

**Research Article**

## **DICLOFENAC (NSAID) IS NOT INFECTIOUS FOR EURASIAN GRIFFON VULTURE (*GYPS FULVUS*): A STUDY AT JORBEER, BIKANER**

**\*Prabodh Chander Khatri**

*Desert Wild Life Society, Bikaner, Rajasthan, India*

*\*Author for Correspondence*

### **ABSTRACT**

Usually Diclofenac, a non-steroidal anti-inflammatory drug (NSAID), is the main cause of the observed population decline (due to deaths) in vulture. Diclofenac is a widely available veterinary drug in South Asia, where it is used to treat domestic livestock. Vultures are exposed to the drug when they consume carcasses of animals that were treated with diclofenac shortly before death. The experimental testing has established that diclofenac is toxic to only four species of vultures in the genus *Gyps* i.e. *Gyps bengalensis*, *Gyps indicus*, *Gyps tenuirostris* and *Gyps himalayensis* but information on the toxicity of diclofenac to rest of other four members of genus is lacking i.e. (*Gyps fulvus*, *Gyps africanus*, *Gyps coprotheres* and *Gyps rueppelli*). The Griffon vulture (*Gyps fulvus*) is a large old vulture in the bird of prey accipitridae. It is regular winter migratory vulture along with other raptors at Jorbeer, Bikaner (Rajasthan) India. Plenty of food available at Jorbeer as 20-35 carcasses dumped per day. The population data was recorded during March 2001 to October 2011. The Eurasian Griffon vulture (*Gyps fulvus*) have shown continuous growth and increased consistently in past years. No sick and diseased vulture was recorded in 11 years of study period. Few vultures were observed injured by feral dogs. The Eurasian griffons (*Gyps fulvus*) have not exhibited overt sign of diclofenac (NSAID) contamination and toxicity.

**Key Words:** Diclofenac (NSAID), Eurasian Griffon vulture and Population

### **INTRODUCTION**

Since the 1990s vulture populations across the Indian subcontinent have collapsed (Gilbert *et al.*, 2002; Prakash *et al.*, 2003); the peregrine fund 2004). At least three species have been affected: the white-black vulture (*Gyps bengalensis*). Long billed vulture (*Gyps indicus*) and slender billed vulture (*Gyps tenuirostris*) (Rasmussen & Parry 2001). Populations have been declined by more than 95% within about 10 years (Prakash *et al.*, 2003; The peregrine fund 2004). The IUCN - world conservation union has listed all three species as critically endangered (Hiltor- Taylor 2000).

Veterinary use of the non-steroidal anti-inflammatory drug (NSAID) diclofenac has been shown to be the major cause of the collapse of population of three *Gyps* species endemic to South Asia. Diclofenac poisoning of vultures is thought to occur when they feed on carcasses of treated livestock. At post-mortem examination, these birds showed extensive visceral gout, deposits of uric acid on and within internal organs due to kidney failure (Oaks *et al.*, 2004). Determining the toxicity of diclofenac and other NSAIDs to vultures and other scavenging birds is an urgent priority to ascertain the wider threat that these drugs may pose. NSAIDs are widely used in veterinary medicine, so vultures (accipitrid and cathartid) and other scavenging birds (e.g. raptors, scavenging strokes and corvids) in many areas are likely to consume NSAID treated animals (Anderson *et al* 2005).

Eight vultures' species of the genus *Gyps* are widely distributed across Europe, Asia and Africa. They are all obligate scavengers, feeding primarily on the carcasses of large ungulates and nesting and roosting often colonially, on cliffs or in the trees. They use energetically economical soaring flight to travel long distances from nests and roosts in search of ungulate carcasses (Houston 1974, Ruxton and Houston 2004). The genus *Gyps* contains eight species, which includes the three resident Asian species (*Gyps bengalensis*, *Gyps indicus* and *Gyps tenuirostris*), two migratory species (*Gyps fulvus* and *Gyps himalayensis*) and three species of Africa (*Gyps africanus*, *Gyps coprotheres* and *Gyps rueppelli*).

