

## An Epidemiological Study on Prevalence of Goat Warble Fly Infestation (GWFI) from Punjab Province, Pakistan

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### Summary

The purpose of the present study was to determine the prevalence of Warble Fly Infestation (WFI) in goats of Punjab Province, Pakistan. Goat warble fly infestation is caused by *Przhevalskiana silenus* (Diptera: Oestridae). There were a total of five hundred animals examined from July 2012 to January 2013 from Khoshab and Chakwal districts of Punjab province for the prevalence of warble. The larvae were collected from the infested goats and identified as *P. silenus*. The results showed that the prevalence of GWFI was 17.8% (89/500). The number of nodules in the infested animals ranged from 1-14 (6.61±2.4). The breed wise prevalence was in beetle breed (13.2%), local breed (18%) and desi breed (22.9%), respectively. The sex wise prevalence was in male (15.3%) and in female (19.4%). The prevalence based on age showed that the rate of infestation in animals having age group (1-3 year) was 20.9%, (4-6 year) was 14.6% and (>6 year) was 18.1%, respectively. The present study showed that these epidemiological factors have a significant effect on the prevalence of WFI in goats of Punjab Province. The results showed the effect of different treatments given to animals on the basis of sex, age groups, infested and non-infested animals. The results of this survey showed that the fly is active from March to June. It was first study on GWFI in Punjab Province; northern part of Pakistan. It would be very helpful in devising the future strategies towards the eradication and control of warble fly in other endemic areas of Pakistan.

**Keywords:** Goat Warble Fly Infestation, GWFI, Prevalence, *Przhevalskiana silenus*, Khoshab, Chakwal districts, Pakistan

## Pakistan Punjab Eyaletinde Keçi Nokra Enfestasyonunun Prevalansı Üzerine Epidemiyolojik Bir Çalışma

### Özet

Bu çalışmanın amacı Pakistan'ın Punjab Eyaletinde Keçi Nokrasının prevalansını tespit etmektir. Keçi Nokrası *Przhevalskiana silenus* (Diptera: Oestridae) tarafından meydana getirilir. Prevalansın tespiti amacıyla Punjab'ın Khoshab ve Chakwal bölgelerinde Temmuz 2012 ile Ocak 2013 tarihleri arasında toplam 500 adet hayvan incelendi. Larvalar enfekte keçilerden toplandı ve *P. silenus* olarak tanımlandı. Keçi Nokrasının prevalansı %17.8 (89/500) olarak tespit edildi. Hayvanlardaki nodüllerin sayısı 1-14 (6.61±2.4) olarak belirlendi. Türler göre prevalans beetle ırkında %13.2, lokal ırklarda %18 ve desi ırklarda %22.9 olarak tespit edildi. Tekelerde prevalans %15.3 iken dişilerde %19.4 idi. Enfestasyon; 1-3 yaş arası keçilerde %20.9, 4-6 yaş arası olanlarda %14.6 ve 6 yaş üzerilerde %18.1 oranlarında mevcuttu. Araştırılan epidemiyolojik faktörlerin Punjab Eyaletinde Keçi Nokrasının prevalansı üzerinde önemli etkisi olduğu tespit edildi. Çalışmanın sonuçlarına göre nokranın Mart ayından Temmuz ayına kadar aktif olduğu belirlendi. Bu çalışma Keçi Nokrası üzerine Punjab Eyaletinde yapılan ilk çalışmadır. Çalışmanın Pakistan'ın diğer endemic bölgelerinde nokranın eradikasyonu ve kontrol edilmesine yönelik stratejileri belirlemede yararlı olacağı düşünülmektedir.

**Anahtar sözcükler:** Keçi Nokra Enfestasyonu, GWFI, Prevalans, *Przhevalskiana silenus*, Khoshab, Chakwal bölgeleri, Pakistan



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## INTRODUCTION

Pakistan is an agricultural country and livestock acts as the backbone of agriculture. Milk, meat, hides and wool obtained from the livestock help to increase the export of Pakistan as well as prosperity of the farmer.

