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

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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 coprothers 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-blacked 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 catharid) and other scavenging birds (e.g. raptors, scavenging stroks 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 research 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 coprothers and Gyps rueppelli).
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, Aegypiuss 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 Accipridae. 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 part of the 'Thar' desert. Jorbeer is a dumping site for cattle carcasses, situated 12 km from city. The geographical location of area is 20'30 North latitude and 73'50 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 M² day⁻¹. 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 (Aegypiuss 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, Salvadoria 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 carcasses at Jorbeer
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 monachus) and departs by first week of March.


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)
Cunnigham. 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
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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. (Chhangani 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](image)

The important fact supports the study that old world vultures (*Gyps fulvus*) are long lived, have low reproductive rates, high adult survivial 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
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
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