ACTIVE SURVEILLANCE BASED RANKING ORDER AND TEMPORAL DISTRIBUTION OF PARTURIENT HAEMOGLOBINURIA CASES IN BUFFALO POPULATION IN DISTRICT CHAKWAL, PAKISTAN

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ABSTRACT: A descriptive epidemiological study was carried out for understanding the ranking order and temporal distribution of parturient haemoglobinuria in buffalo. For this data was recorded from each household of eight randomly selected villages. Parturient haemoglobinuria ranked as number one disease among all observed cases with respect to mortality (1.03%) and proportional mortality (29.41%) rate and appeared as 4thand 3rdposition in ranking with respect to incidence (3.97%) and case fatality (25.97%) rate. For assessment of temporal distribution, data of 77 haemoglobinuria cases was analyzed. Significantly (P<0.05) increased proportion of haemoglobinuria cases were recorded during December (23.3%) and in 4th lactation (31.1%). Majority (62.22%) of pregnant animals were affected during or after 7th month of pregnancy whereas; significantly (P<0.05) increased proportion (68.88%) of non pregnant animals was affected within 60 days of parturition. Findings indicated that parturient haemoglobinuria was among most important diseases of breeding age buffaloes causing 29.41% of the total deaths.

Key words: Parturient haemoglobinuria, ranking order, epidemiological study, active surveillance, buffalo.

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INTRODUCTION

Parturient haemoglobinuria is a major disease of breeding age in buffaloes causing considerable losses in India, Pakistan and Egypt. This disease is characterized by intravascular haemolysis, anaemia and haemoglobinuria. The incidence rate is much higher in buffaloes as compared to cattle. Majority of buffaloes are affected during last stage of gestation or in early lactation usually in their 3rd to 6th lactations. Exact pathogenesis is not yet known however multidimensional etiological factors associated with this disease are low dietary phosphorous and copper levels, increased molybdenum and haemolytic agents from cruciferous/toxic plants (Gahlawat *et al.,* 2007; Brechbuhl *et al.,* 2008; Dua, 2009; Durrani *et al,*. 2010; Ghanem and El-deeb, 2010). According to an estimate, the annual economic losses due to parturient haemoglobinuria were Rs. 490.2 millions in Punjab, Pakistan during 1996 (Mahmood *et al.,* 2012 and 2013). As per recommendations of 2nd world buffalo congress (1988), New Delhi, India " field investigations related to disease surveillance, monitoring and forecasting should be given top priority in the list of basic research on buffalo diseases" (Anonymous, 1988). Information on epidemiological aspects of parturient haemoglobinuria in the buffalo rearing countries, particularly in Pakistan, is quite scanty and this is important for planning a control strategy of this disease. The present study is therefore designed to investigate ranking order and temporal distribution of parturient haemoglobinuria in order to suggest future research priorities.

MATERIALS AND METHODS

Descriptive epidemiological study was conducted in district Chakwal from April, 2010 to March, 2011 through active surveillance system to find out the ranking order and distribution of parturient haemoglobinuria. Disease was clinically diagnosed on the basis of specific signs i.e.red/coffee colored urine and constipation/straining during defecation. Other similar disease conditions including haemoparasites and leptospirosis were ruled out through standard laboratory techniques (Cole *et al.,* 1973 and Anwar *et al.,* 2005).

Target Population: All breeding age buffaloes of North Punjab constituted the target population for the present study. From endemic areas of parturient haemoglobinuria in North Punjab i.e. Attock, Chakwal, Jhelum and Rawalpindi, district Chakwal was randomly selected for the present study. Out of total 461 villages of district Chakwal, eight villages were randomly selected for collection of required information. All breeding age buffaloes (N=1938) of these selected villages were taken as study population.

Sampling Plan: Random sampling technique was used for selection of sample in two steps. In the first phase, eight villages including Buchal kalan, Wallana, Dandi, Saghar, Dhiryala kahoon, Dalwal, Mureed and Karyala were randomly selected for collection of required information whereas in the second phase, the sampling frame was all breeding age buffaloes (1938) from these selected villages with sampling unit of one breeding age buffalo.

Sample Size: Sample size was calculated according to recommendations of Thrusfield (2005):

$$n = \frac{1.96^2 P_{expected} (1 - P_{expected})}{d^2}$$

n = desired sample size

$P_{expected}$ = expected prevalence of parturient haemoglobinuria

d = desired absolute precision

By specifying the values of expected prevalence (4%) and desired absolute precision (5%), the desired sample size was n = 59.

Data collection: Required information regarding disease problems of breeding age buffaloes was recorded by visiting each household of selected villages from April, 2010 to March, 2011 through presented questionnaire. One questionnaire was filled for each household.

