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Effect of environmental factors on lower respiratory tract diseases in 65 horses

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Abstract

The clinical study was carried out in the 65 horses aged between 1 month to 12 years having history of chronic respiratory symptoms. The aim of this study was to diagnose lower respiratory tract diseases and to study the relation of environmental factors for development of diseases. The results included the horses which were stabled in the moderate to good ventilation were having diseases like pulmonary abscess and recurrent airway disease but the horses having poor ventilation developed bacterial pneumonia, pulmonary abscess, recurrent airway disease, inflammatory airway disease and pulmonary consolidation. The effect of bedding material along with the environment during which the study was carried was also recorded. Thus, the indirect relationship exists between bedding material, ventilation status and season on lower respiratory tract diseases.

Keywords: environmental factors, bedding, ventilation, season, lower respiratory tract

1. Introduction

During the last several decades, respiratory system act as a limiting factor in performing horses particularly during peak exercise in which oxygen consumption and carbon-dioxide output in horses may reach thirty times more than the values at rest. Therefore, any pulmonary dysfunction leads to impairment of aerobic metabolism in performing horses.

Young athletic horses are most affected with inflammatory airway disease (IAD) due to pressure exerted on lungs during moderate to heavy exercise and presented with history of cough, increased respiratory secretions and exercise intolerance. Recurrent airway obstruction (RAO) is an allergic disorder in adult or mature horses characterized by cough, mucopurulent secretion, abnormal breath sound, increased respiratory efforts and exercise intolerance (Couetil, 2014) [2].

Adult horses are susceptible for development of pneumonia when a bacterium is aspirated from environment, via nose and oropharynx then reach the lower airway and impairs the pulmonary defense mechanism (Carvalho *et al.*, 2017).

2. Materials and Methods

2.1 Selection of animal for study

For this study, the horses were presented at Teaching Veterinary Hospital, Krantisinh Nana Patil College of Veterinary Science, Shirwal, District Satara and referred cases from nearest stud farms located around Pune and Western part of Maharashtra with chief complaint of chronic coughing, nasal discharge, exercise intolerance and poor performance.

The horses included 32 Thoroughbred, 33 Marwari and Kathiwari horses. These total 65 horses aged between 1 month to 12 years. They were divided in 6 groups on the basis of age criteria (grouped as 1-3 months, 3-6 months, 6-12 months, 1-6 year, 6-8 years and 8-12 years) just for evaluation and data analysis. All horses presented with chief complain of chronic respiratory symptoms like coughing, nasal discharge (watery to mucopurulent), fever etc. at the time of presentation. The chronicity of respiratory symptoms more than one week with non-responsive to symptomatic medicinal treatment was considered as study material in this study. Most of the horses were referred from the livestock development officers for second opinion on respiratory disorders during the investigation.

2.2 Collection of Disease History

Total sixty- five horses presented with history of chronic respiratory symptoms underwent routine preliminary anamnesis including breed, age, sex, utility of horse, duration of illness, chief complaints, history of previous disease and stabling conditions (bedding material, ventilation status, environment, etc.)

2.3 Clinical Examination of Horses

The parameters like body temperature ($^{\circ}\text{F}$); auscultation of heartbeat (per minute) and respiratory rate (per minute) and duration of clinical symptoms were recorded. More attention was given on type and rhythm of breathing pattern; lung sound (normal, rales, crackling, wheezing, etc.); coughing (frequency/timing) or type of coughing (dry/moist).

2.4 Haematological Evaluation

About 5ml blood sample was collected from all horses aseptically via jugular vein for hematobiochemical estimation and samples were screened for haemoglobin (gm/dl), Packed

Cell Volume (%), WBC ($\times 10^3 /\mu\text{l}$), RBC ($\times 10^6/\mu\text{l}$), Platelets (Lacs/ μl), Differential Leucocyte Count (%).

3. Results

Out of 65 horses, 32 foals aged between 1 to 3 months, born in winter season showed mean average duration of illness 5.59 ± 0.759 weeks. All foals were nurtured on farm premises for racing purpose, and they were kept in stables having moderate to good ventilation with paddy straw bedding material. All of them showed overlapping clinical symptoms like nocturnal coughing, mild fever and generalized weakness (Table No. 1).

Two horses aged between 3-12 months sheltered in poorly ventilated stable with paddy straw bedding material exhibited typical clinical signs like nasal discharge, intermittent coughing etc. after lunging work. Horses aged between 1-4 years (13), 4-8 years (12) and 8-12 years (6) showed overlapping disease history and clinical manifestation. They were sheltered in stables with poor ventilation and bedded on straw (Fig.1).



Fig 1: Stables having bedding with rice straw in farm premises.

