INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 15, No. 5, p. 462-478, 2019

RESEARCH PAPER OPEN ACCESS

Incidence and prevalence of coccidiosis in different age group and contributory factor of coccidiosis in poultry farms of District Sahiwal, Punjab Pakistan

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Key words: Poultry, Coccidiosis, Factor, Age, *Eimeria*, Sahiwal, Prevalence.

http://dx.doi.org/10.12692/ijb/15.5.462-478 Article published on November 28, 2019

Abstract

Coccidiosis is caused by the genus *Eimeria* and nine species are known to occur in chicken, which are widely distributed throughout the world. Prevalence of *Eimeria* was 34.25% in district Sahiwal. In local poultry flocks, population of Eimeria consist of seven species. Study of local isolates indicated *E tenella* was most prominent species of *Eimeria*, followed by *E acervulina*. *E mittis* and *E brunette* were least prevalent species. From February 2013 to October 2017, 5700 gut & 5700 faecal samples of broiler and Layer chickens suspected for coccidiosis were collected. Fecal samples were collected in W shape path from each farm. Monthly highest incidences of coccidiosis were observed in August and September while in Jun lowest circulation of parasite was observed. Age group 2 was most prominent in outbreak of coccidiosis; in age group 2 prevalence of disease was 48.39%. Lowest mortality and sensitivity of infection was observed in age group 4. Rate of incidence in were 22.87% in good, 31.20% in Normal and 45.21% in poor management condition. Prevalence of coccidiosis was 76.23% and 22.39% of outbreaks were observed in layers. 55.81% of isolates collected from poultry farms having rice hulls was positive. Wood shavings were also used as bedding material and infestation rate of isolates from these samples was 43.65%. It revealed from data collected that by improving management numbers of outbreaks was reduced to half. Continue increase in commonness of disease was detected from 2013 to 2016, it decreases in 2017.

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Introduction

Coccidia infections in chicken cause greater financial losses than in other domesticated birds. It costs on yearly basis, for prophilaxis, as well as therapy exceed two billion Euros (Karlsson and Reid, 1978; Graat *et al.,* 1996; Kinung'hi *et al.,* 2004; Dalloul and Lillehoj, 2006; Livestock Census, 2007). In general, the losses caused by coccidiosis without including the sub clinical coccidiosis are estimated to be 2 billion USD throughout the world (O'Lorcain *et al.,* 1996; Gussem, 2007; Gari *et al.,* 2008). Losses due to sub clinical forms of the disease are heavy and can't be estimated (Gordon and Jordan, 1982). Methusela (2001) has reported that coccidiosis contributes to 8.4% loss in profit in large scale farms and 11.86% loss in profit in small scale farms (Haug *et al.,* 2008b; Zaman *et al.,* 2012).

It is caused by the genus *Eimeria* and nine species are known to occur in chicken, which are widely distributed throughout the world (Soulsby, 1982; Lillehoj and Trout, 1993; McDougald and Reid, 1994; Bachaya *et al.,* 2012; Pant *et al.,* 2018). Coccidia exhibit marked degree of host specificity (Becker, 1948; Boles and Becker 1954; Ayaz *et al.,* 2003; Lee *et al.,* 2010).

E. tenella and *E. necatrix* are the most pathogenic species. *E. acervulina, E. maxima* and *E. mivati* are common and slightly moderate pathogenic; *E. brunetti* is uncommon but pathogenic when it does occur. *E. mitis , E. praecox* and *E. hagani* are relatively non-pathogenic species (Reid, 1978; Soulsby, 1982; Guale, 1990; Lillehoj and Trout, 1993; Jadhav *et al.,* 2011).The occurrence of clinical coccidiosis is directly related to the number of sporulated oocysts ingested by a bird at one time, the pathogenicity of the *Eimeria* species, the age of the infected chicken and the management system (Reid, 1990; Lillehoj and Trout, 1993; Chapman, 1997; Whitmarsh, 1997; Adib-Nishaboori *et al.,* 2000; Gyorke *et al.*, 2013; Zhang *et al.,* 2013; Sharma *et al.*, 2016). The extensive use of anticoccidial drugs has led to the development of resistance strains, which ultimately resulted in reduced activity of the drug against the agent (Reid, 1990; Graat *et al.,* 1996; Singla *et al.,* 2007). The other approaches, alternative to drugs to minimize the losses due to coccidiosis are induction of protective immunity through vaccination and the use of naturally resistant birds (Kawazoe and Fabio, 1994; Peeters *et al.,* 1994; Stephen *et al.,* 1997; Pinard-van Der Laan *et al.*, 1998; Peek and Landman WJ. 2003; Williams, 2006; Abbas *et al.,* 2007; Zhang *et al.,* 2013).