Distribution of disease: Data of 77 parturient haemoglobinuria cases recorded during study period was analyzed for distribution of disease with respect to time/month of occurrence, lactation number, pregnancy status, postpartum period and previous disease history of affected animals. Chi square test for proportion was applied at 5% significance level using SPSS 17 software.

Incidence, mortality, case fatality and proportional mortality rates of parturient haemoglobinuria and other buffalo diseases were calculated according to recommendations of Thrusfield (2005).

RESULTS AND DISCUSSION

Out of 77 parturient haemoglobinuria cases recorded during the study period *i.e.* from April 2010 to March 2011, 20 affected animals died and remaining 57 recovered. The disease incidence, mortality and case fatality rates were 3.97%, 1.03% and 25.97% respectively whereas the proportional mortality rate was 29.41% table 1. Parturient haemoglobinuria appeared as number one disease among all disease problems of breeding age buffaloes with respect to mortality rate 1.03%, proportional mortality rate 29.41%, stood 4th with respect to its incidence 3.97% and stood 3rd with respect to case fatality rate 25.97%. The highest mortality and proportional mortality rates of parturient haemoglobinuria indicated that it was most fatal disease of breeding age/milking buffaloes causing heavy losses every year. Although the incidence rate was relatively low but the proportional mortality rate of 29.41% indicated that a major proportion of breeding age buffaloes died due to parturient haemoglobinuria. The findings of the present study with respect to frequency of parturient haemoglobinuria were close to previous studies conducted by Pirzada and Hussain (1998); Kahn and Line (2005) and Iqbal *et al.* (2005).

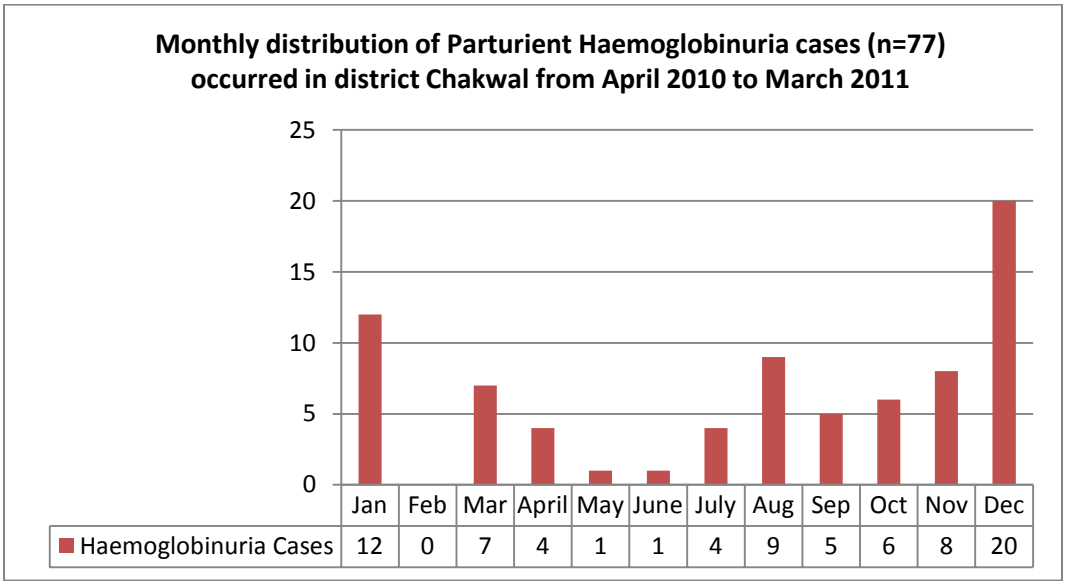
Significantly ($P < 0.05$) increased number of parturient haemoglobinuria cases (23.3%) occurred in December whereas no case was recorded during the month of February. Month wise distribution of total 77 cases is shown in figure-1. Significantly ($P < 0.05$) higher proportion of affected animals developed haemoglobinuria in 4th lactation i.e. 31.1% followed by 3rd 26.1%; 5th 18.9%; 6th 10%; 2nd 9.4%; 8th 3.3% and 7th 1.1% lactations respectively. A total of 39 i.e. 50.64% haemoglobinuria cases were recorded in pregnant animals. Significant ($P<0.05$) majority of these pregnant animals i.e. n=24/62% was affected during or after 7th month of pregnancy. Detailed distribution of total 77 cases with respect to lactation number and month of pregnancy is presented in figure-2 and 3. Out of remaining 38 i.e. 49.35% non pregnant animals, significantly ($P<0.05$) higher proportion (26/68.42%) developed the disease within 60 days of postpartum. A significantly ($P<0.05$) lower proportion i.e. 33.3% of effected animals had a history of haemoglobinuria during their previous lactations/gestations. Significant ($P<0.05$) majority i.e. 87% and 61% of all 77 haemoglobinuric animals was affected in their 3rd to 6th lactations and during winter season *i.e.* from November to March .