Horses suffering with pulmonary consolidation showed variable dyspnoea with yellowish and mucopurulent nasal discharge indicative of mixed infection. Horses with inflammatory airway disease and recurrent airway obstruction showed variable expiratory and inspiratory respiratory distress especially after lunging or trotting. Three horses were showing bacterial pneumonia characterized by tachypnoea, mucopurulent nasal discharge, and loss of appetite while investigation. The pulmonary abscess showed dry cough during late night or early morning could be due to extreme cold climate during winter season. On auscultation of both lungs, mixed respiratory distress (inspiratory and expiratory dyspnoea) and dry to wheezing lung sounds.

Tachycardia was consistently observed in all the horses suffering with bacterial pneumonia ($55.333 \pm 2.90/\text{min}$), pulmonary consolidation ($44.125 \pm 2.24/\text{min}$), pulmonary abscess ($56.182 \pm 0.82/\text{min}$), recurrent airway obstruction ($49.273 \pm 2.44/\text{min}$) and inflammatory airway disease

($50.70 \pm 2.34/\text{min}$) could be due to mixed bacterial infection or respiratory distress (Fig.2).

Remarkable increase in respiratory rate was observed in cases of bacterial pneumonia ($55.00 \pm 2.887/\text{min}$) and pulmonary abscess ($48.485 \pm 1.097/\text{min}$). Horses suffering from chronic lung disease (pulmonary consolidation, IAD and RAO) also showed increasing trend of respiratory rate throughout the investigation indicating chronicity of lung diseases.

Bacterial pneumonia revealed leukocytosis ($10.29 \pm 1.13 \times 10^3/\mu\text{l}$) indicating non-significant changes during the investigation could be due to presence of band leukocytes and inflammatory changes in lower respiratory tract; mild anemia ($9.767 \pm 0.81 \text{ gm/dl}$) might be due to chronic malnourishment. Horses suffering with recurrent airway obstruction and inflammatory airway disease showed normal blood cell count throughout the investigation probably due to non-infectious etiologies of respiratory disorders (Fig.3).

