TICK-BORNE DISEASES IN CATTLE: AN AREA OF IMMENSE ATTENTION

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ABSTRACT

Tick-borne diseases (TBDs) in cattle represents a great economic concern especially considerable impact on farmers' livelihoods in India. These diseases are transmitted by various tick species with *Rhipicephalus (Boophilus)*, *Hyalomma*, and *Ixodes* being among the most common vectors. The primary tick-borne diseases in cattle include theileriosis, anaplasmosis and babesiosis which cause clinical signs varying from fever and anaemia to major complications such as organ failure and death. India's tropical and subtropical climate creates a conducive environment for ticks, with high humidity and temperature favouring their lifecycle. The prevalence of TBDs is further exacerbated by poor management practices, lack of regular tick control and lack of awareness among farmers. Effective management strategies for tick control and TBD prevention include the use of acaricides, vaccination, and rotational grazing. Additionally, increased awareness among farmers about the importance of tick management and veterinary care is essential for reducing the burden of these diseases. Therefore, this article emphasizes the most common tick-borne diseases in cattle prevalent in India along with their prevention and control strategies.

Keywords: Anaemia, Cattle, Farmers, Tick

I. INTRODUCTION

India, with its vast agrarian economy, has largely dependent upon livestock for economic sustainability, food security, and rural livelihoods. Among the most crucial livestock species are cattle, which are vital sources of milk and agricultural labour. However, cattle health in India faces numerous challenges, one of the most pressing being tick-borne diseases (TBDs). These diseases, caused by ticks that infest cattle, not only cause significant economic losses but also pose substantial risks to cattle health. The threat of tick-borne diseases has emerged as a critical area of concern, requiring urgent attention to ensure that India's cattle farming remains productive and sustainable.

II. PREVALENCE OF TICK-BORNE DISEASES IN CATTLE

India accounts for about 193.46 million cattle population (Livestock census 2019), most of which are affected from tick infestation (Ghosh et al., 2006). Ticks in addition to causing irritation and blood loss are major vectors for various pathogens responsible for a range of diseases. In India, where cattle are a cornerstone of the agricultural system, the widespread incidence of tick-borne diseases has become an issue of immense concern, particularly due to the impact of these diseases on production, reproduction, and overall farm productivity.

The major tick-borne diseases affecting cattle in India include Theileriosis, Anaplasmosis and Babesiosis. These diseases have not only been a persistent challenge for Indian farmers but have also resulted in the death of many animals, leading to severe economic losses.

III. CONTRIBUTING FACTORS

Several factors contribute to the high prevalence of tick-borne diseases in Indian cattle. These factors include climate conditions, agricultural practices, and gaps in knowledge and veterinary care.

Climate and Environmental Factors

India's tropical climate provides the perfect environment for ticks to thrive. The combination of warm temperatures and high humidity during the monsoon season creates ideal conditions for ticks to reproduce (Kumar et al., 2015). In many regions of India, the abundance of vegetation and free-roaming cattle provide ticks with ample opportunities to infest livestock. The warm, humid conditions facilitate the survival and growth of tick populations, which in turn increases the risk of tick-borne diseases (Kohli et al., 2014).

Inadequate Veterinary Care

In rural parts of India, where livestock farming is most prevalent, access to veterinary services is often limited. Many farmers lack the resources to employ professional veterinarians or purchase the necessary medications to manage tick infestations and treat tick-borne diseases. In these areas, farmers often rely on traditional or ineffective methods of disease control, which can exacerbate the spread of tick-borne illnesses.

Increased Livestock Movement and Crossbreed Cattle Population

The movement of livestock from one area to another is a common practice in India, especially for grazing purposes or for sale in markets. This movement can result in the spread of tick-borne diseases as cattle from different regions, with varying levels of disease exposure, are brought together. Without proper quarantine and disease control measures, such movements can lead to the introduction of new pathogens and increase the risk of disease outbreaks. Also, increased rearing of crossbreed cattle increases the susceptibility of developing haemo-protozoan diseases (Kohli et al., 2014).

Gaps in Awareness and Education

Despite the significant impact of tick-borne diseases on cattle health, many farmers in India are not fully aware of the risks posed by ticks or the importance of disease prevention. In rural areas, there is often a lack of information on effective tick control measures, leading to improper or insufficient tick management. Additionally, there is a lack of training on recognizing early symptoms of tick-borne diseases, which can delay treatment and increase the likelihood of mortality.