Parasitism is one of the major problems of low productivity in livestock sector of the world [1]. One of these is WFI, which cause infection in cattle, buffaloes, sheep and goats [2-4]. Hypodermosis prevalence is common in semi-hilly, mountainous and riverine areas of Pakistan [3]. Due to its high prevalence, it exists in many parts of the world. It was found that the prevalence of warble fly infestation was almost 80% in Czech Republics, 49.2% in Greece, 85% in Italy, 52.3% in Spain, 40% in United Kingdom and 32-43% in Romania [5]. The prevalence of Warble Fly Infestation (WFI) was 3.2%, 18.4% in buffalo and cattle of Pakistan [6,7]. Previous studies showed that hypodermosis is one of the major parasitic infection in many countries of the northern hemisphere. This menace not only causes the physical damage to the animal, but also affects the internal organs and damages the host immune system. In many European and North American countries, chemotherapy treatments used against adult fly and first larval stage, have significantly reduced the infestation of this disease [8]. The infestation rate was in cattle (14.1%), sheep (2.1%) and goats (24.9%) respectively in Green mountains, Libya. The goats were infested by *P. silenus* [9]. The adult fly is active from April to June in different areas of world. The adult fly lacks mouthparts and survives on resources accumulated during the larval period. During the periods that the fly is active, the first instar larvae emerge from eggs laid directly on the hairs of the hind legs (mainly tarsal and femoral regions) of the goat. The larvae then penetrate the epidermis and dermis to enter into the subcutaneous tissue to migrate for a short distance to reach the flanks and sacrum. The migration pattern inside the body of animals seems to be exclusively subcutaneous [10,11]. Leather industry is one of the major industrial units working in Pakistan and producing large export products but, due to this parasite, this industry is suffering from economic losses. The losses due to this menace cannot be calculated due to a number of factors, while hide damage was the most important consequence of the infestation resulting in low price on account of holes formed by the warble fly. Pakistan produces 7.5 million hides and 36.3 million skins, annually. The estimated losses in D. G. Khan and Rajanpur districts were Rs: 12.9, 9.9 million, respectively. The total losses were Rs 22.8 million from cattle and Rs 2.2 million from buffaloes [12]. Although Pakistan is an agricultural land having a large number of livestock; warble fly is continuously attacking the livestock products but no important work has been done in this regard to calculate damage caused by this notorious parasite.

The purpose of present study is to determine the

prevalence of Warble Fly Infestation (WFI) in district Khoshab and Chakwal of Punjab province, Pakistan. The objectives of the present were (1) Treatments given to different animals in different herds and their effectiveness. (2) Sex & breed wise prevalence of Warble Fly Infestation (WFI) in goats of different areas of Punjab Province (Khoshab and Chakwal).

## MATERIAL and METHODS

### Location

Punjab is the Pakistan's second largest province at 205,344 km<sup>2</sup> (79,284 sq<sup>2</sup> miles) after Balochistan and is located at the northwestern edge of the geologic Indian plate in South Asia. The geographical location of the Chakwal is 32° 56' 0" North, 72° 52' 0" East and of Khoshab is 32° 17' 48" North, 72° 21' 9" East in Punjab Province, Pakistan.

### Topography

The Punjab province is bordered by Kashmir (Azad Kashmir, Pakistan and Jammu and Kashmir, India) to the north-east, the Indian states of Punjab and Rajasthan to the east, the Pakistani province of Sindh to the south, the province of Baluchistan to the southwest, the province of Khyber Pakhtunkhwa to the west, and the Islamabad Capital Territory to the north. Undivided Punjab is home to six rivers, of which five flows through Pakistani Punjab. From west to east, these are: the Indus, Jhelum, Beas, Chenab, Ravi and Sutlej. Nearly 60% of Pakistan's population lives in the Punjab. It is the nation's only province that touches every other province; it also surrounds the federal enclave of the national capital city at Islamabad. This geographical position and a large multi-ethnic population strongly influence Punjab's outlook on National affairs and induces in Punjab a keen awareness of the problems of the Pakistan's other important provinces and territories. The landscape is amongst the most heavily irrigated on earth and canals can be found throughout the province. Weather extremes are notable from the hot and barren south to the cool hills of the north. The foothills of the Himalayas are found in the extreme north as well.