### Research Article

Nine species of vultures are recorded in the Indian subcontinents (Ali and Ripley, 1983) of which seven species have been observed at Jorbeer area, Bikaner (Rajasthan) India. The four species were recorded from genus *Gyps* (*G. Benaglensis*, *G. Indicus*, *G. fulvus* and *G. Himalayensis*) and rest of three species i.e. *Sarcogyps calvus*, *Aegypius monachus* and *Neophron percnopterus* come and stay in winters at Jorbeer. Out some Egyptian vultures (*Neophron percnopterus*) are resident in this area.

The Eurarian Griffon Vulture (*Gyps fulvus*) is a large old vulture in the bird of prey Acciptridae. They migrate down to warmer foothills and plains in winters. Eurasian Griffon vulture is a regular winter visited at Jorbeer. It was observed that the population of Eurasian Griffons increased in past years. However, neither of these studies established whether diclofenac poisoning is toxic to Eurasian Griffon Vultures (*Gyps fulvus*). This paper describes that Diclofenac (NSAID) is not affecting the population of Genus *Gyps fulvus*.

### MATERIALS AND METHODS

The Bikaner district of Rajasthan is western past of the 'Thar' desert. Jorbeer is a dumping site for cattle carcasses, situated 12 km from city. The geographical location of area is 20°3' North lalitude and 73°5' East longitudes at height of 234.84MSL. Approximately 20-35 carcasses were dumped per day by municipal board, providing plenty of food regularly to scavenging birds and mammals. The climate is dry with low annual rainfall less than 100mm. and temperature ranges upto 49.5 high and minimum -1°C to -2°C, high solar incidence 450-500 cal M<sup>-2</sup> day<sup>-1</sup>. Other raptors at site included six species of vultures (white backed vulture (*G.bengalensis*), Long billed vulture (*G.indicus*), Himalayan Griffons (*G.Himalayensis*), Cinerous vulture (*Aegypius monachus*), King vulture (*Sarcogyps calvus*) and Egyptian vulture (*Neophron percnopterus*), Stepple Eagles (*Aquila nipalensis*), Towny Eagle (*A. rapax*), Black kite (*Milvus migrans*), Black Eagle (*Ictinateus malayensis*) etc. The vegetation of the region is thorny and scanty i.e. *Prosopis cineraria*, *Salvadora oloides* and bushes of *Zizypus manutina* along with shrubs of *Aerva-persica*, *Leptadenia pyrotechnica* etc. Stray dogs were present in varying number at the site (Figure 1).



Figure 1: Showing carcass dumping stand ecology: Dogs, Cattle Egrets are searching amongst the heaps of carcassess at Jorbeer