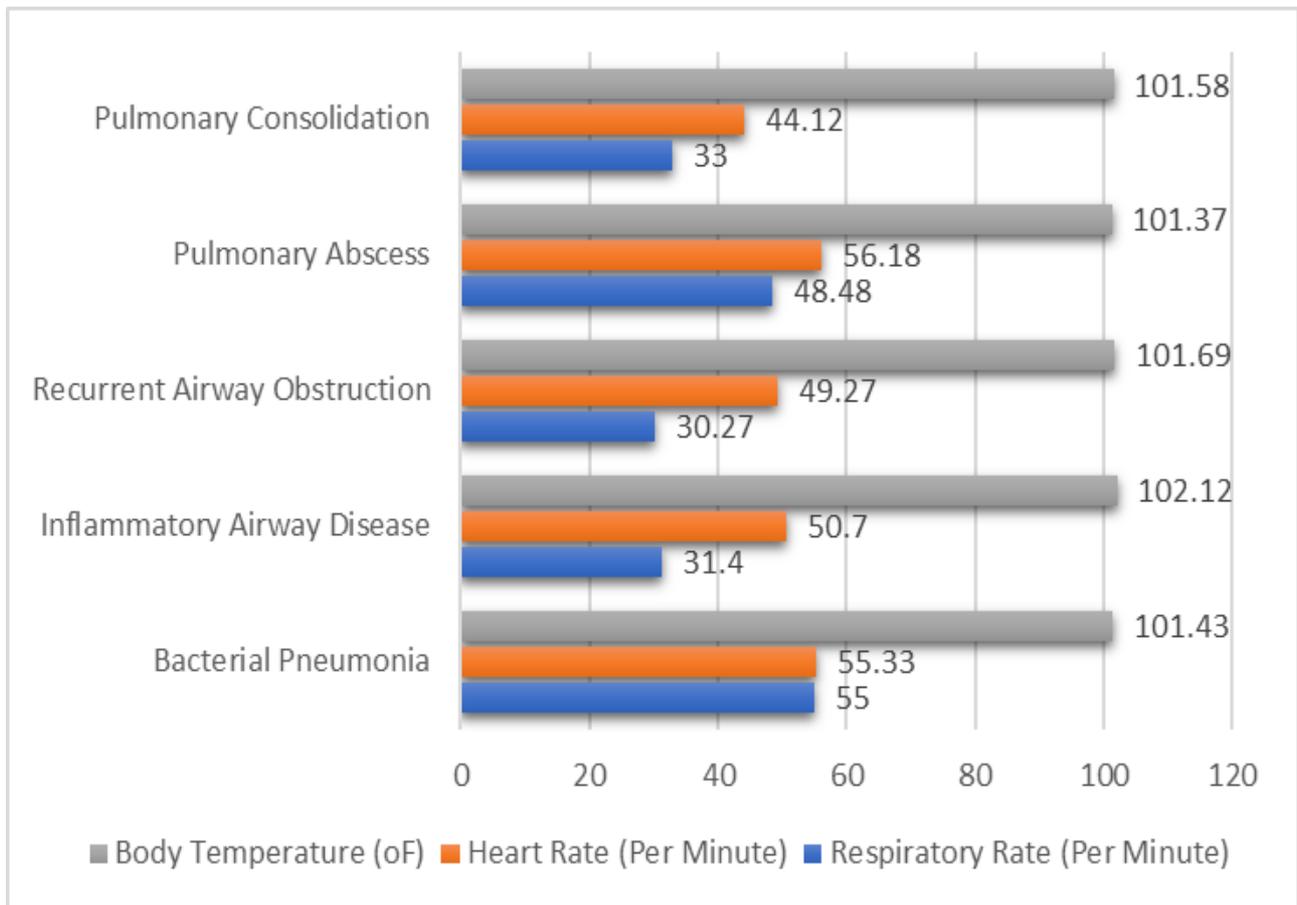


Fig 2: Chart showing mean values of clinical parameters recorded in various lung diseases.

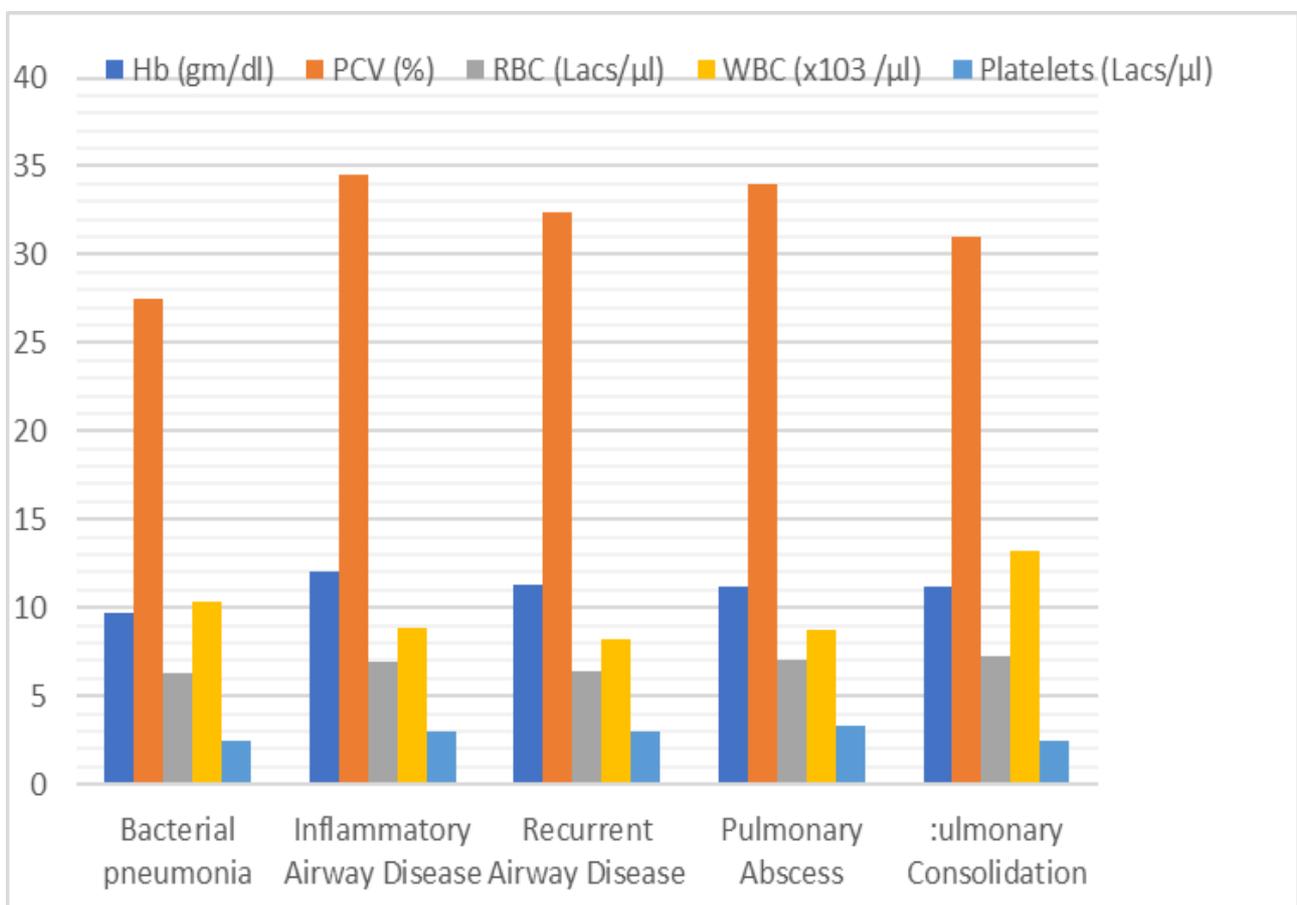


Fig 3: Columns showing mean average \pm values of haematological parameters recorded in horses with various lung disorders.