### Climate

The habitat of the warble fly is hilly and semi-hilly areas. According to it those areas are selected that have hilly or semi-hilly conditions like Chakwal and Khoshab. These areas have suitable temperature conditions and other ecological factors like high altitudes that are ideal for the growth and development of the warble fly. Moreover; these areas also have large number of livestock that help to further increase the living conditions and host of the warble fly.

### Experimental Design

This epidemiological survey was conducted from

September, 2012 to March, 2013. These months are selected because warbles present on the back of the animals start developing from September and last till February. The larvae were collected from infested animals.

### Palpation Method

The animals of these areas were examined on monthly basis by palpation method. The nodules were counted by using visual and hand palpation method. The counting of nodules on animal started from anterior portion leading to the posterior portion. The animals were examined on monthly basis to count the numbers of nodules and all this was recorded on a separate data sheet. Initially some of the larvae were directly collected from the upper dorsal part of the animal near the vertebral column. These were collected with the help of hands. The larvae were collected by picking them from the ground, when they dropped. The larvae from animal skin dropped on the ground during the months of January to onward to form mature fly which starts the life cycle again. So during these months (February, March) larvae are collected from the ground instead of animal skin directly. The larvae were collecting in bottle containing 70% ethanol and kept in freezer at  $-20^{\circ}\text{C}$ .

### Statistical Analysis

The Statistical analysis (Chisquare) was done by using the statistical package SPSS for Windows 20.0.

## RESULTS

Out of five hundred goats, 89 (17.8%) were found to be infested by *Przhevalskiana silenus*. The number of nodules in the infested animals ranged from 1-14 ( $6.61 \pm 2.4$ ). The nodules were observed on the back of infested goats. The warble started to appear by the start of September and skin perforation started from end of October to December. The larvae collected from infested goats were identified as *P. silenus* according to Zumpt [13]. This is the first report of *P. silenus* in goats of Khoshab and Chakwal district, Pakistan (Fig. 1).

The present study was conducted in 10 villages, 40 herds of Khoshab and Chakwal district to determine the prevalence of warble fly infestation in the goats from July 2012 to January 2013. The results of present study revealed that the rate of infestation was 17.8% (89/500).

The village wise prevalence was determined from the ten villages. The prevalence in villages of Khoshab district as in Dhokri (12.7%), Ghatti (13.2%), Jabbi sharif (9.1%), Warcha (0%) and Chohasharif (6.7%). In district Chakwal it was in village Manara, (25.5%), Runsial, (34.9%), Bhone, (30%), Tala gang, (14.3%) and Choa Saidan shah, (9.1%). The statistical analysis has showed the significant differences ( $P < 0.05$ ) in the prevalence of GWFI in different villages of Punjab Province, Pakistan.

The goats of three breeds (Beatle, Desi breed and local breed) were examined in the present study on monthly basis. The statistical analysis shows that prevalence in

