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Vanishing Vultures: Are veterinary Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) killing vultures ? A study at Jorbeer, Bikaner

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ABSTRACT

Jorbeer (Bikaner) has remained major source of attraction in past year as 20-35 carcasses dumped per day by municipal board. Seven vulture species have been regularly wintering at Jorbeer. The site is 4 square / kilometer forest area and 12 km. away from Bikaner city. Three vulture species have increased consistently i.e. Eurasian Griffon Vulture, Himalayan Griffon Vulture and Egyptian Vultures. King Vulture, White backed vulture, long billed vulture and Cinereous vultures remained stable in population. Vultures were observed healthy during long term study from October 2001 to March, 2015.

As variety of theories reveals that Diclofenac and now Aceclofenac are main cause of vultures decline. Vultures at Jorbeer have not exhibited overt sign of Diclofenac and Aceclofenac contamination and toxicity. Even no single vulture were observed sick or diseased. Vultures were always injured and killed by feral dogs. Feral dogs are main threat for vultures at Jorbeer. The manufacture and importation of veterinary diclofenac was already banned in India in May 2006. The survey conducted in this study shows that Aceclofenac has not been prescribing by Doctors and unavailable in veterinary pharma shops. In Bikaner city Nimesulide, Paracetamol, Chlorzoxazone, Ketoprofen and Analgin are widely used to treat cattle population. This study explains that Diclofenac, Aceclofenac and other non-steroidal anti-inflammatory drugs. (NSAIDs) are not responsible for vulture decline.

Keywords: Diclofenac, Aceclofenac, NSAIDs, Vulture Population, Feral dogs.

INTRODUCTION

During the first half of the twentieth century, two species of Gyps Vulture (*Gyps bengalensis* and *Gyps tenuirostris*) were well distributed and often specially noted as abundant in South east Asia. By the end of that century, both species were extinct across almost the entire area. Since the early 1990s Gyps vulture populations have collapsed across the Indian subcontinent.^{1,2,3} Populations of at least three species are known to have been affected (white-backed *Gyps bengalensis*, long-billed *G. indicus* and slender-billed *G. tenuirostris* vultures) and have declined by more than 97% since 1992.^{2,4} All three species are now listed as critically endangered by the IUCN-World Conservation Union⁵.

Considerable evidence now indicates that the catastrophic vulture decline has been caused by the non-steroidal anti-inflammatory drug (NSAID) diclofenac, which is widely used to treat livestock. In experiments, captive *G. bengalensis* died after feeding on tissues of domestic animals that had received a normal veterinary dose of the drug a few hours before death⁶. Diclofenac and Aceclofenac are non-steroidal anti-inflammatory drugs. Both can be used to relieve pain. Aceclofenac, the new entrant in this category, bears close structural and pharmacological resemblance to diclofenac. It has been found that aceclofenac is a new derivative of diclofenac and gets metabolized into diclofenac.

Nine species of vultures are recorded in Indian subcontinent⁷. Seven species were observed at Jorbeer, Bikaner (Rajasthan) India⁸. All the vulture species come and stays in winters. These are long billed vulture (*Gyps indicus*), white backed vulture (*Gyps bengalensis*), Eurasian Griffon Vulture (*Gyps fulvus*), Himalayan Griffon Vulture (*Gyps himalayensis*), King Vulture (*Sarcogyps Calvus*), Cinereous Vulture (*Aegyptius monachus*) and Egyptian vulture (*Neophron percnopterus*).

The variety of studies reveals that NSAIDs (Diclofenac and Aceclofenac) drugs used on cattle proved to be poison for vultures of India and other South Asia countries. But this study at Jorbeer, Bikaner reflects that vultures species are increasing or remains consistent. These veterinary drugs are not affecting the vultures population.

MATERIAL AND METHODS

Study Site

The Bikaner district of Rajasthan is situated in western part of the "Thar" desert. The study area Jorbeer situated South-East to Bikaner at a distance of 12km. from city behind NRCC (National Research Centre of Camel). The geographical location of study area is 28°3' North latitude and 73°5' East longitudes at the height of 234.84 MSL. Jorbeer is a municipal dumping stand as 20-35 carcasses dumped per day by the municipal board. This desert area is known for extreme desertic conditions whose temperature reaches 49.50°C high and minimum -1°C to -2°C. The vegetation of the region is thorny and scanty.

