

The decline of birds due to EM radiation: a review

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ABSTRACT

The aim of this research article is to review the population of birds after the installation of a transmission tower for mobile phones. The factors that affect the population and health of birds are studied in this manuscript. Birds are getting disorient from their path due to the variation in the electromagnetic field of earth. The bird species that have disappeared from the world is also discussed. It is observed that bird's reproductive success near the mobile phone base station is negligible compared to the far regions from the source.

Keywords: Electromagnetic radiation, Migration of birds, Reproductive success in birds, geomagnetic field.

INTRODUCTION

Electromagnetic radiation is created by the vibration between an electric field and a magnetic field. Electromagnetic waves are the combination of radio waves, microwaves, infrared rays, visible rays, UV rays, X-rays, and gamma rays. The frequency range of electromagnetic waves is less than 3×10^9 Hz and greater than 3×10^{19} Hz (1). Electromagnetic waves are harmful as well as beneficial to living beings. The main objective of this manuscript is to determine the biological effects of electromagnetic radiation (EMR) (2). In the present era, electromagnetic waves are widely used in telecommunication and healthcare departments. The interaction of electromagnetic radiation with the living organs and the application of EMR in medical and telecommunication areas are studied. The benefits and harms of EM radiation are also discussed in this manuscript. The main sources of electromagnetic radiation were invented by humans, which include computers, televisions, mobile phones, microwave ovens, and antennas for telecommunication etc. One of the electromagnetic fields is solar radiation, which is experienced by everyone. Some medical devices like MRI (Magnetic Resonance Imaging), X-ray computed tomography, Laser Lithotripsy, Radiation therapy, Position Emission Tomography (PET), and immunotherapy are the sources of high frequency electromagnetic waves (3). At present, for domestic use, some devices like induction cook tops, cordless phones, hairdryers, modems, and alarm systems are used. These devices increase the impact of electromagnetic fields in residential areas. Electromagnetic waves are also used to treat some diseases like kidney stones, cancer, brain tumors, and gallstones etc. Electromagnetic waves are the combination of ionizing and non-ionizing EM waves. The energy of ionizing EM waves is very high, whereas the energy of non-ionizing EM waves is very low. The ionizing EM waves consist of X-rays and gamma rays, which are high frequency rays. And non-ionizing EM ways

include microwaves, IR rays, visible rays, UV rays, and extremely low frequency (ELF) radiation. Ionizing radiation can ionize the matter through which it travels and has the ability to change the structure of the atom or molecule. Non-ionizing EM waves do not have enough energy to ionize the matter through which they travel. Non-ionizing radiation cannot directly affect the structure of an atom or molecule, but it may cause vibration in the atom due to heat produced in the atom. The direct and continuous exposure of non-ionizing radiation may cause of damage of cells and tissues due to heat up.

There is so much research done in the area of birds' health, population, and safety. According to the previous research, approximately 5245 bird species are suspicious all over the world whose population has decreased in the last decade (4). People used to eat birds, but this is not the only reason that the population of bird species is decreasing. Electromagnetic radiation, climate change, and pollution are also other factors due to which some bird species are vanishing from the world. It is observed that due to the installation of mobile phone base stations in many areas in the UK, a decline in the population of birds in urban areas was detected. One of the species was the sparrow, whose population decreased by 41% in the time period of thirty years. In Spain, during the period of 10 years from 1997 to 2007 (5), three bird species out of fourteen totally vanished due to the installation of mobile phone base stations, and a decline in the population of four species was also recorded. The variation in the productivity of *Ciconiaciconia* (white stork) was also recorded; the productivity near the mobile base station was less than at a distance of 200 m from the source of EM radiation (6). A decline in the population of house sparrows was also recorded in Belgium. The population decreased sharply in the areas where the strength of the electromagnetic field was strong. India is a well recognized country for its biodiversity. There are seventeen countries in the world which are famous for their biodiversity, and India is one of them. There are thousands of species of birds found in the world, and approximately one thousand two hundred thirty species of them are found in India alone (7). Bird species' reproductive success is reduced, as is the population and density of birds near the source of EM waves. A decline in the population of birds has been detected in some states of India like Punjab, Uttar Pradesh, and Madhya Pradesh, etc. Pigeons, sparrows, swans, and parrots are extremely affected by this harmful radiation. In Chennai, there are four species named *Passer domesticus* (house sparrow), *Haliasturindus* (brahmini kite), *Pycnonotusjocosus* (red whiskered bulbul) and *Streptopeliachinensis* (spotted dove) are declined. When birds pass through a region near a mobile phone base station, the EM radiation affects the navigational abilities of birds, which causes them to become disoriented from their path and fly in the wrong direction (8).