Mineral deficiency particularly phosphorous: a major predisposing factor of parturient haemoglobinuria was reported in soils of dry tropical countries like Pakistan (Mahmood *et al.*, 2013). This deficiency was ultimately transferred to animals due to prolonged feeding on phosphorous deficient cruciferous/toxic plants *i.e.* sugar beet, alfalfa hay, brassica and berseem during winter season. These cruciferous plants were reported to be associated with hypophosphataemia and haemoglobinuria due to their decreased phosphorous level, wider calcium to phosphorous ratio *i.e.* >2:1 in berseem and haemolytic agents (Radostits *et al.*, 2007 and Khan and Akhtar, 2007). High calcium to phosphorous ratio results in decreased absorption of phosphorous through gastrointestinal tract rendering it unavailable to the animal for utilization leading to hypophosphataemia. The primary haemolytic factor in brassica was S-methyl cystein sulfoxide whereas in sugar be*et al*falfa and berseem was saponin. Peak production level of buffaloes during 3rd to 6th lactations also resulted in stress on mineral balance. This stress was intensified due to late stage of gestation because minerals were required for fetal growth. Higher incidence of parturient

Table 1: Epidemiological rates for diseases of milking buffaloes occurred from April 2010 – March 2011 in eight selected villages of district Chakwal.

DISEASES	Total cases	Total Deaths	Incidence Rate %	Mortality Rate %	Case Fatality Rate %	Proportional Mortality Rate %
Gastro-intestinal disorders						
Idiopathic diarrhea	69	2	3.56	0.1	2.89	2.94
Tympany	74	7	3.81	0.36	9.45	10.29
Respiratory diseases						
Pneumonia	93	5	4.79	0.25	5.37	7.35
Reproductive ailments						
Abortion	10	0	0.51	0	0	0
Dystokia	17	1	0.87	0.05	5.88	1.47
Endometritis	71	0	3.66	0	0	0
Uterine prolapsed	23	10	1.18	0.51	43.47	14.70
Skin abnormalities						
Mange	36	0	1.85	0	0	0
Managemental disorders						
Mastitis	202	0	10.42	0	0	0
Generalized conditions						
Foot and Mouth disease (FMD)	291	14	15.01	0.72	4.81	20.58
Haemorrhagic septicaemia (HS)	21	7	1.08	0.36	33.33	10.29
Haemoparasites	18	2	0.92	0.1	11.11	2.94
Milk Fever	29	0	1.49	0	0	0
Parturient haemoglobinuria (PHU)	**77**	**20**	**3.97**	**1.03**	**25.97**	**29.41**

Figure 1



haemoglobinuria during advanced pregnancy (≥7months) may therefore be attributed to decreased provision of additional nutrients required for the developing fetus at this stage (Heuer and Bode, 1998; Mahmood *et al*., 2013 and Radostits *et al.,* 2007). In a study conducted by Samad (1997) analysis of six years haemoglobinuric buffaloes' data revealed that pregnancy and late stage of gestation were putative risk factors of parturient haemoglobinuria whereas parturition was the sparing factor. Findings of the present study were close to

previously reported distribution pattern of parturient haemoglobinuria by (Muhammad *et al.*, 2000; Bhikane *et al.*, 2004; Gahlawat *et al.*, 2007; Khan and Akhtar, 2007 and Durrani *et al.*, 2010) whereas were contrary to reported by Chugh *et al.* (1996) who found highest occurrence of parturient haemoglobinuria in September in India which may be due to different climatic conditions. Previous report of Heuer and Bode (1998) was also contrary to the findings of present study with respect to seasonal pattern of disease as they did not find a case of parturient haemoglobinuria during May to October of study year. This contradiction is probably due to different study designs.