IV. KEY TICK-BORNE DISEASES

Theileriosis

Theileriosis, caused by *Theileria annulata* is one of the major concerns for cattle health in India. The disease is primarily transmitted by *Hyalomma anatolicum,* which are abundant in India. Infected cattle may exhibit symptoms such as fever, anaemia (pale mucus membrane), swelling of the lymph nodes, and loss of appetite. If not treated, the disease can lead to severe weight loss and even death. Theileriosis not only impacts cattle health but also affects the economics of cattle farming, as it results in reduced milk yields, poor growth rates, and infertility. Additionally, it requires costly veterinary interventions, further exacerbating the economic burden on farmers.

Anaplasmosis

Bovine anaplasmosis caused by *Anaplasma marginale* in India, which is an intra-erythrocytic rickettsial organism. It is transmitted by infected ticks (*Rhipicephalus* genus) or mechanically by biting flies or blood-contaminated fomites (Paramanandham et al., 2019). The abundance of biting flies (Tabanus spp and and Stomoxyss pp.) due to hot and humid area in southern parts of India augment the mechanical transmission of disease to naïve animals (ArunKumar and Nagarajan, 2013). Infected cattle show clinical signs like fever, anaemia, icterus, weight loss, lethargy, laboured breathing, abortion and in severe cases, death (Richy and Palmer, 1990).

Anaplasmosis can significantly reduce the productivity of affected cattle, leading to a drop in milk production and weight gain. In addition, the disease compromises the immune system, making the animals more susceptible to other infections (Paramanandham et al., 2019).

Babesiosis

Bovine babesiosis is one of the most widespread tick-borne diseases in cattle, caused by the intraerythrocytic protozoan *Babesia bigemina* in India. It is transmitted through the bite of infected ticks, primarily the *Rhipicephalus (Boophilus)* species, which are prevalent in tropical and subtropical climates, including India. Babesiosis is characterized by clinical signs such as fever, anaemia, jaundice, and weakness. In severe cases, it can lead to death. The disease often results in significant economic losses, as it leads to a decline in milk production, reduced weight gain, and poor fertility in cattle. In addition, the cost of treating infected animals adds to the financial burden on farmers, especially in rural areas where veterinary care may be limited.

V. DIAGNOSIS AND MANAGEMENT

Diagnosis of these diseases can be done on the basis of clinical picture and microscopical visualization of blood smear (Fig 1a,1b,1c and 1d) and lymph node cytology. Treatment requires injectable Buparvaquone (@2.5 mg/kg b.wt. IM 2 doses 48 hrs apart) for theileriosis (Nagar et al., 2019), diminazine aceturate @3.5mg/kg b.wt. IM for babesiosis and oxytetracycline (@20mg/kg b.wt. IV) for anaplasmosis and as alternate drug for theileriosis along with supportive therapy for anaemia. For babesiosis, recently imidocarb has been made available and commonly used @1.2 mg/kg b.wt. SC (Shah et al., 2019). Prevention include managemental practices including tick control (Srikant Ghosh and Gaurav Nagar et al., 2014).