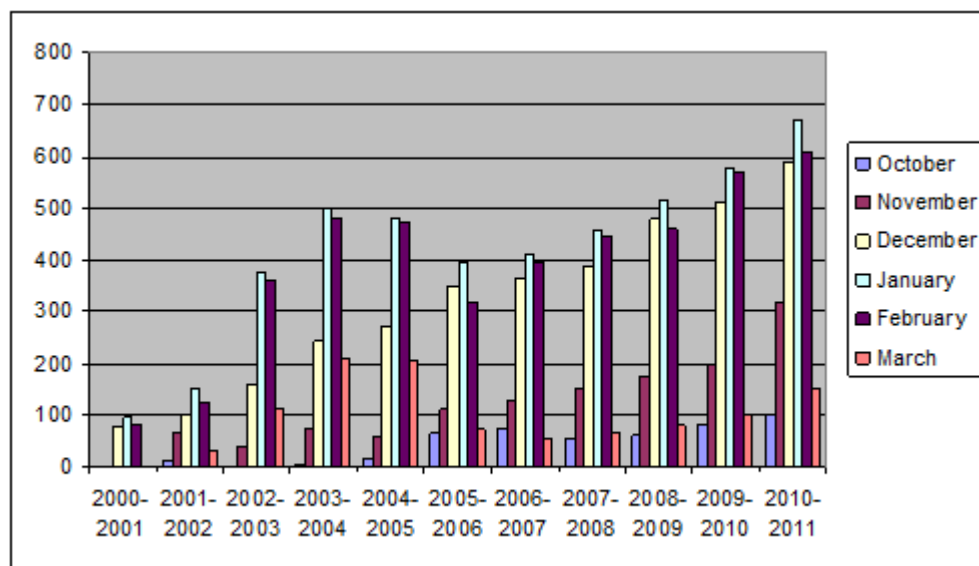
## Research Article

All Griffon vultures were counted by binocular, avoiding close approaches that might alter behaviour. Visits were always carried out from morning until dusk in order to determine the importance of nocturnal sites (Garrido and Sarasa 1998). Counts were plotted graphically and only the highest counts per months were considered sunyer 1988). The population data of Eurasian Griffons from October 2001 to March 2005 has been obtained from my Ph.D. Thesis (Chander 2006). Total eleven years of population record has been presented graphically in this paper.

## RESULT AND DISCUSSION

Since the outbreak of the disease in India, an increase in the number of Eurasian Griffon vulture (*Gyps fulvus*) spending the winters in India. In recent years, large numbers of migratory Eurasian Griffons have been over wintering in north west India. It is regular winter visitor of Jorbeer, Bikaner. The maximum population observed in December, January and February months. Eurasian Griffons (*Gyps fulvus*) reaches the jorbeer area in the month of October as flocks along with Himalayan Griffons (*Gyps himalayensis*) and Cinereous vultures (*Aegypius monacus*) and departs by first week of March.

The maximum population data of 11 years was recorded (2001-2011) i.e. 97 Eurasian vultures in year 2000-2001, 150 vultures in 2001-2002, 375 vultures in 2002-2003, 498 vultures in 2003-2004, 479 vultures in 2004-2005, 395 vultures in 2005-2006, 410 vultures in 2006-2007, 455 vultures in 2007-2008, 515 vultures in 2008-2009, 580 vultures 2009-2010 and 670 Eurasian Griffon vultures in year 2010-2011. The population of Eurasian Griffons vultures have increased regularly in past years at Jorbeer. (Figure 2)



**Figure 2: Eurasian Griffon Vulture (*Gyps fulvus*) showing monthwise population of year (2001-2011)**

Cuningham. A (2000) reports an increase in the number of Eurasian Griffons spending the winters in India. Prakash V. (1999) has observed wintering 25-30 Eurasian Griffons every year from 1985 to 1996 in Keoladeo National park, Bharatpur Rajasthan. Spain holds more than 80% European Griffon vulture (*Gyps fulvus*) (Hagemeijer and Blair 1997, Del Moral and Marti, 2001) During the 1980's and 1990's. This population has undergone a sharp increase in Spain.

*Gyps* vultures are exposed to diclofenac through consuming the contaminated carcasses of livestock 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 tenurostris*) and Himalayan Griffon Vulture (*Gyps Himalayensis*) but information on

### Research Article

the toxicity of diclofenac to other members of the genus is not described in recent studies. (Devojit Das et al 2011).