Figure 2

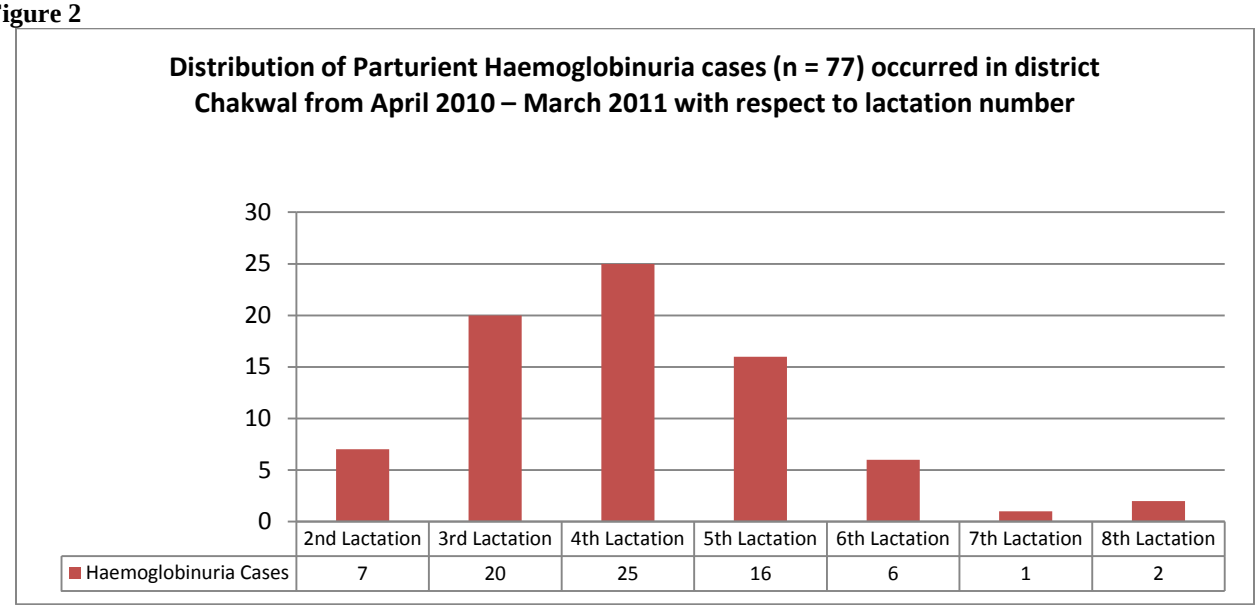
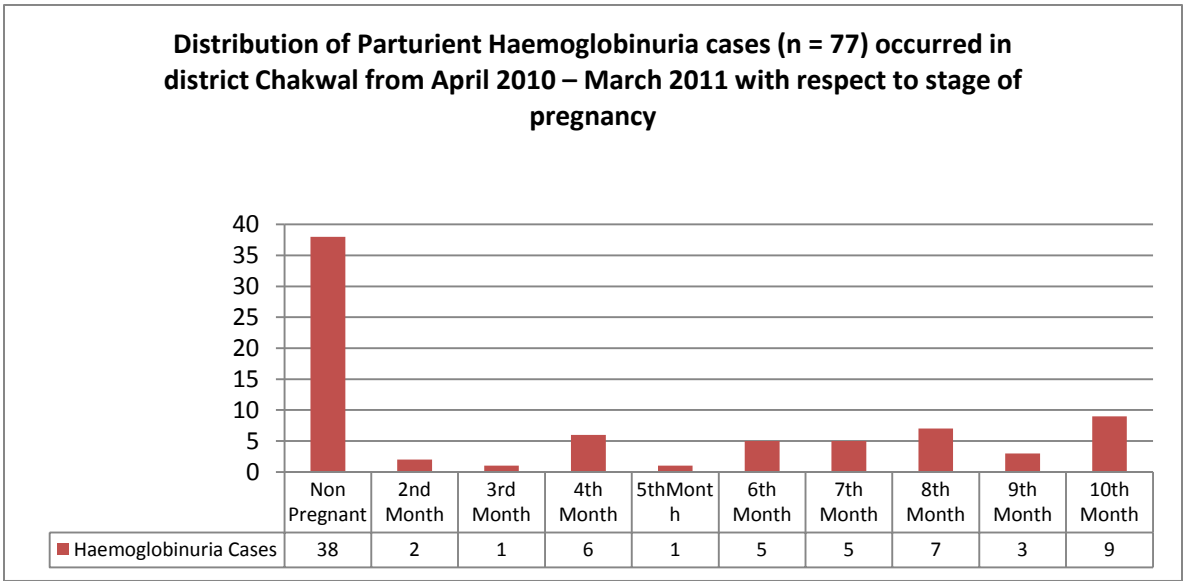


Figure 3



Conclusion: Keeping in view the important findings of the present study, it is suggested that parturient haemoglobinuria should be given top priority in the list of research on buffalo diseases. For a better understanding of etiology and pathophysiology, a comprehensive study should be conducted to investigate the macro and micro mineral status of serum before the onset of clinical signs and their relationship with host and environmental factors. Investigation of seasonal changes in mineral status of soil, fodder and buffaloes in different agro-ecological zones of Punjab thereby suggesting fertilizers, feed supplements and mineral mixtures accordingly

would be helpful in prevention and control of this disease.

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