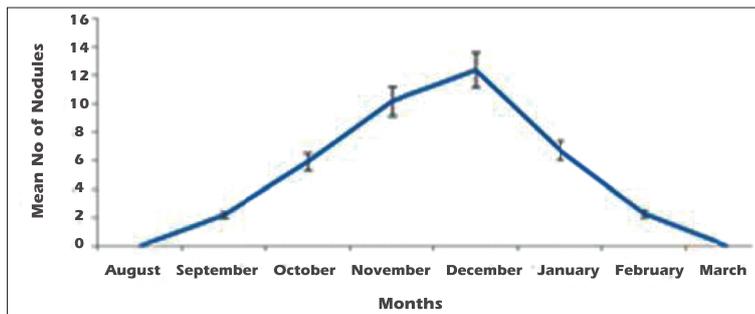
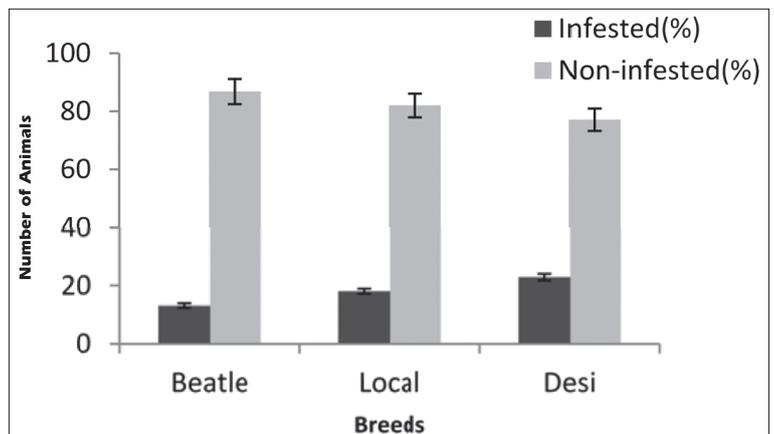


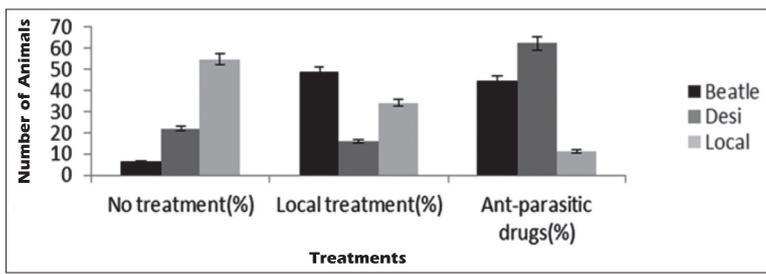
Fig 1. Month wise intensity of Infestation of WFI in goats

Şekil 1. Keçi nokra enfestasyonunun aylara göre dağılımı

Fig 2. Breed wise prevalence of WFI in goats of Punjab Province, Pakistan

Şekil 2. Pakistan'ın Pencap Eyaletinde Keçi nokra enfestasyonunun ırklara göre dağılımı

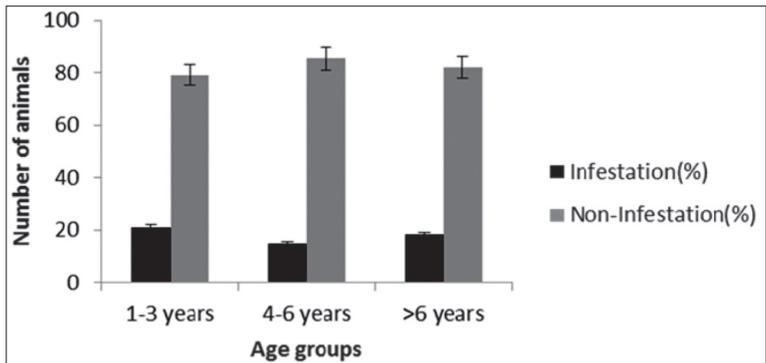
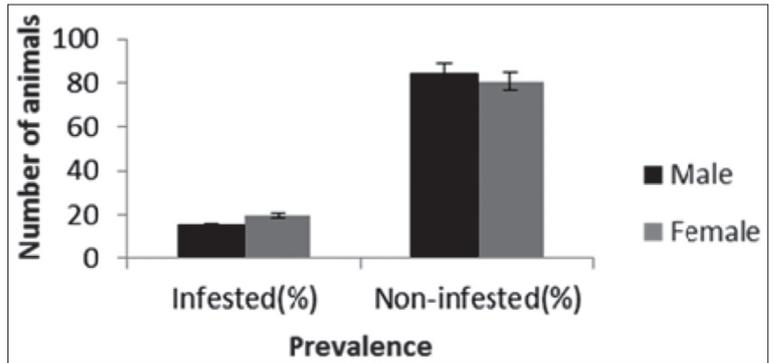