Human beings are the main mechanical transmitters in disseminating oocysts, which could be carried over by manure clinging to shoes or by utensils carried about from one pen to another. Flies, beetles, cockroaches, rodents, pets and wild birds have also been incriminated as mechanical vectors (Reid, 1978; Fornace *et al.,* 2013; Frolich *et al.,* 2013). Oocysts may survive as long as 86 weeks in shaded soil. But sunlight assists in destruction of oocysts. Incubator temperature held for several days will kill oocysts, so there is little danger of hatchery transmission to the baby chicks. Oocysts are so resistant to disinfectants that they survive stringent attempts to kill them (Patillo and Becker, 1955; Adamu *et al.* (2009); Grema *et al.* (2014) and Lawal *et al.* (2016).

In cage system there is only 1% infection (Guale, 1990; Reid, 1990; McDougald *et al.,* 1997). In deep litter poultry houses, which offer optimal condition of temperature and humidity for oocyst sporulation, the risk of infection is further increased (Urquhart *et al.,* 1987; Becker, 1989; Islam *et al.,* 2010). Infection with single species of coccidium is rare in natural conditions, and mixed infections are common. Nevertheless, in many outbreaks the clinical entity can be ascribed principally to one species or occasionally a combination of two or three (Soulsby, 1982; Karaer *et al.,* 2012). The clinical disease is dependent on the number of oocysts ingested by individual birds. If the environment hygiene is poor, this number may be very large which is particularly true for *E. tenella* that have high biotic potential. But in very light doses no clinically recognizable symptoms may occur and thus, the morbidity and mortality increase in proportion to the size of the dose

ingested (Soulsby, (1982); Becker, (1989); Grema *et al.* (2014), and Adamu *et al.* (2009) and Lawal *et al.* (2016).

Preliminary studies on the prevalence of coccidiosis done in the past have shown that both clinical and sub clinical coccidiosis have been occurring with low prevalence rate in the local strain chicken kept under the backyard production system than in the commercially oriented production systems (Guale, 1990; Ashenafi, *et al.,* 2004; Tadesse and Feyissa, 2016). In broiler farms from Romania, found *Eimeria* spp. in 91% flocks, and in 92% farms (Gyorke *et al.,* 2013). Prevalence rate as low as 6.8% and as high as 80.3% has been observed in different urban and peri-urban poultry farms in Ethiopia (Methusela, 2001). The range of coccidial infection prevalence has been reported as low as less than 10 % to as high as more than 90 % in broilers globally (Morris and Gasser, 2006; Karaer *et al.,* 2012; Haug *et al.,* 2008; Singh and Meitei, 2015). The incidence of coccidiosis in commercial poultry can range from 5 to 70 % (Du and Hu 2004).

The objective of this study is to conduct prevalence study of poultry coccidiosis in district Sahiwal. The species of *Eimeria* occurring in the area were identified and ranked based on seasonal frequency of occurrence.

Methods and materials

Study Area

Sahiwal is found in province Punjab of Pakistan. It consists of two tehsils namely Sahiwal and Chichawatni which comprises of three towns and 1371 villages. It is situated at 500 feet from sea level. Most of the area is irrigated from canals derived from Upper Sutlaj canal system and River Ravi. It is situated at 30-40 north latitude and 73 longitudes.

Climate

The study site i.e. district Sahiwal, it has warm climate with average rainfall of 2000 mm. It has fertile land but the temperature reaches upto 50 ^{o}C in summer and decreases to 5 ^{o}C in winter.

