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EFFECT OF MOBILE TOWER RADIATION ON AVIAN FAUNA: A CASE STUDY OF LOLAB VALLEY, KUPWARA JAMMU AND KASHMIR

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Abstract: This paper summarizes a field survey which was conducted in different sites of Mobile towers located in Lolab Valley, Kupwara, Jammu and Kashmir to examine and analyze the effect of mobile tower radiation on birds. During the survey period, a total of 17 species of birds were recorded at the selected sites. The number of birds recorded within 200 m radius of mobile tower radiation was comparatively less than that found outside 200 m radius which reveals that these birds are affected more within this range as the number and effect of electromagnetic radiations emitted by mobile towers is inversely proportional to the distance from the tower as per ICNIRP (International Commission on Non Ionizing Radiation Protection). Moreover the birds commonly found within 200m radius were Common Myna, Rock Pigeon, Steppe Eagle, Jungle Crow and Eurasian Jackdaw. Based on the current available literature it can be stated that the invisible electromagnetic radiations emitted from cell phone towers affect the physiological and behavioral activities of birds. Hence future research is essential to explore more possible connection between electromagnetic radiations and their hazardous effects on avian fauna.

Index terms: Lolab Valley, Mobile tower, Electromagnetic radiations, Avian fauna, Hazardous.

I. INTRODUCTION

India is the world's fastest growing industry in terms of number of wireless connections after china with 811.59 million mobile phone subscribers..The wide spread use of mobile phones has lead to cell phone towers being placed in many communities.Mobile tower is a triangular/cone shaped metal structure which is more than 9 meter in height on which 3 Or more antennas are fixed, the structural height may depend on whether it is fixed on land or a building. These towers also called base stations have electronic equipment and antennas that receive and transmit radio frequency signals. Cell phones communicate with nearly cell towers mainly through RF waves, a form of energy in the electromagnetic spectrum between FM radio waves o microwaves.The RF-EMF radiations fall in the range of 10MHz–300GHz. Cell phone technology uses frequencies mainly between 800MHz and 3GHz and cell tower antenna uses a frequency of 900 or 1800MHz, pulsed at low frequencies, generally known as microwaves (300MHz–300GHz).The unseen electromagnetic radiations emitted from the mobile towers induce undesirable impact on living beings (R. Bhattacharya, R. Roy 2013).Microwave radiation has thermal effect causing increased body temperature followed by physiological changes, besides it has some non thermal effects causing changes in cellular metabolism in birds (Tanner 1966).Radiation from base stations usually cause irritation among the birds causing them to disappear to some other places where the radiation is low hence this provides a clue for their disappearance from the cities (Appleton *et al* 2002).Out of 919 research studies related to effects of cell phone radiations 30 are related to birds having positive (77%), negative (10%), and neutral 13% reports(Kumar 2010).According to a survey done in Bijapur district of Chhattisgarh the no of birds which was present in the area before installation of mobile towers has been reduced due to mobile tower Radiations (Durgam et al 2017). Recent studies reveal that the density of birds decreases with increase in the number of mobile tower radiations (Manish Kumar and R.K.Singh 2018).The present survey on the effect of mobile tower radiation on birds was carried out in different sites of Lolab Valley, Kupwara, Jammu and Kashmir.



Fig 2. Mobile tower in Lolab Valley



Fig 3. Rock Pigeon near mobile tower

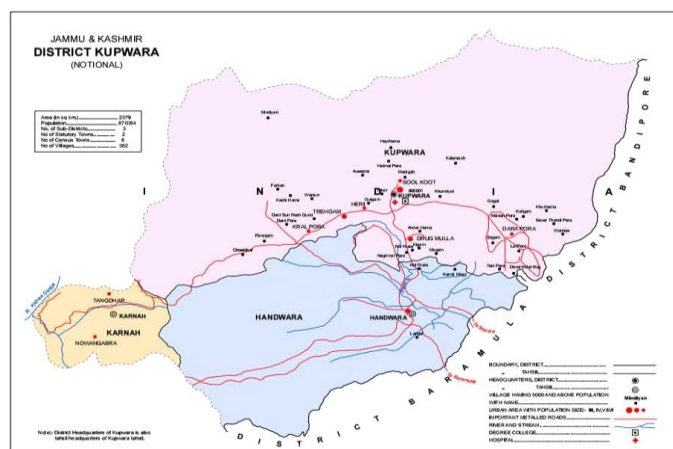


Fig 1. Source: District Census Handbook Kupwara census of India 2011.

