact on their manner that it can lead to irreparable hurts.

Keywords – Electromagnetic radiation (EMR); transmission lines, ionization, non-ionization, Human Health

I. INTRODUCTION

Several publications in the scientific literature have raised concern about the individual and public health impact of adverse non-ionizing radiation from electromagnetic field (EMF) exposure emanating from certain power, electrical and wireless devices commonly found in the home, workplace, school and community [1]. Despite the many challenges in establishing irrefutable scientific proof of harm and the various gaps in elucidating the precise mechanisms of harm, epidemiological analyses continue to suggest considerable potential for injury and affliction as a result of non-ionizing radiation exposure [2]. As environmental health has not been emphasized in medical education, [3] some clinicians are not fully aware of possible EMF-related health problems and, as a result, manifestations of non-ionizing radiation may remain misdiagnosed and ineffectually managed. There is recognition of the potential cellular and tissue damage associated with exposure to ionizing radiation from X-rays, electromagnetic radiation (EMR) emanating from power lines, mobile phones, common electrical devices and some types of machinery has also begun to attract recent attention as a potential health hazard [4]. The main objective of the current paper is a review concerning to possible effect of Electromagnetic radiation (EMR) on the human’s health in various situation [5].

II. OVERVIEW OF ELECTROMAGNETIC SPECTRUM

Non-ionizing radiation refers to a type of energy that is given off or radiates’ away from the source of that energy. There are different forms of energy, each with distinct physical properties that can be measured and expressed in terms of frequency and wavelengths. Some waves have a high frequency, some medium and some low. The electromagnetic spectrum is a name used to describe a group of distinct energy forms that emanate from various sources. The energies released are referred to as types of EMR. Exhibiting high frequencies are gamma rays, X-rays and ultraviolet light; lower frequencies of the spectrum include microwaves and radio waves [6]. Light wave emission, which occurs at medium frequencies, provides for normal vision and the light we perceive; infra-red energy allows for the perception of heat. Most energy forms such as X-rays, ultraviolet energy and radio waves are invisible and imperceptible to the human. Without specialized instrumentation, most frequencies cannot be detected and, as a result, people generally do not appreciate their
exposure to energy fields in these ranges. Despite the lack of perception, exposure to high-frequency energy including X-rays is termed ionizing radiation and is potentially damaging to human cells. By altering the atomic composition of cell structures, by breaking chemical bonds and by inducing free radical formation, sufficient exposure to ionizing radiation may inflict DNA damage or mutation, thus increasing the risk of malignancy or cell death [7, 8].

III. NON-IONIZING RADIATION
Non-ionizing’ radiation, generally referring to energy forms with lower frequencies, has been considered safe by many scientists and without adverse effects at common exposure levels. Recently, however, increasing evidence suggests that some frequencies of Non-ionizing radiation may have potential to cause biological harm. Most of the research on the health effects of adverse Non-ionizing radiation has been done that consisting of three general types of anthropogenic non-ionizing EMR as the following:
First, there are extremely low frequency EMR from power lines, electrical appliances and electronic equipment [9].
Second is the electrical pollution: the operation of some electronic equipment (such as plasma televisions, some energy efficient appliances, variable speed motors, etc.) has the ability to manufacture frequency signals generally in the 3–150 kHz range which then flows along and radiates from wiring in affected homes and other buildings [10].
Third, there are microwave and radiofrequency emissions from wireless telecommunication devices such as wireless telephones, cell towers, antennas as well as broadcast transmission towers [11]. Ground current, sometimes referred to as stray current is electricity that is not confined to electrical wiring. Electrical current follows the path of least resistance and can flow through any and all available paths including earth, wires and various objects. Accordingly, electrical voltage can transmit through the ground and into building structures through such devices as metal pipes or rods in plumbing equipment, resulting in Non-ionizing radiation scattering into the adjacent environment [12].

A. EMFs and Human Health
While medical studies correlating EMF with adverse health outcomes have sometimes yielded apparently contradictory results, Studies looking at reproductive dysfunction, cancer potential appear to support previous suspicions that EMF exposure may present a health risk. Adverse pregnancy outcomes including miscarriage, stillbirth, preterm delivery, altered gender ratio and congenital anomalies have all been linked to maternal EMF exposure. A large prospective study published in Epidemiology, for example, is reported on peak EMF exposure in 1063 pregnant women around the San Francisco area. After participants wore a magnetic field detector, the researchers found that rates of pregnancy loss grew significantly with increasing levels of maximum magnetic field exposure in routine day-to-day life.

B. EMFs and Cancer
Numerous studies have investigated the allegation that intense exposure to some frequencies of EMR may be carcinogenic. For example, International Journal of Cancer recently published an important population-based case–control study on the link between childhood leukemia and magnetic fields in Japan. By assessing magnetic field levels in children’s bedrooms, the researchers confirmed that high EMF exposure was associated with a significantly higher risk of childhood leukaemia.

C. Physical and psychological impact
People with EHS frequently experience debilitating symptoms which can affect any body system including the central nervous system, musculoskeletal system, gastrointestinal tract, and endocrine system. Symptoms often lead to ongoing psychological stress and intense fear of being hit by EMR wherever they go. Many patients become incapacitated by such fear knowing that an invisible wireless signal may incite major
symptoms in their body at any time and any place. This unremitting fear and preoccupation with health issues can have a major impact on well-being, to the point where EHS individuals develop a phobia and disdain of electricity, with some desiring to escape civilization.