Methods

Vultures has been observed by using binocular and calculated by scanning and counting method. The counts and survey of this undisturbed forest area was done during day from 7.00 - 18.00 hrs in regular intervals. The behaviours and activities of different vulture species were observed very minutely. The maximum population of different vultures has been presented in years and monthwise in table. The area selected for the observation various bushes, ground and large trees such as *prosopis cineraria* and *Salvadora oleoides* etc.

RESULTS AND DISCUSSION

During the 1970s and 1980s, when Gyps vultures were absent or scarce across most of Southeast Asia *G. bengalensis* and *G. indicus*, remained extremely abundant in India, especially amount town and cities. This abundance resulted from the large number of cow carcasses available for vultures in northern and central state of India, where religious beliefs prohibit their slaughter⁹. Veterinary use of diclofenac, a non-steroidal anti-inflammatory drug (NSAID), was considered as main factor responsible for the declines of Gyps vultures in South Asia. Various studies have established that diclofenac is toxic to vultures¹⁰ and widespread in cattle carcasses across India¹¹ at sufficient concentrations to be the principal cause of the declines¹².

Now Aceclofenac has been considered a threat to critically Endangered vultures in India due to its structural and pharmacological resemblance to diclofenac¹³. The study suggest that Aceclofenac should not even be safety tested on vultures as it threat to already clear. As a consequence, the manufacture and importation of veterinary diclofenac was banned in India in May 2006 with bans in Nepal and Pakistan in same year.

Jorbeer has remained a major source of attraction in past years. The seven species of vultures have been visiting in winters past years. Eurasian Griffon Vulture, Himalayan Griffon vultures and Egyptian vultures have increased consistently. The King vulture, white backed vulture, long billed vulture and cinereous vultures were observed stable in population. Three Species king vulture, long billed vulture and white backed vulture are disappearing slowly from the site after year 2010. At present these species observed totally absent at jorbeer. Nests have not been recorded at Jorbeer, Bikaner. The effect of any disease were not observed on seven species of vultures⁸. During long term study Eurasian Griffon Vultures (*Gyps fulvus*) observed in maximum numbers (n=670). The Eurasian Griffons were increased regularly in past years because large amount of predictable food availability. The feeding and roosting site both were close together at Jorbeer, indicates the high suitability of utilization carcass dumps as food source because it reduces utilization of energy while reaching for food¹⁴.

The Eurasian Griffon Vulture (*Gyps fulvus*) (n= 670) Himalayan Griffon Vulture (*Gyps himalayensis*) (n=98), Cinereous Vulture (*Aegyptius monachus*) (n=71), Egyptian Vultures (*Neophron percnopterus*) (n=800), long billed vulture (*Gyps indicus*) (n=7) and white backed vultures (*Gyps bengalensis*) (n=6) and Maximum of (n=5) King Vulture (*Sarcogyps calvus*) were recorded in 15 years of research work.

Table 1: Maximum Population of Different Vultures at Jorbeer (Year 2000-2015)

S.No	Name of Vulture	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1.	King Vulture	4	5	3	2	3	2	4	5	3	2	4	-	-	-	-
2.	Cinereous Vulture	35	25	70	63	59	55	69	67	70	64	71	65	70	64	65
3.	Egyptian Vulture	280	350	394	400	410	380	419	426	438	478	460	450	442	540	800
4.	Long Billed Vulture	4	2	6	7	6	4	6	7	4	5	2	4	5	-	-
5.	White Backed Vulture	4	2	6	7	6	4	4	6	5	5	3	2	4	-	-
6.	Eurasian Griffon Vulture	97	150	375	498	479	395	410	455	515	580	670	650	632	620	650
7.	Himalaya n Griffon Vulture	74	79	84	90	92	79	87	92	94	98	87	93	84	75	50