II. MATERIALS AND METHODS

Study Area

The present study on the “Effect of mobile tower radiation on avian fauna” was conducted in five villages namely Darpora (site I), Lalpora (site II), Wavoor (site III), Sogam (site IV), and Krohsan (site V) of Lolab Valley, Kupwara, Jammu and Kashmir. Lolab valley is an oval shaped Himalayan valley situated 114Kms Northwest of Srinagar the capital of Jammu and Kashmir. The entrance to the valley lies 9 km north of Kupwara town. The valley is situated between the geographical coordinates of $34^{\circ}25'$ and $34^{\circ}42'$ N latitude and $74^{\circ}15'$ and $74^{\circ}32'$ E longitude. It lies at an elevation of 5564 ft above sea level. The area of the valley is 338.16 sq km. The valley is stunted with natural scenic beauty surrounded by lush green forests and snow clad mountains.

Field Methodology

For the collection and analysis of data point count method was used. It is a method in which the observer records all the visiting birds from a fixed position without touching and disturbing them for a specific period of time. The selected sites were visited twice a day for 2-3 hours in the morning and 2-3 hours in the evening to record the composition of birds. The snaps of the birds were taken using latest digital camera (DSLR). Birds were later identified with the help of the book entitled “The Book of Indian Birds” by Salim Ali.

Data Analysis

Table 1: Data Showing number and type of towers in selected sites of Lolab Valley

S.No	Tower location	Tower type						Total
		Airtel	Aircel	Reliance	BSNL	Vodafone	Idea	
1	Darpora	1	0	0	0	0	0	1
2	Lalpora	3	0	1	0	1	0	5
3	Wavoora	1	0	1	0	1	0	3
4	Sogam	4	0	1	1	0	0	6
5	Krohsan	2	0	1	0	0	0	3
Total								18

Table 2. Radiated power density from the mobile tower location and birds recorded in the area

S.No	Tower location	Tower type	Total number of towers within 200m radius distance	Power density in watts/meter	Total power density	Total no. of birds recorded in the area
01	Darpora	Airtel	01	0.002	0.002	27
02	Lalpora	Reliance	01	0.002	0.002	16
03	Wavoora	Airtel	01	0.002	0.002	15
04	Sogam	Reliance	01	0.002	0.002	14
05	Krohsan	Airtel	01	0.002	0.002	22

Power density (Pd) at a distance R is given by

$$Pd = Pt \times Gt / 4\pi R^2 \text{ watt/m}^2$$

Where Pt = transmitter power in watts,

Gt = gain of transmitting antenna

R = distance from the antenna in meters

For Pt = 20 watt, Gt = 17 dB = 50, pd for various values of R is given in table 3.

Table 3. Power density at distance R from the transmitting tower

Distance R (m)	Power density Pd in W/m ²	Power density Pd in μW/m ²
1	79.6	7,96,00,000
3	8.84	88,40,000
5	3.18	31,80,000
10	0.796	7,96,000
50	0.038	31,800
100	0.008	7,960
500	0.000318	318

Table 4: Bird distribution in the selected sites within 200m and outside 200m radius of Mobile Tower.

S.No	Tower location	Total No. of birds recorded in the area	
		Within 200m Radius of Mobile Tower	Outside 200m Radius of Mobile Tower
1	Darpora (site I)	27	40
2	Lalpora (site II)	16	29
3	Wavoora (site III)	15	37
4	Sogam (site IV)	14	30
5	Krohsan(site V)	22	35