Samples Collection

From February 2013 to June October 2017, 5700 gut & 5700 faecal samples of broiler and Layer chickens suspected for coccidiosis were collected from poultry sale point and poultry farms in adjacent areas reported to have signs of coccidiosis. The samples i.e. intestines along with caeca were collected in 2.5% (w/v) potassium dichromate solution and stored in the dark at 4°*C*. The samples were brought to Microbiology Research Laboratory (MRL), Quaid-i-Azam University, and Islamabad for further analysis. For the isolation of oocysts, each sample was processed using the method described by Eckert *et al.*, 1995.

Data collection

At the time of sample collection, information regarding age, no. of birds per house, no. of houses in the poultry farm, house dimensions, season, use of anticoccidials, ventilation system, genotype of broilers, management practices like watering and feeding methods, condition of drinkers and feeders, nature and condition of litter, frequency of change of litter; were recorded from poultry farmers.

Gut Examination

Intestine was freed from mesentery and surface of intestine was carefully observed for the presence of blood clotting, or pitchy patchy or inflamed area. Different species of *Eimeria* infect different part of intestine and have characteristic lesion shape and pattern. Different parts of intestine were carefully open with the help of scissors and observed. Gross lesion score were taken along with other pathological problem ranging from petechi, reddening, thickening, ballooning, hemorrhage (bleeding), caecal core, whitish spot, ladder like appearance, from ceacal destruction to swelling of whole intestine. Depending upon the amount of intestinal destruction, type of species and severity of diseases specific number were allotted ranging from 0-4 (Calnek, 1997; Jordan, 1990; Pellerdy, 1952).

Mucosal Scrapping Examination

When there is any clue from for the presence of

Coccidiosis from fecal samples or from sign and symptom such as bloody diarrhea is due to *Eimeria tenella*, whitish diarrhea is indicator of *Eimeria acervulina*.

Fecal Examination

Fecal samples from each poultry farm were collected in plastic zipper bag. Fecal samples were collected in W shape path from each farm. Fresh feces and litter samples from each poultry farm were collected. Litter samples were also taken from places that are wet. Fecal sample were transported to laboratory and stored at 4c till further processing (MAFF, 1982; Conway and McKenzie, 2007).

Eimeria Species Identification

Combination of different methods was used for species specific identification of *Eimeria* in poultry. Pathological lesions, Oocysts index, and sporulation time help in differentiation of different species. There is Specific infection site of each *Eimeria* species in the intestine of chicken, criteria for identification of present species was developed by Long and Reid (1982).

Data Analysis

Data was summarizing with the help of descriptive statistics by using Microsoft Excel worksheet. SPSS statistical software package was used to analyze data. For measuring statistical significance of result Pearson's Chi square test was applied. 95% CI and p-value < 0.05 was used to know the significance.

To calculate prevalence number of positive samples was divided by total number of samples and multiplied by hundred. Chi-square helps to draw relationship between prevalence of Coccidiosis and Risk factor of Coccidiosis. If resulting P-value is less than 0.05, association is statistical significant.

Result

Continue increase in commonness of disease was detected from 2013 to 2016, it decrease in 2017. Prevalence of coccidiosis in intensive poultry industry, during survey of local farms fecal and intestinal samples were collected and processed in lab reveals incidence of coccidiosis went on increasing during successive year except 2017 (Fig 1).

