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Epidemiological Study of Warble Fly in Pakistan

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ABSTRACT

Hypodermosis is an important endoparasitic infection of cattle and goats prevalent in hilly and semi-hilly areas of Pakistan and considered as an important disease of economic significance affecting ruminants especially cattle (*Hypoderma bovis* and *Hypoderma lineatum*) and goats (*Przhevalskiana silenus*). The major economic loss incurred by warble fly infection to livestock and leather industry is due to perforation of hide and skin. Therefore, the present study aims to investigate field epidemiology of warble fly in four federating units of Pakistan. As per farmers perceptions the warble fly prevalence was 1-66% in goats this year while in cattles it was 0-33% as compared to last year (20–80%). The warble fly larval prevalence was recorded physically (66%) in goats at Gilgit during autumn, followed by Ziarat (1-8%), Fort Munro (0-14%), D.I. Khan (0-5%), while in cattle it was 33% followed by Ziarat (0%), Fort Munro (2-0%), Gilgit (0-33%), D.I. Khan (1-13%).

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Authors' Contribution
MH and AR designed the study. MQ and MJ executed the study, MH, AR and MQ wrote the manuscript. AR analysed the data. AH and NH critically reviewed the manuscript.

Key words
Warble fly, Myiasis, Hypoderma, lumpy skin disease

INTRODUCTION

Livestock is a crucial component of Pakistan's economy, particularly in rural areas where the majority of the population relies on agriculture. The livestock sector in Pakistan annually produces 36.3 million skins and 7.5 million hides, which are significant, export items contributing to 12 percent of the total exports. Leather and leather products are among Pakistan's largest sources of foreign exchange (Ahmad and Ali, 2023). Several factors contribute to low production in the livestock sector, one of which is ectoparasitic infestations. Myiasis caused by Hypoderma species larvae is a notable economic threat to both wild and domesticated ruminants. Hosts of this parasite include buffalo, cattle, deer, reindeer, sheep, and goats (Liaquat *et al*, 2021). Warble fly infestation, affecting cattle (*Hypoderma bovis* and *Hypoderma lineatum*) and goats (*Przhevalskiana silenus*), is significant in hilly, semi-hilly, and sandy areas of Pakistan. This infestation results in substantial economic losses due to hide and skin perforation, degraded meat quality, and reduced milk production (Arshad *et al*., 2014). Infested skins can see price reductions of up to 70%, depending on the number of perforations caused by warble fly larvae (Oryan *et al*., 2009). Hypodermosis is a significant endoparasitic infection prevalent in the hilly and semi-hilly areas of Pakistan, mainly affecting cattle and goats. Warble fly infestation (WFI), caused by larvae of *Przhevalskiana silenus*, results in economic losses by reducing milk yield and the quality of meat and hides. This disease is characterized by subcutaneous warbles on the dorso lumbar region of affected animals, with all three larval stages (L_1, L_2, and L_3) causing infestations over 7-9 months without internal migration, unlike other Hypoderminae members (Otranto *et al*., 1999; Ahmad and Ali, 2013).

The prevalence of warble flies can vary depending on several factors, such as geography, host population density, and environmental conditions. In Europe and North America, the prevalence of warble flies is relatively high, and they are considered a significant problem for livestock farmers. In some regions, 100 % infestation rate was recorded in cattle and goats populations. While in

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Pakistan prevalence of Warble fly infestation was found to be 3.2% overall, with goats and cattle having higher rates of 18.4 %. Chemotherapy treatments have been effective against the adult fly and first larval stage in many European and North American countries (Liaquat *et al*., 2021).

Keeping in view the importance of disease this study was conducted for field epidemiology of warble fly infestation in high risk areas of Pakistan.

MATERIALS AND METHODS

A team of scientists from the Animal Health Program and Animal Sciences Division, PARC, visited eight villages in four federating units (Punjab, Balochistan, Khyber Pakhtunkhwa, and Gilgit) of Pakistan for the physical examination of animals on an already developed questionnaire during spring (March-May 2023) and again during autumn (September-November 2023). In these visits, 225 livestock farmers holding 1685 goats and 653 cattle were also clinically examined for warble fly infestation (Table I).

Table I. Field epidemiological survey of warble fly in various areas of Pakistan.