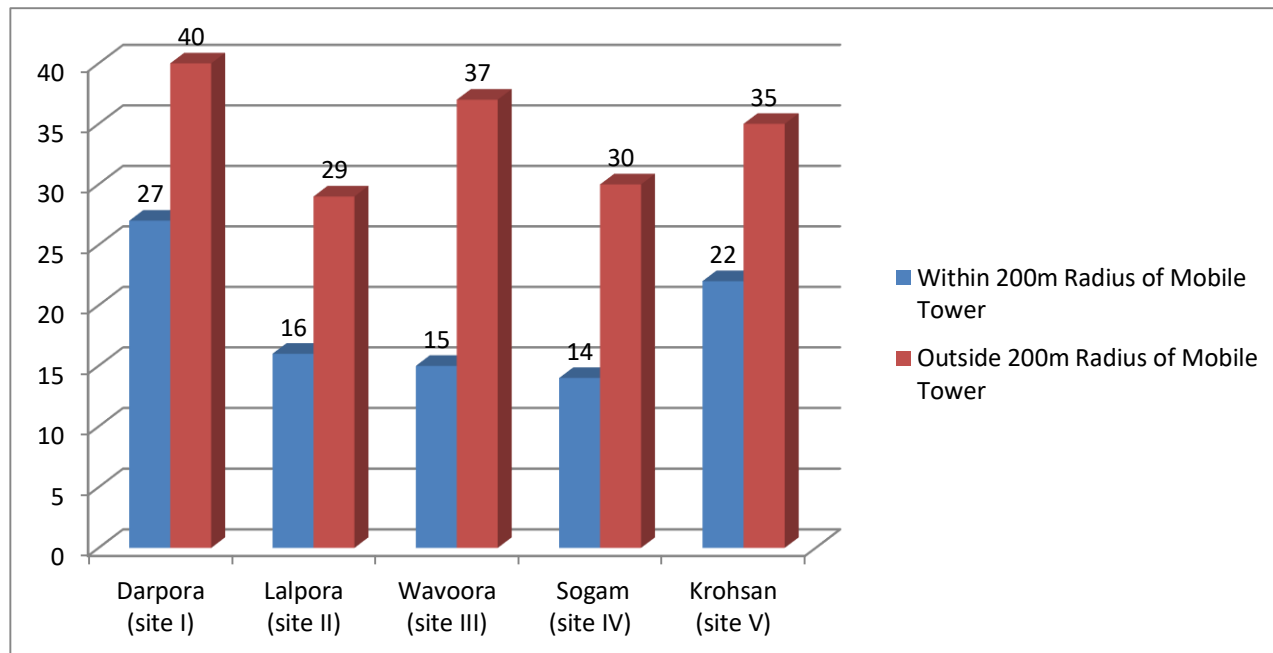


Fig 4. Comparison of bird distribution within 200m and outside 200m radius of mobile tower in the selected sites of Lolab Valley

Table 5: Bird distribution within 200m radius of mobile tower in the selected sites of Lolab Valley.

S.No	Common Name	Scientific Name	Site I	Site II	Site III	Site IV	Site V	Percentage %
1	Slatyheaded parakeet	<i>Psittacula himalayana</i>	0	0	0	0	0	0
2	Grey bushchat	<i>Saxicola ferreus</i>	0	0	0	0	0	0
3	Eurasian hoopoe	<i>Upupa epops</i>	0	0	0	0	0	0
4	European turtle dove	<i>Streptopelia turtur</i>	0	0	0	0	0	0
5	Himalayan bulbul	<i>Pycnonotus leucogenys</i>	0	0	0	0	0	0
6	Rock pigeon	<i>Columbia livia</i>	6	5	6	7	8	31.91
7	Common myna	<i>Acridotheres tristis</i>	12	8	6	5	7	40.42
8	House sparrow	<i>Passer domesticus</i>	0	1	0	0	1	2.12
9	Yellow billed blue magpie	<i>Urocissa flavirostris</i>	0	0	0	0	0	0
10	Himalayan woodpecker	<i>Dendro cops himalayensis</i>	0	0	0	0	0	0
11	Steppe eagle	<i>Aquila nipalensis</i>	2	1	1	0	1	5.31
12	Jungle crow	<i>Corvus macrorhynchos</i>	4	0	0	1	0	5.31
13	Eurasian jackdaw	<i>Corvus monedula</i>	3	1	2	1	5	12.76
14	Rock bunting	<i>Emberiza cia</i>	0	0	0	0	0	0
15	White wagtail	<i>Motacilla alba</i>	0	0	0	0	0	0
16	Spotted forktail	<i>Enicurus maculatus</i>	0	0	0	0	0	0
17	Plumbeous water red start	<i>Rhyacornis fuliginosa</i>	0	0	0	0	0	0
		TOTAL	27	16	15	14	22	100

Table 6: Bird distribution at outside 200m radius of mobile tower in the selected sites of Lolab Valley.