**Fig 3.** Effect of treatments given to different breeds of goats of Punjab Province, Pakistan

**Şekil 3.** Pakistan'ın Pencap Eyaletindeki farklı ırk keçilerde tedavinin etkisi

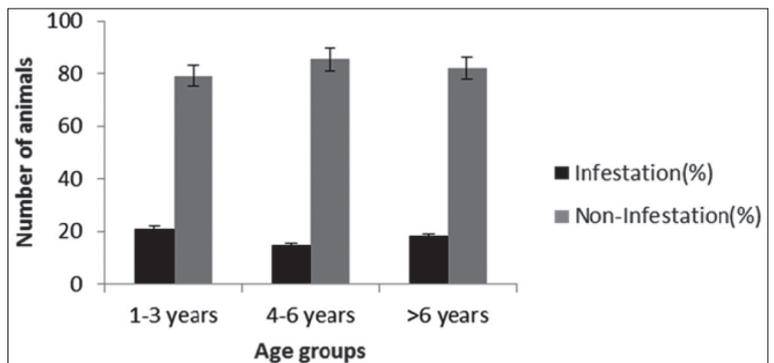
**Fig 4.** Sex wise prevalence of WFI in goats of Punjab Province, Pakistan  
**Şekil 4.** Pakistan'ın Pencap Eyaletindeki keçilerde Keçi nokrasının cinsiyet üzerindeki yaygınlığı



**Fig 5.** Use of Medication in different sexes examined for WFI in goats of Punjab Province, Pakistan

**Şekil 5.** Pakistan'ın Pencap Eyaletinde Keçi nokrası için muayene edilen farklı cinsiyetteki keçilerde ilaç kullanımı

**Fig 6.** Age wise prevalence of WFI in goats of Punjab Province, Pakistan  
**Şekil 6.** Pakistan'ın Pencap Eyaletinde nokralı keçilerin yaş prevalansı



beetle breed was (13.2%), local breed (18%) and desi breed (22.9%), respectively. Among all three breeds the highest infestation was observed in desi breed (22.9%) (Fig. 2).

The results showed that majority of the non-infested animals were medicated {local treatment (29.4%), Anti-parasitic drugs (43.1%)} as compared to non medicated goats (27.5%) The medication schedule of all the examined goats was recorded consisting of non-medicated, local treatment and anti-parasitic drugs. In beetle

breed the non-medicated was 13/197 (6.6%), local treatments 96/197 (48.7%) and anti-parasitic drugs 88/197 (44.7%). In desi breed, non-medicated was 29/133 (21.80%), local treatments 21/133 (15.78%) and anti-parasitic drugs 83/133 (62.4%). In local breed non-medicated was 93/170 (54.7%), local treatments 58/197 (34.1%) and anti-parasitic drugs 19/170 (11.2%). There are 27% (135/500) goats were non medicated, 35% (175) were given local treatment and 190 (38%) were given anti-parasitic drugs (Fig. 3).

**Table 1.** Showing the statistical analysis of different epidemiological factors on the prevalence of WFI in goats of Punjab Province, Pakistan**Table 1.** Pakistan'ın Punjab Eyaletinde Keçi nokrasının prevalansı üzerine değişik epidemiyolojik faktörlerin istatistiksel analizi