Province/District	Season	Clinical observation of animals		Number of farmers
		Goats	Cattles	
Balochistan (Ziarat)	Spring	485	37	20
	Autumn	215	12	9
DG Khan (Fort Munro)	Spring	337	108	43
	Autumn	58	12	13
Gilgit (Gorikot/Astore)	Spring	240	149	57
	Autumn	50	12	16
Khyber Pakhtunkhowa (D.I. Khan)	Spring	188	237	43
	Autumn	112	86	24
	Total	1685	653	225

RESULTS

Prevalence of warble fly larvae (Przhevalskiana silenus) *in goats*

The warble fly larval *Przhevalskiana silenus* prevalence was higher (up to 66%) during autumn as compared to spring season (0-0.4%) in goats. Area wise higher prevalence was recorded in Gilgit followed by Fort Munro, Ziarat and D.I. Khan (Table II). As per farmer's perceptions, the warble fly prevalence was higher in last few years (20–80%) as compared to the current year (2023) this might be due to heavy usage of spray and ivermectin for the control of lumpy skin disease.

Table II. Prevalence of warble fly larvae (*Przhevalskiana silenus*) in goats during two seasons at various areas of Pakistan.

Province/ District	Season	No. of goats examined	No. of goats infected	Prevalence (%)
Balochistan (Ziarat)	Spring	485	2	0.41
	Autumn	215	18	8.37
Punjab (Fort Munro)	Spring	337	0	0
	Autumn	58	8	13.79
Gilgit (Gorikot/Astore)	Spring	240	0	0
	Autumn	50	33	66
KPK (DI. Khan)	Spring	188	0	0
	Autumn	112	5	4.4
	Total/overall	1685	49	2.9

Prevalence of warble fly larvae (Hypoderma lineatum) *in cattle*

The warble fly larval (*Hypoderma lineatum*) prevalence was higher (up to 33%) during autumn as compared to spring season (0-1.85%) in cattle (Table III). Area wise higher prevalence was recorded in Gilgit followed by D.I. Khan, Fortmunro. The cattle in Ziarat area were found free of warble fly larvae.

Table III. Field epidemiological survey of warble fly in various areas of Pakistan during spring season in cattles.

Province/ District	Season	No. of cattle examined	No. of cattle infected	Prevalence (%)
Balochistan (Ziarat)	Spring	37	0	0
	Autumn	12	0	0
DG Khan (Fort Munro)	Spring	108	2	1.85
	Autumn	12	0	0
Gilgit (Gorikot/Astore)	Spring	149	0	0
	Autumn	12	4	33.33
KPK (D.I. Khan)	Spring	237	2	0.84
	Autumn	86	11	12.79
Total/overall		653	23	2.52

DISCUSSION

Warble fly infestation is a major economic concern for cattle and goats in Pakistan, particularly in hilly

and semi-hilly areas. This study aimed to document field epidemiology of warble fly in goats and cattle across four federating units (Punjab, Gilgit, Khyber Pakhtunkhwa, and Balochistan) of Pakistan. Warble fly larvae (*Przhevalskiana silenus*) prevalence in goats ranged from 1-8% in Balochistan (Ziarat), 14% in Punjab (Fort Munro), 5% in Khyber Pakhtunkhwa (DI Khan), and 66% in Gilgit-Baltistan. Compared to previous years, prevalence in Gilgit-Baltistan was lower (32% vs. up to 80%) as reported by (Khan *et al*., 2012). For cattle, *Hypoderma lineatum* prevalence during the two seasons was 0% in Balochistan, 2% in Punjab (Fort Munro), 1-13% in Khyber Pakhtunkhwa (DI Khan), and 33.33% in Gilgit-Baltistan. Lower prevalence in Punjab, Balochistan, and Khyber Pakhtunkhwa among the districts might be due to management system, grazing patterns, pastures and extensive use of acaricidal spray and ivermectin for lumpy skin disease control. Similar findings were reported by (Ahmad and Ali, 2012; Arshad *et al*. 2014). Our results are in agreement with (Khan *et al*., 2012) shows higher prevalence comparatively less warble fly prevalence's decreased due to heavy use of Acaricides spray and ivermectin in the last two years.

CONCLUSION

Field epidemiology of warble fly infestation revealed a significant decrease in prevalence, dropping to 32% from previous rates as high as 80%. This change in trend is attributed to the extensive use of acaricidal sprays and ivermectin for controlling lumpy skin disease, which also significantly reduced warble fly infestation. This information will aid in developing a long-term control strategy for warble fly.

DECLARATIONS

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IRB approval

The study was approved from Departmental Ethical Committee of NARC.

Statement of conflict of interest

The authors have declared no conflict of interest.

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