The population of individual vulture species has remained consistent in growth at Jorbeer, Bikaner. There are various studies suggest that viral disease and Diclofenac are the main causes of vulture decline but at Jorbeer no sick and diseased vulture were reported. The vulture were observed healthy and feeding naturally⁸. Gyps vultures are exposed to diclofenac through consuming the contaminated carcasses of live stock that have been treated with the drug shortly before death from kidney failure, extensive visceral gout and renal damage. This experimental testing has established that diclofenac is toxic to four species of vultures in genus Gyps i.e. white backed vulture (*Gyps bengalensis*), Long billed vulture (*Gyps indicus*), Slender-billed vulture (*Gyps tenuirostris*) and Himalayan Griffon Vulture (*Gyps himalayensis*) but information on the toxicity of diclofenac to other member of the genus is not described in recent studies¹⁵. The Eurasian Griffon vulture (*Gyps fulvus*) has shown continuous growth and increased consistently in past years at Jorbeer. No sick and diseased vulture was recorded during study period. Eurasian Griffons have not exhibited overt sign of diclofenac (NSAID) contamination and toxicity¹⁶. Carcass dumps appears to be a key factors for increasing Eurasian Griffon Vultures during winter migration at Jorbeer, as 20-35 carcasses available daily at Jorbeer¹⁵. The home range characteristics of vultures were examined in winters. They have occupied 8640 square/ kilometer area at Jorbeer and surrounding areas of Bikaner district (Rajasthan).

The home range of each species was overlapped and covering 74 villages between latitudes 27⁰35' North to 28⁰30' North and 72⁰52' East to 73⁰49' East longitude¹⁷.

Fig. 1(a): Adult Egyptian Vulture (*Neophron percnopterus*) killed by Feral Dogs at Jorbeer, Bikaner



Fig. 1(b): Adult Eurasian Griffon Vulture (*Gyps Fulvus*) killed by Feral Dogs at Jorbeer, Bikaner



Now Aceclofenac has been found that it is a new derivative of diclofenac and gets metabolized into diclofenac. Aceclofenac would be more dangerous for vultures because it is more potent than diclofenac in its action against pain. According to veterinary doctors of Govt. Veterinary Hospital, Gogagate, Bikaner. Aceclofenac is not in practice and they are not prescribing this drug.

Nimesulide, Paracetamol, Chlorzoxazone, Ketoprofen, Veterinary Bolus and injections and Analgin anti-inflammatory drugs are available in veterinary hospitals and pharma shops. The pharmacists in front of hospital told that they are not selling diclofenac and aceclofenac drugs banned in veterinary use by Govt. of India. The survey supports the study that Diclofenac and Aceclofenac may not be the cause of vulture decline. The illegal selling of Diclofenac and Aceclofenac these drugs should be the matter of concern.

Fig. 1 (C): Group of Feral dogs at carcass dump at jorbeer, Bikaner



The use of Diclofenac as a veterinary drug was banned in 2006 but various studies and reports suggest that vultures are still declining. At Jorbeer the effect of Diclofenac and Aceclofenac has not been observed in past years. Vultures were injured or killed by feral dogs. The population of feral dogs is continuously increasing at Jorbeer. The number has reached 700 to 1000. Dogs are the main threat for vultures at Jorbeer. Vultures were mostly injured during group feeding.

There are some recommendations for the survival of vultures -

1. The illegal selling of diclofenac and aceclofenac should be checked in veterinary pharmaceutical shops.
2. The major plan would be encouraged, for taking action against illegal pharmaceutical manufacturers and pharmacists.
3. Conservationists in India have promoted the sale and use of meloxicam as it is the only safer NSAID of low toxicity to vultures as well as being an effective for treating livestock must be recommended.
4. The cutting of old and mature trees should be banned for vulture's nests.
5. The area must be away from human activity and other disturbances.
6. Feral dogs have been observed as dangerous for vultures so the dump area must be protected from feral dogs.
7. The carcass dumps would have been away from road highways.
8. Pathological studies should be encouraged to find out the effects of drugs and viral diseases.

CONCLUSION

Diclofenac and Aceclofenac (NSAIDs) were the medications used to treat inflammation and pains in veterinary sciences. Diclofenac was banned in India in May 2006. Recently Aceclofenac has not found in practice by veterinarians in Bikaner City. Variety of studies suggests that these NSAIDs are main cause of vulture decline specially in four Gyps species. Effects of any NSAIDs were not observed at Jorbeer, Bikaner. Vultures were recorded healthy and feeding naturally. Feral dogs are main threat for vultures at Jorbeer.

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