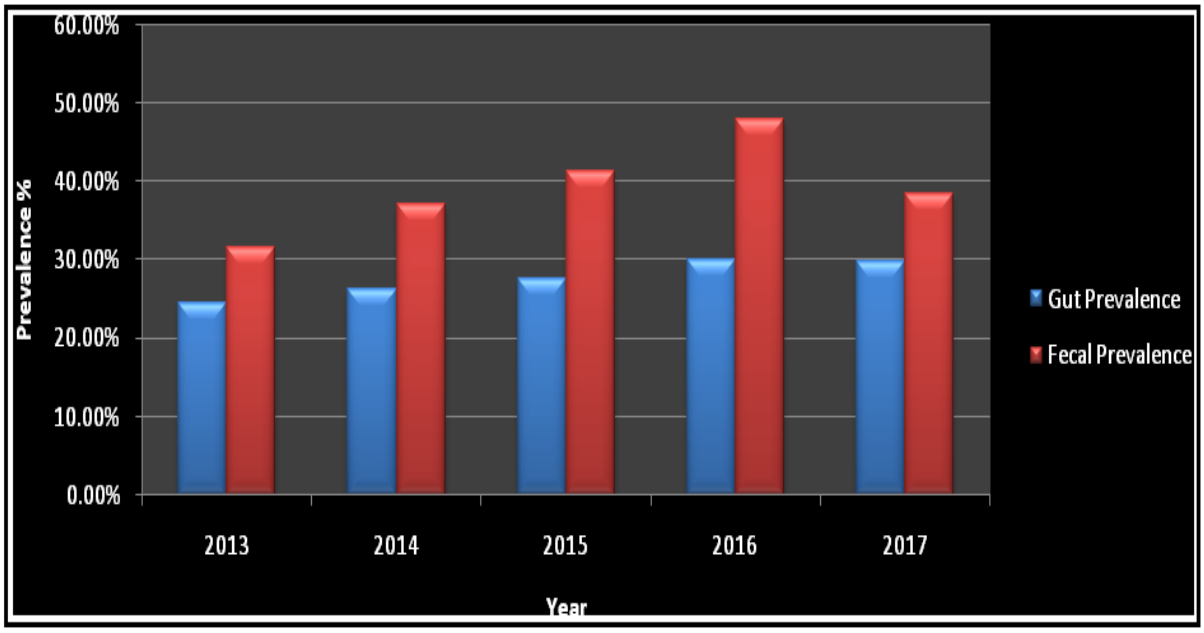

Fig. 1. Prevalence of *Eimeria* in Poultry Farms from 2013 to 2017.

Seven species of *Eimeria* were present in different frequencies. Postmortem of dead birds indicate *E tenella* was most prominent species of *Eimeria*, followed by *E acervulina*. *E mittis and E brunette* were least common species detected in intensive poultry industry (Fig 2).