S.No	Common Name	Scientific Name	Site I	Site II	Site III	Site IV	Site V	Percentage %
1	Slatyheaded parakeet	<i>Psittacula himalayana</i>	5	0	0	4	0	5.26
2	Grey bushchat	<i>Saxicola ferreus</i>	2	0	0	1	2	2.92
3	Eurasian hoopoe	<i>Upupa epops</i>	1	2	0	0	1	2.33
4	European turtle dove	<i>Streptopelia turtur</i>	1	1	2	0	0	2.33
5	Himalayan bulbul	<i>Pycnonotus leucogenys</i>	3	2	4	0	2	6.42
6	Rock pigeon	<i>Columbia livia</i>	7	6	10	7	9	22.80
7	Common myna	<i>Acridotheres tristis</i>	9	5	8	6	10	22.22
8	House sparrow	<i>Passer domesticus</i>	3	7	5	4	2	12.28
9	Yellow billed blue magpie	<i>Urocissa flavirostris</i>	0	1	0	1	0	1.16
10	Himalayan woodpecker	<i>Dendro cops himalayensis</i>	2	0	2	0	1	2.92
11	Steppe eagle	<i>Aquila nipalensis</i>	2	3	2	1	0	4.67
12	Jungle crow	<i>Corvus macrorhynchos</i>	1	1	0	2	0	2.33
13	Eurasian jackdaw	<i>Corvus monedula</i>	3	1	2	1	3	5.84
14	Rock bunting	<i>Emberiza cia</i>	0	0	1	0	0	0.58
15	White wagtail	<i>Motacilla alba</i>	0	0	1	1	0	1.16
16	Spotted forktail	<i>Enicurus maculatus</i>	1	0	0	1	2	2.33
17	Plumbeous water red start	<i>Rhyacornis fuliginosa</i>	0	0	0	1	3	2.33
		TOTAL	40	29	37	30	35	100

Table 7: Bird species recorded within 200 m radius and outside 200m radius of mobile tower at the selected sites of Lolab valley.

S. No	Bird Species	Site I		Site II		Site III		Site IV		Site V	
		Withi n 200m	Outsid e 200m	Withi n 200m	Outsid e 200m	Withi n 200m	Outsid e 200m	Withi n 200m	Outsid e 200m	Withi n 200m	Outsid e 200m
1	Slatyheaded parakeet	-	✓	-	-	-	-	-	✓	-	-
2	Grey bushchat	-	✓	-	-	-	-	-	✓	-	✓
3	Eurasian hoopoe	-	✓	-	✓	-	-	-	-	-	✓
4	European turtle dove	-	✓	-	✓	-	✓	-	-	-	-
5	Himalayan bulbul	-	✓	-	✓	-	✓	-	-	-	✓
6	Rock pigeon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	Common myna	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	House sparrow	-	✓	✓	✓	-	✓	-	✓	✓	✓
9	Yellow billed blue magpie	-	-	-	✓	-	-	-	✓	-	-
10	Himalayan woodpecker	-	✓	-	-	-	✓	-	-	-	✓
11	Steppe eagle	✓	✓	✓	✓	✓	✓	-	✓	✓	-
12	Jungle crow	✓	✓	✓	✓	✓	✓	✓	✓	-	-
13	Eurasian jackdaw	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
15	White wagtail	-	-	-	-	-	✓	-	✓	-	-
16	Spotted forktail	-	✓	-	-	-	-	-	✓	-	✓
17	Plumbeous water red start	-	-	-	-	-	-	-	✓	-	✓

Table 8: Bird distribution recorded at the selected sites of Lolab valley.

S.no	Common name	Scientific name	No .of individuals
1	Slatyheaded parakeet	<i>Psittacula himalayana</i>	9
2	Grey bushchat	<i>Saxicola ferreus</i>	5
3	Eurasian hoopoe	<i>Upupa epops</i>	4
4	European turtle dove	<i>Streptopelia turtur</i>	4
5	Himalayan bulbul	<i>Pycnonotus leucogenys</i>	11
6	Rock pigeon	<i>Columbia livia</i>	71
7	Common myna	<i>Acridotheres tristis</i>	76
8	House sparrow	<i>Passer domesticus</i>	23
9	Yellow billed blue magpie	<i>Urocissa flavirostris</i>	2
10	Himalayan woodpecker	<i>Dendro cops himalayensis</i>	5
11	Steppe eagle	<i>Aquila nipalensis</i>	13
12	Jungle crow	<i>Corvus macrorhynchos</i>	9
13	Eurasian jackdaw	<i>Corvus monedula</i>	22
14	Rock bunting	<i>Emberiza cia</i>	1
15	White wagtail	<i>Motacilla alba</i>	2
16	Spotted forktail	<i>Enicurus maculatus</i>	4
17	Plumbeous water red start	<i>Rhyacornis fuliginosa</i>	4
	Total		265