D. EMF Effects of The Mobile Phones And Telecommunication

Mobile phones transmit and receive signals via electromagnetic fields (EMFs) that are partly absorbed by the MP user. As MPs are commonly used in close proximity to the head, this feature has led to concerns about possible adverse effects on human health [8]. One problem in translating exposure sources for humans to experimental studies in rodents is that the frequency of maximum RF energy absorption depends on body size, shape, orientation and composition. Maximum resonant absorption in rats at lies in the frequency range of microwave and mobile phone exposure used in researches (0.5 to 3 GHz), but would scale to about 100 MHz in humans. This factor can in principle be taken into account in SAR calculations, but presents a problem for those studies that only use the external field strength to set exposure levels. Penetration depth relative to head size is also expected to be greater in laboratory rodents than in humans and their tissue parameters, heat redistribution and dissipation mechanisms differ. Another potential source of inaccuracies in exposure level is the RF exposure cell. Exposure cells that resonance signal in the body [14].

E. High Voltage Radiation Impacts On Humanity And Environment

The transmission lines with voltage above of 100 kV are the most powerful source of electro-magnetic non-ionizing radiation. The investigations of radiation effect on technical personnel are begun, when initiated construction of first 220 kV transmission lines, when the first signals of health worsening of workers appeared. Putting into operation transmission lines with voltage of 400kV led to many works in this field which afterwards became the foundation for the development of first in the world standard acts limiting the influence of 50 Hz electric field [15].

Transmission lines with voltage above of 500 kV influence on the environment in forms of:

a) Electric field with industrial frequency 50 Hz which apart from its harmful effect causes a number of undesirable effects.

b) Magnetic field with industrial frequency

c) Corona discharge radiation

F. EMFs and Nervous System (Blood–Brain Barrier)

The mammalian blood–brain barrier consists of endothelial cells, linked by tight junctions, and the adjoining pericytes and extracellular matrix. It helps maintain a highly stable extracellular environment necessary for accurate synaptic transmission and protects nervous tissue from injury. An increase in its normally low permeability for hydrophilic and charged molecules could potentially be detrimental [16]. Environmental heat in excess of the mammalian thermoregulatory capacity can increase the permeability of the blood–brain barrier to macromolecules. Neuronal albumin uptake in various brain regions was recently shown to be dose-dependently related to brain temperature, with effects becoming apparent with temperature increases of 1°C or more. Since sufficiently strong RF fields can lead to tissue heating, it seems logical to ask whether this could be a mechanism leading to increased blood–brain barrier permeability.

G. EMFs Effects on Sleep

There are some effects of high-frequency EMF exposure on sleep. This appears as a relevant topic for several reasons. Amongst other symptoms, complaints regarding sleep disturbances have been noted in anecdotal reports of people who believe to be affected by radiofrequency EMF, and this has led to speculations that EMF may interfere with normal sleep pattern, thus possibly mediating other health consequences. The potential risk of sleep disturbances has to be judged against the physiological background that sleep is a very complex biological process controlled by the central nervous system. And although the exact neurobiological mechanisms are not yet known in detail, the regular sequences of waking and sleeping states are necessary requirements for correct information processing of the brain, metabolic homeostasis and intact immune function. Moreover, sleep appears to be an appropriate physiological system to be studied with the aim of elucidating the interaction between high-frequency EMF and the human organism as sleep is a well defined biological condition, reacting very sensitively to external influences. Exposure can be there is increasing evidence that weak high frequency EMF, at intensities well below those necessary to cause any significant heating, can also induce biological effects [6, 17]. Nowadays the strive to resolve the impacts of non-ionizing high-frequency EMF clearly is focused on cancer risk, which may possibly be explained by an adoption of the anxiety about carcinogenic effects of ionizing radiation.[18]
VI. CONCLUSION

The present study was discussed the exposure of EMF radiations and their effects on the human health and wildlife. Especially, electromagnetic field impacts of the high voltage that is exposing from high voltage transmissions and corona effects. In current literature considered to some main impacts on the social humanity. The purpose of the current study was to give more knowledge about Electromagnetic radiations effect on our life, because many people don’t know about hazards due to radiations that already discussed about some fatal problems in variety categories in ion and non-ion radiation [19].

One of the more significant findings to emerge from this report is that we recognize whole radiation ways that may mention, such as microwave radiation that can produce effects especially on nervous, cardiovascular, immune and reproductive systems including: damage to the nervous system by altering electroencephalogram, changes in neural response or changes of the blood–brain barrier, disruption of circadian rhythms (sleep–wake) by interfering with the pineal gland and hormonal imbalances, Changes in heart rate and blood pressure, Impairment of health and immunity towards pathogens, weakness, exhaustion, deterioration of plumage and growth problems, DNA damage, Cancer decease and Impact on the pregnant women.

At last, recommended, all the buildings construct out of radiation defines, and as well, must used of good protection for all high voltage transmission lines. In urban, most of transmission lines must mount from underground, because high voltage radiation impacts will reduce, also there is some equipment that neutralize radiation effects and prevent to scattering of harms of electromagnetic radiation effects, when electrical and communications companies want to mount their radiation devices, they must attend to all above outlines that mentioned.

According results of the correlation analysis, based on the experimental data, it was concluded that the sufficient influence on the value of electric field intensity under the transmission line belongs to the factors which are able to change the conductors sag greatly and consequently change the distance between the conductive lines and the measured point.

Besides the considered above factors, the change of the relief under the transmission lines influences on the distance between the conductive parts line and the ground surface. If there are local ground rises and falls, in reference to the horizon, it can lead to substantial increase and decrease values of the electric field intensity, lead to the displacement of the maximal intensity zone aside from the line centre, and lead to distortion of the symmetrical field distribution [19, 20].

REFERENCES