The above discussed various studies suggest that Diclofenac (NSAID). a medication used to treat information and panis in veterinary use is the main cause of vulture decline specially in four Gyps species. But there have not been recorded any data regarding Eurasian Griffon vultures (*Gyps fulvus*). The Eurasian Griffons from Genus Gyps were observed healthy and feeding naturally during their winter migration. The population of Eurasian Griffon vultures (*Gyps fulvus*) shows consistent growth in past 11 years at Jorbeer. The use of Diclofenac as a veterinary medicine was banned in 2006. But still vulture population have been breeding and surviving in and around Jodhpur and many parts of Western Rajasthan (Chhangani 2004). The variety of theories also explains that diclofenac is not only cause of vulture decline. There are another factors i.e. habitat loss, poisoning, accidents, predation by feral dogs and human population pressure. (Channgani 2004, Gupta, 2005). Wintering aspects of migrant Griffon vultures and other birds of prey received very little attention by researchers (Martinez and sanchez-zapata 1999). Jorbeer is the dumping site for dead animals. The number of dead animals ranges from 25-35 daily; so there is no food scarcity for vultures and other animals. Food availability has certainly a functional response in Griffon numbers and their distribution (Munday et. al. 1992; Parra and Telleria 2004) This increase was related to changes in food resources in particular livestock availability (Griffon vultures feed almost exclusively on livestock carcasses; eg. Donazar 1993). Carcass dump appear to be a key factor for increasing Eurasian Griffon vultures during winter migration at Jorbeer, Bikaner (Khatri, 2012). Supplementing populations with carcasses has proven to be particularly crucial for reducing juvenile mortality during critical periods such as post fledging and migration of the non-adult vulture population (Diaz *et al.*, 1996). (Figure 3)



**Figure 3: Showing Vultures, Dogs At The Carcass Dumping Stand Jorbeer: Griffon Vultures Sitting on the Tree Tops of *Prosopis Cineraria* and *Salvadora Oleoides***

The important fact supports the study that old world vultures (*Gyps fulvus*) are long lived, have low reproductive rates, high adult survival and a low juvenile survival (Wynne-Edwards 1955, Amadon 1964, Piper *et al.*, 1981). One bird was reported to live for 37 years in captivity and annual survival rates of wild large raptors are typically around 95% higher (Newton 1979). An annual survival rate of 99% was reported for adult Eurasian Griffons, though this was for reintroduced population receiving supplementary food and protection (Sarrazin *et al.*, 1994). The heridity structure of Eurasian griffon vultures is much

### Research Article

stronger than other Gyps vulture's species to face with infectious diseases and different drugs like diclofenac (NSAID). There are some evidences that a warming climate may encourage birds that have historically migrated to remain year round in a given region (Sahar Malburg 2011). The Eurasian Griffons Vultures migrates from the regions of harsh winters i.e. Himalayas, West China and South Tibet. Eurasia Balochistan, Kohistan and salt range. Bikaner district is western part of 'Thar' desert, which provides suitable temperature conditions to migrate and survival for Eurasian Griffons (*Gyps fulvus*).

### Recommendations

There are some recommendation for protection and survival of the vultures at Jorbeer.

The area must be protected from feral dogs, human activity and other disturbances.

There has been a general decline in the number of old and mature trees. The vultures are big birds, which weight about 2-5 Kg and they need big and strong trees for nesting. The mature trees should be protected for nesting of vultures in future.

Pathological studies should be initiated to find out the effect of any disease on vulture population.

The Jorbeer area should be declared as the "vulture sanctuary" or "vulture restaurant."