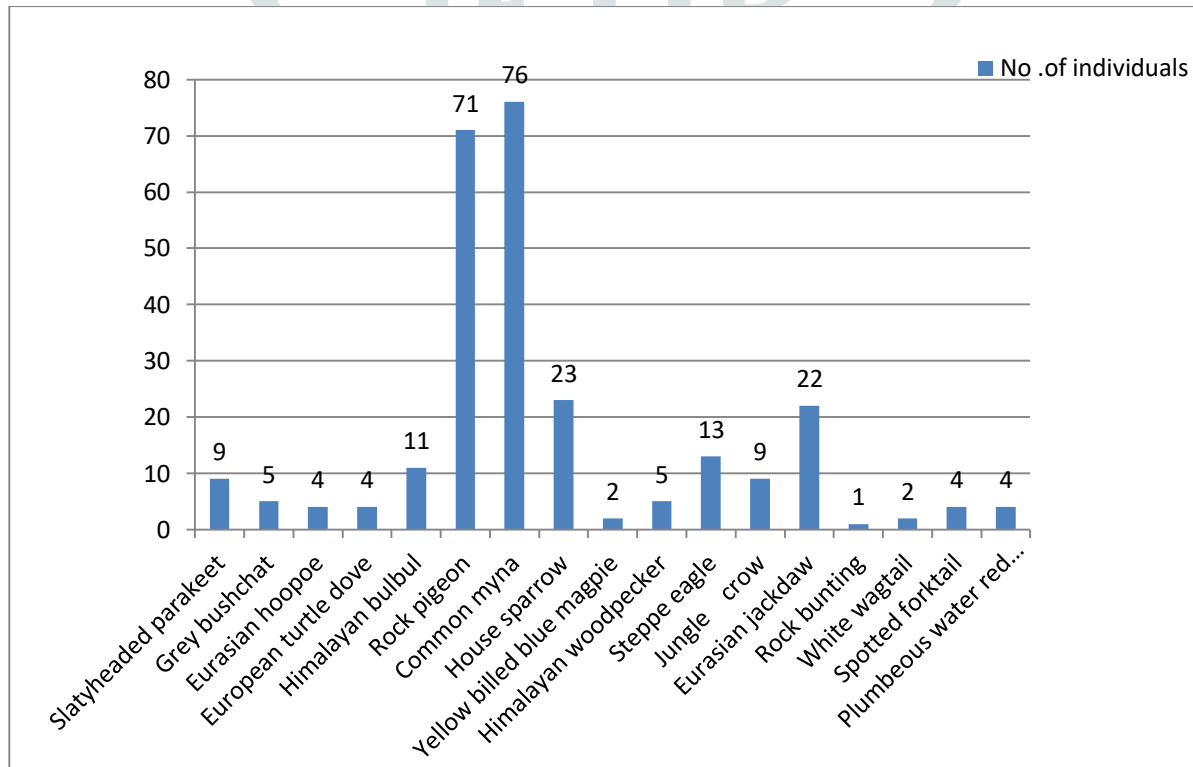


Fig 5: Comparison of Bird distribution recorded at the selected sites of Lolab valley

III. RESULTS

The present survey reveals that a total of 17 species of Birds were recorded near cell phone towers at all the selected sites of the study area. The number of birds recorded within 200 m radius of mobile tower radiation was found to be 94 which is comparatively less than that found outside 200m radius i.e. 171 which means that birds are very much exposed to electromagnetic radiations within 200m radius as compared to outside 200m radius of mobile tower radiations as the number and effect of radiations is inversely proportional to the distance from the tower. The birds found within 200m radius more often were Rock pigeon, Common Myna, Steppe Eagle, Jungle Crow and Eurasian Jackdaw. Out of these highest percentage was found to be that of Common Myna (40.42%) followed by Rock pigeon (31.90%). It suggests that these birds might have adapted themselves, attained resistance against the electromagnetic radiations and are thus least affected by such radiations.

IV. CONCLUSION AND SUGGESTIONS

From the above results it can be concluded that Birds are highly affected by electromagnetic Radiations produced from mobile towers .Behaviour of birds may be changed when exposed to such radiations .They may lose the power of orientation,natural navigation and fly in any direction. Birds absorb radiation more often due to their more body surface area to body weight ratio .Moreover studies reveal that some birds are declining and some are about to decline due to more installation of mobile towers .So there is a need to have a serious concern about the effect produced on birds due to the these mobile tower radiations and possible arrangements to be made to minimize or limit such radiations. Therefore it becomes essential to carry out more research in future so that the harmful effects of the technology are easily assessable to common man so as to have a better tomorrow

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