Review of Literature

In the last few years' birds have shown strange behavior due to stress. Some avian veterinarians are witnesses to the strange behavior of birds after the installation of mobile phone base stations. Migratory birds are lost during their migration as the number of mobile phone towers is increasing throughout the world. This may cause their death. It is very strange why birds are getting thrown off their path after the installation of transmission towers in the cities. According to some research, birds are very sensitive to the geomagnetic field (9). During the migration period, they find their path with the help of the earth's magnetic field. As the source of electromagnetic field is increased, there is a variation in the magnetic field of earth. When birds sense this magnetic field, they disorient and fly in the wrong direction. Sometimes birds reach the wrong place where they wander

in search of food, and due to the lack of food, they die. This is also a main reason behind the decreasing population of birds. Electromagnetic radiation is an invisible kind of pollution that is not seen but affects us continuously.

Many studies have shown that birds have the ability to sense the earth's magnetic field. Birds have a natural compass in their minds. When the source of electromagnetic radiation was very low, birds could migrate from a long distance without getting lost because they found their path of navigation with the help of the earth's magnetic field (10). But nowadays, it is a common thing for birds to die due to striking any tower or building. It is proof that the navigational ability of birds is affected by electromagnetic radiation. Electrical power lines are also an essential part of today's life. The number of these towers in the metro cities is very high. Now, for the development of rural areas, towers are being installed (11). Birds that have lost their navigational ability get struck by these towers and sometimes get trapped in the wire guide and die (12).

There are two more reasons for the declining bird population. First, due to lack of space for nesting and perching because of humans cutting down the forest and making houses and buildings over there. Secondly, humans use pesticides on their farms and lawns. Birds take grains and grubs in their food. Birds take grubs for their chicks, but due to the use of pesticides, grubs die and birds have nothing for their chicks. So, due to the lack of nests and food, birds are dying and the population of birds is decreasing. In some previous research, it was found that EM radiation is responsible for destroying the eggs and embryos of sparrows (13). There was a time when the bird sparrow was a common bird whose density was very high. But as time passes and as technology is introduced very fast, the diversity of house sparrows becomes low. There are some other factors like urbanization, lack of food, pollution, etc. that contribute to the decline of the house sparrow in the world. Continuous exposure to EM radiation affects the behavior, immune system, growth, reproductive success, and development in birds (14).

According to a laboratory study in Punjab, 50 eggs were exposed to electromagnetic radiation for a duration of 5–10 minutes; all the embryos in the eggs were destroyed (15). In some field studies, it was found that in the vicinity of mobile phone base stations, the breeding density and growth of birds were reduced. The population in that area decreased during the study period of 3.8 years. A study has been done in Nadia district in West Bengal, near the vicinity of a cell phone base station to find a possible link between the avian nesting and distance from the tower. It was found that the maximum value of power density was within a distance of 8m to 20m from the base station. In this region, the occurrence of nest was found to be the lowest, whereas the occurrence of finding the nest away from the tower at 80m was good (16). By 2021, India's total cell phone user base will be 1.2 billion, with 750 million of them using smart phones. It is forecasted that by 2026, India will be the second largest country to manufacture smart phones. Due to the pandemic COVID-19, most of the official work is done online, and the usage of smart phones and the internet has increased rapidly in the last 3 years. That's why the number of sources of EM radiation has increased.

Conclusion

From the above discussion, it is concluded that there are many factors behind the decline of bird populations in the whole world, but electromagnetic radiation emitted from mobile phones and mobile phone towers is a big factor behind the declination of bird populations. The increasing

number of mobile users is the reason behind the increased source of electromagnetic radiation in the world. It is observed from previous studies that the productivity of white stork near the mobile phone base station is less than the distance of 200m away from the source of EM waves. The nest count of birds in the Nadia district of West Bengal is negligible near the higher power density of radiation and higher at a distance of 80m away from the source. Thus, it is suggested that the intensity of the radiation of mobile phone and like towers should be as low as possible.

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