### REFERENCES

- Ali S and Ripley SD (1983).** Hand book of the Birds of India and Pakistan compact edition Oxford University press Bombay.
- Amadon D (1964).** The evolution of low reproductive rates in Birds. *Evolution* **18** 105-110.
- Anderson MD, Piper SE and Morgan SE (2005).** Non-steriodal anti-inflammatory drug use in South Africa and Possible effects on vultures. *African Journal of Science* **101** 112-114.
- Chander P (2006).** Demography and Socio-Ecology of Gyps vultures at Bikaner. PhD Thesis for Maharshi Dayanand Saraswati University Ajmer.
- Chhangani, AK (2004).** Is diclofenac the only cause of vulture decline? *Vulture News* **50** 15-22.
- Cunnigham A (2001).** Investigation of vulture mortality in India. Report of a visit to India (February, March 2000) Royal society protection of Birds and Bombay National History Society.
- Das D, Cuthbert RJ, Jakati RD and Prakash V (2011).** Diclofenac is toxic to the Himalayan vulture *Gyps himalayensis*. *Bird Conservation International* **21** 72-75.
- Diaz M. Arensio B, Telleria JL (1996).** Avis Ibedricas I no passeriformes JM Reyero Ediciones. Madrid Spain.
- Donazar JA (1993).** Los buitres ibericos. Biologia Y conservation Madrid.
- Garrido JR and Sarasa CG (1998).** Importanica del vertedero de los Bassios Campo de Gibraltar (adiz) en al ruto migratoria occidental de Milano Negro (*Milvus migrans*) el Buitre Le onado. *Gyps fulvus Almoraima* **19** 217-224.
- Gilbert M, Virani MZ, Watson RT, Oaks JL, Benson PC, Khan AA, Ahmed S, Chaudhary J, Arshad M, Mahmood S and Shah QA (2002).** Breeding and mortality of oriental white backed vulture *Gyps bengalensis* in Punjab provice Pakistan. *Bird Conservation International* **6** 189-197.
- Gupta BK (2005).** Is Diclofenac the only cause of vulture decline? *Current Science* **88**(5) 679-680.
- Hilton-Taylor C (2000).** *IUCN Red list of Threatened Species*. IUCN Gland and Cambridge.
- Houston D (1974).** Food searching beharious in griffon vulture. *African Journal of Ecology* **12** 63-77.
- Khatri PC (2012).** The increase in the population of Eurasian Griffon vulture (*Gyps fulvus*) at Jorbeer Bikaner: Carcass dumps as key habitat for winter migration in the Griffon vultures. *International Journal of Geology Earth and Environmental Sciences* **2**(2) 157-162.
- Martinez JE and Sanchez-zapta JA (1999).** Invernada de Ageuililla Calzada (*Hieraaetus pennatus*) Y Culebrera Europea (*Circactus gallicus*) en Espana. *Ardeola* **46**(1) 93-96.
- Munday PJ, Butchart, Ledger J and Piper S (1992).** The vultures of Afica academic press London.
- Newton, I (1979).** Population Ecology of Raptors. Poyser Berkhamsted UK.



**Research Article**

**Oaks JL, Gilbert M, Virani MZ, watson RT, Meteyer CU, Rideout B, Shivaprasad HL, Ahmed S, Chaudhry MJI, Arshad M, Mahmood S, Ali A and Khan AA (2004).** Diclofenac residues as the cause of vulture population decline in Pakistan. *Nature* **427** 630-633.

**Para J and Telleria JL (2004).** The increase in the spanish population of Griffon vulture *Gyps fulvus* during 1989-1999 effect of food and nest site availability. *Bird conservation International* **14** 33-41.

**Piper SE, Munday PJ and Ledger JA (1981).** Estimates of survival in the cape vulture in the cape vulture *Gyps Corprothers*. *Journal of animal Ecology* **50** 815-825.

**Prakash V (1999).** Status of vultures in Keoladeo National Park Bharatpur Rajasthan with special reference to population crash in gyps species. *Journal of Bombay Natural History Society* **96**(3) 365-378.

**Prakash V, Pain DJ, Cunningham AA, Donald PF, Prakash N, Verma A, Gargi R, Sivakumar S and Rahmani AR (2003).** Catastrophic collapse of Indian white-backed *Gyps bengalensis* and Long-billed *Gyps indicus* vulture population. *Biological conservation* **109** 381-390.

**Ruxton GD and Houston DC (2004).** Obligate vertebrate scavengers must be large soaring fliers. *Journal of Theoretical Biology* **228** 431-436.

**Sarrazin F, Bangnolinic, Pinna JL, Danchin E and Clobert J (1994).** High survival of Griffon Vultures (*Gyps fulvus*) in a reintroduced population. *Auk* **111** 853-862.

**Sunyer C (1998).** Importancia Y manejo de basureos Y mula lares para la conservation de las poblaciones de aves rapaces Y et control de la rabia selvatica. Ministerio de obras publicas Transports y Medio Ambient de Espana Madrid Spain.

**The peregrine Fund (2004).** The peregrine fund Boise (Available: <http://www.Peregrinefund.org/vulture>)

**Wynne- Edwards VC (1955).** Low reproductive rates in birds, especially sea-birds. *Acta XI International Ornithological Congress* 540-547.