Table 1: Prevalence or incidence of chronic respiratory symptoms in horses with different age groups.

Age group (Months/Years)	Duration of illness (Weeks)	No. of horses	Gender		Present disease history	Utility of horse	Stabling Condition of horse			Previous disease history
			Fillies/ Mare	Colts/ Stallion			Bedding material	Ventilation status	Environment/ Season	
1-3 Months	5.59± 0.75	32	13	19	Intermittent coughing during night and reduced suckling reflexes, mild fever, etc.	Pre-racing training	Straw	Moderate to good	Winter	Nil
3-6 Months	1	1	0	1	Nasal discharge, coughing after lunging work	Lunging & Trotting	Straw	Poor	Winter	Treated for upper respiratory tract infection
6-12 months	2	1	1	0	Exercise intolerance, coughing, watery nasal discharge, fever, etc.	Lunging & Racing	Straw	Poor-moderate	Summer	Poor performance
1-4 Years	2.2 ± 0.20	13	11	2	Respiratory distress, coughing, nasal discharge, reduced work tolerance, etc.	Riding & Jumping	Wooden Shaving	Poor	Manson	Treated for sinusitis
4-8 years	1.6 ± 0.33	12	10	2	Poor performance during riding, flaring of nostrils, costal breathing, etc.	Riding & Jumping	Straw	Poor - moderate	Monsoon	Treated for tendon injuries
8-12 years	5.6 ± 3.87	6	6	0	Exercise intolerance, poor performance, fatigue, coughing, etc.	Riding & Jumping	Straw	Adequate	Winter	Treated for chronic coughing.
Total		65	41	24						

4. Discussion

In present study, duration of illness was higher as compared to Lakritz *et al.* (1993) [8] and Ramzan *et al.* (2008) [13] who reported 3±3.1 days and 15 days, respectively in their studies. The prevalence of various lung diseases in present study was varied on basis of age. Similar findings were reported by Lakritz *et al.* (1993) [8] and Dixon *et al.* (1995) [4] and they found that the incidence of lower respiratory disease was common in horses more than two years older. Some diseases like pneumonia or lung abscess in present study were found in foals in accordance with Lakritz *et al.* (1993) [8] and Grimm *et al.* (2007) [5] who also stated that, *R. equi* induced lung abscess were common in foals and it is virulent bacteria which was isolated from fecal sample of broodmares on stud premises.

In the present study, irrespective of age and sex of animals, overall respiratory symptoms were prominent in winter season and horses bedded on paddy straw indicated that, exposure of horse to dust levels commonly observed in poorly ventilated housing system was enough to cause airway inflammation. Dusty bedding material contains more than 50 species of molds; allergens and forage mite which induces allergic bronchitis (Burrell *et al.*, 1996; Sabev, 2014 and Mazan, 2018) [1, 14, 10] and respiratory symptoms were more exaggerated in winter season (Ramseyer *et al.*, 2007) [12].

Similar clinical findings were publicized by Mair and Rush (2013) [9]; Couetil (2014) [2] and Hermange *et al.* (2019) [6] in their studies and concluded that, horses with inflammatory airway disease or recurrent airway disease were characterized by cough, increased respiratory secretions, and mixed respiratory distress which were the common clinical signs.

Tachycardia was common findings in present clinical study with chronic lower respiratory disorders as recorded by Mair and Rush (2013) [9] and Sabev (2014) [14] in horses suffering with pulmonary abscess or chronic pulmonary diseases. Higgins and Wright (1999) [7]; Racklyeft and Love (2000) [11] and Vengust *et al.* (2002) [15] revealed that horses with chronic respiratory disorders has a consistent tachypnoea finding.

In present study, mild leukocytosis and anemia was reported

in cases of bacterial pneumonia and pulmonary abscess (Lakritz *et al.*, 1993; Vengust *et al.*, 2002 and Wilkins, 2003) [8, 15, 16]. Sabev (2014) [14] stated that no abnormalities in blood count and differential pictures detected in horses with RAO whereas Couetil (2016) [3] reported that, horses with IAD were usually within normal limits.

5. Conclusion

The conclusions can be prevalence of chronic respiratory diseases was common in winter season and that to be in confined horses with overlapping respiratory symptoms. Adult horses are highly prone to inflammatory airway disease or recurrent airway obstruction due to exposure to various allergens or dust leading to cytological changes evidenced via bronchoalveolar lavage. Horses with IAD or RAO showed typical signs like respiratory distress, poor performance and mixed respiratory distress.

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