S. No	Factors	Groups	Prevalence		Statistical Analysis (Chi-square)
			Infested	Non-Infested	
1	Age	1-3	33 (20.9%)	125 (79.1%)	$\chi^2=2.037$ df=2 p=0.329
		4-6	25 (14.6%)	146 (85.4%)	
		>6	31 (18.1%)	140 (81.9%)	
2	Sex	Male	29 (15.3%)	161 (84.7%)	$\chi^2 = 1.348$ df = 1 p = 0.246
		Female	60 (19.4%)	250 (80.6%)	
3	Breed	Beetle	26 (13.2%)	171 (86.6%)	$\chi^2=5.928$ df=2 p=0.05
		Desi breed (Taedi)	39 (22.9%)	131 (77.1%)	
		Local breed	24 (18%)	109 (82%)	
4	Villages (District)	Dhokri, (Khoshab)	7 (12.7%)	48 (87.3%)	$\chi^2=47.107$ df=9 P=0.00
		Ghatti, (Khoshab)	7 (13.2%)	46 (86.8%)	
		Jabbi sharif, (Khoshab)	5 (9.1%)	50 (90.9%)	
		Warcha, (Khoshab)	0 (0%)	48 (100.0%)	
		Chohasharif, (Khoshab)	3 (6.7%)	42 (93.3%)	
		Manara, (Chakwal)	14 (25.5%)	41 (74.5%)	
		Runsial, (Chakwal)	38 (34.9%)	71 (65.1%)	
		Bhone, (Chakwal)	9 (30.0%)	21 (70.0%)	
		Tala gang, (Chakwal)	4 (14.3%)	24 (85.7%)	
ChoaSaidan shah, (Chakwal)	2 (9.1%)	20 (90.9%)			
5	Medication	Non Medicated	22 (24.7%)	113 (27.5%)	$\chi^2=0.729$ df=2 P=0.396
		Local treatment	54 (60.7%)	121 (29.4%)	
		Anti-parasitic drugs	13 (14.6%)	177 (43.1%)	

The results showed that female 60/310(19.4%) and male 29/190 (15.3%) goats were infested (Fig. 4). The medication schedule was also recorded in both the sexes (Fig. 5). The prevalence in goats having age group (1-3 year) was 33/158 (20.9%), in age group (4-6 year) was 25/171 (14.6%) and in age group (> 6 year) 31/171 (18.1%) were infested. The results showed that younger animals were more infested as compared to older animals (Fig. 6). The statistical analysis showed that there is significant difference between infested and non-infested animals in all age groups (Table 1).

## DISCUSSION

The prevalence in goats of Khoshab and Chakwal districts was 17.8%. Our results were correlates as 25% goats were infested with WFI in Pakistan [2]. In Rakhi Manu and Rakhi Guage area the rate of infestation was 41% and 40% in goats [4]. Similarly, Otify and Mansour reported 24.9% [9], in northern Jordan 10% goats were infested from WFI [11] and in Iran 7% to 18.9% [14]. These results contradictions with present research results might be due to the use of antiparasitic drugs in the study area. As far as the

prevalence of warble fly infestation in district Khoshab and Chakwal is concerned, this is the first report related to goat warble fly infestation.

The female (19.4%) were more infested as compared to male (15.3%). The statistical analysis showed no significance differences ( $P<0.05$ ) between two sexes. Our results were similar to as prevalence rate was same in male and female [11], there was no significant difference between male and female ( $P<0.05$ ) [15]. Similarly, no significant difference among male (47.81%) and female (46.82%) in Jammu province of India [16]. Likewise, Mohammad Hossein Radfar investigated that the difference in the prevalence of the infection between males and females was not significant ( $P>0.05$ ) [17].

The present study shows that highest infestation was observed in desi (Taedi) (22.9%) breed as compare to local (18%) and beetle breed (13.2%) due to the poor immune response. Our results were in accordance with Yadav et al. [16] reported the significantly higher infestation rate among Bakerwali (51.51%) breed as compare to the Beetle (42.59%).

The prevalence in goats having age group (1-3 year)

was 33/158 (20.9%), in age group (4-6 year) was 25/171 (14.6%) and in age group (>6 year) 31/171 (18.1%) were infested. The results showed that younger animals were more infested as compared to older animals. Similarly, the statistical analysis in relation to age showed significant ( $P < 0.01$ ) difference among different age groups <1 year (2.81%), 1-3 years (51.17%), and >3 years (43.16%)<sup>[16]</sup>.

It is concluded from the present study that WFI is serious threat in goats of Pakistan. So it is strongly recommended that due to the economic significance of this parasitic disease, it should be explored in different areas of Pakistan and its effects and damages must be studied for its control.

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