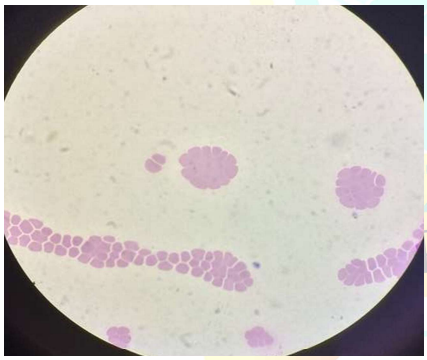

Fig 2a: Presence of piroplasm stage in erythrocytes in *Theileria* affected cow

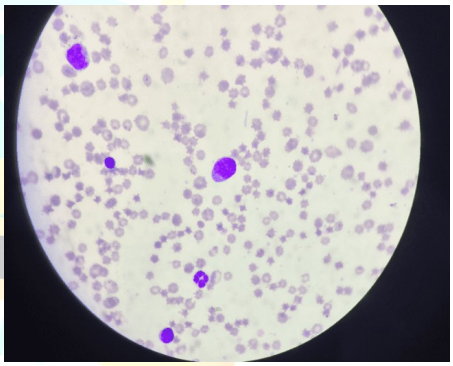

Fig 2b: Presence of Koch Blue Bodies (KBB) in lymphocytes

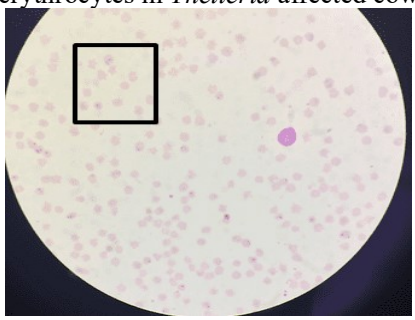

Fig 2c: Presence of *Babesia bigemina* in erythrocytes (marked in box)

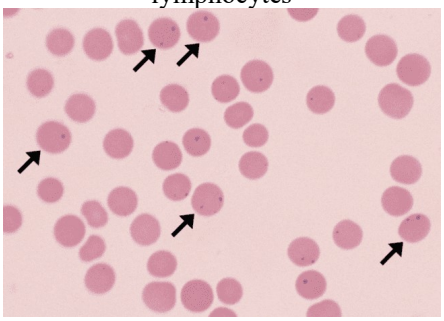

Fig 2d: Presence of *Anaplasma marginale* in erythrocytes (arrow) (Image source: Veterinary Clinical Pathology Database; Google)

VI. PREVENTION AND CONTROL STARTEGIES

Addressing the issue of tick-borne diseases in cattle requires a comprehensive approach that includes prevention, early detection, effective treatment, and better management practices. The following strategies can help mitigate the impact of tick-borne diseases.

Tick Control Programs

Regular tick control measures are crucial in preventing tick infestations and reducing the spread of tick-borne diseases. These measures may include the use of chemical acaricides (substances that kill ticks), rotational grazing to reduce tick exposure, and regular inspections of cattle for tick presence. In some regions, dipping cattle in acaricide solutions or sprays is an effective method of controlling tick populations.

Vaccination and Immunization

Vaccination is a vital tool in preventing certain tick-borne diseases, such as Babesiosis and Theileriosis. In India, live sporozoite vaccine of Theileria annulata from infected ticks accompanied by chemo immunoprophylaxis with tetracycline or buparvaquone is formulated. Attenuated cell line vaccine of T. annulata are used in India and protection is engendered by the attenuated schizont vaccine which has been evaluated by laboratory challenge with live infected ticks or with ground up tick sporozoites inoculated through syringe passage. The results of these challenges vary from no clinical response at all to mild transient clinical reaction with parasitemia. This attenuated schizont vaccine was commercialized under the trade name of "RakshaVac T" and is produced and marketed by Indian Immunological at Hyderabad, India (Saravanan et al., 2013).

Improved Veterinary Services and Access to Medications

Expanding access to veterinary services in rural areas is essential. Mobile veterinary units, trained para-veterinarians, and public-private partnerships can help bridge the gap in veterinary care. Farmers should also have better access to diagnostic facilities, treatment options, and guidance on preventing tick infestations.

Farmer Education and Awareness Campaigns

Farmers need to be educated about the risks associated with tick-borne diseases, the symptoms to watch for, and the importance of regular tick control. Government programs, NGOs, and agricultural extension services should work together to educate farmers through workshops, training sessions, and outreach initiatives. Providing information on effective disease management practices and introducing modern technologies can help farmers reduce the burden of tick-borne diseases.

Research and Development

Continued investment in research is critical for developing new, more effective tick control strategies and vaccines. Research into tick biology, the pathogens they carry, and innovative treatment options can help improve disease management. Additionally, developing sustainable and environmentally friendly methods of tick control that do not rely heavily on chemicals would be beneficial for both cattle and the environment.

VII. CONCLUSION

Tick-borne diseases represent a significant challenge for the cattle industry in India, with implications for cattle health, productivity, and the livelihoods of millions of farmers. With the increasing prevalence of these diseases, it is crucial that India invests in effective strategies for tick control, disease prevention, and treatment. By improving veterinary care, educating farmers, and expanding research on tick-borne diseases, India can reduce the economic losses associated with these diseases and ensure a more resilient and sustainable cattle farming sector. The fight against tick-borne diseases in cattle is an ongoing process that requires collaboration between farmers.

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