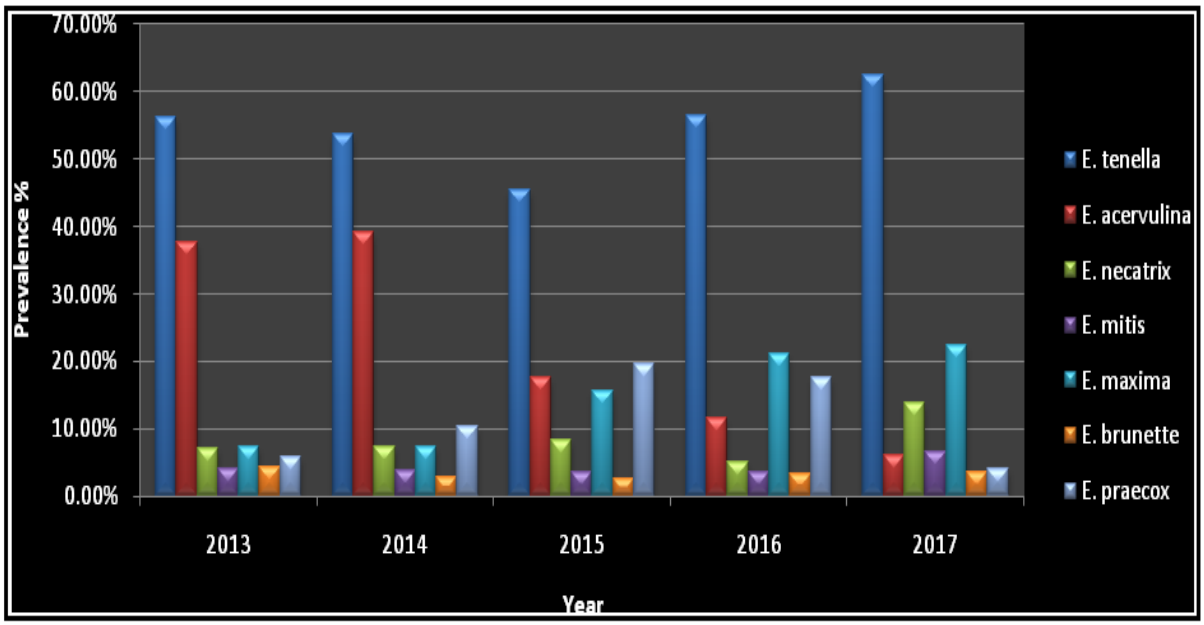

Fig. 2. Year wise Prevalence Percentage of Species in Gut samples.

Seven species of *Eimeria* was present in fecal dropping collected and processed during five year study.

In fecal isolate E *tenella* was ranked 1st in prevalence of species. *E tenella* was 54.02% 2013 increased to 67.31% in 2017. Commonness of *E acervulina* second most common species and *E. mitis* was one of rarest species of *Eimeria*, *E mitis* was less common and difficult to detect due to low number of oocysts in fecal samples. *E. mitis* was 5.74% 2013 increased to 2.38% in 2017 (Fig 3).

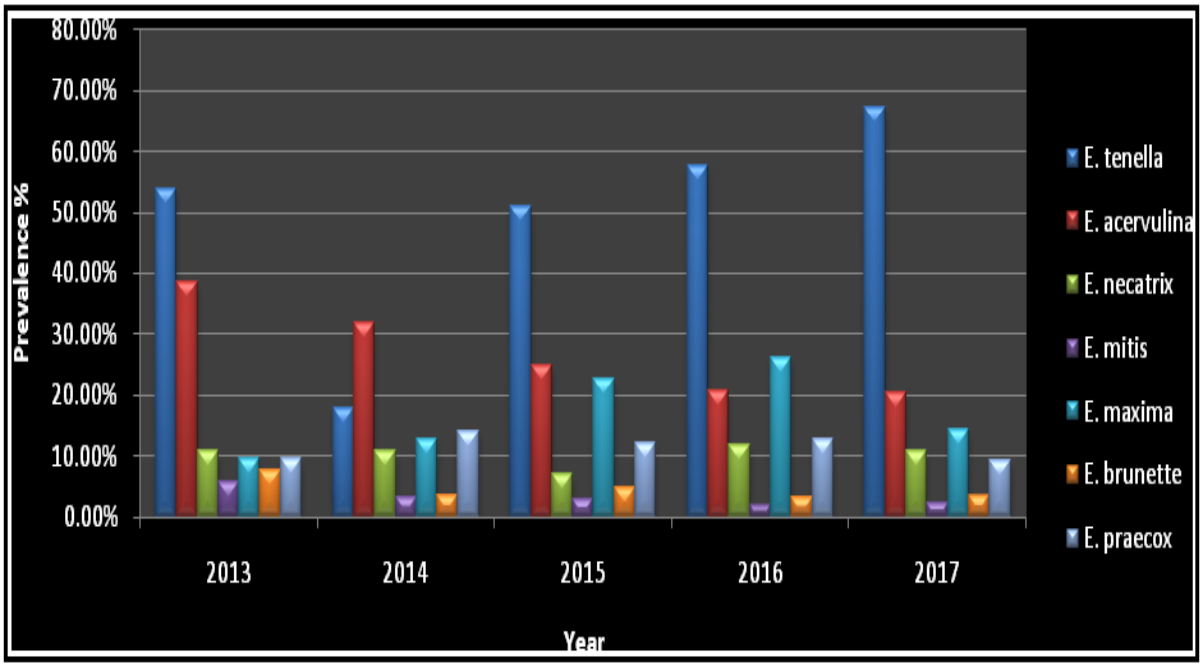

Fig. 3. Year wise Prevalence Percentage of Species in feces.

Age group 2 was most prominent in outbreak of coccidiosis and lowest in age group 4. Incidences of coccidiosis were reported in every month. Highest incidences of coccidiosis were observed in August and September. In Jun lowest circulation of parasite was observed in hot and dry weather (Fig 4).

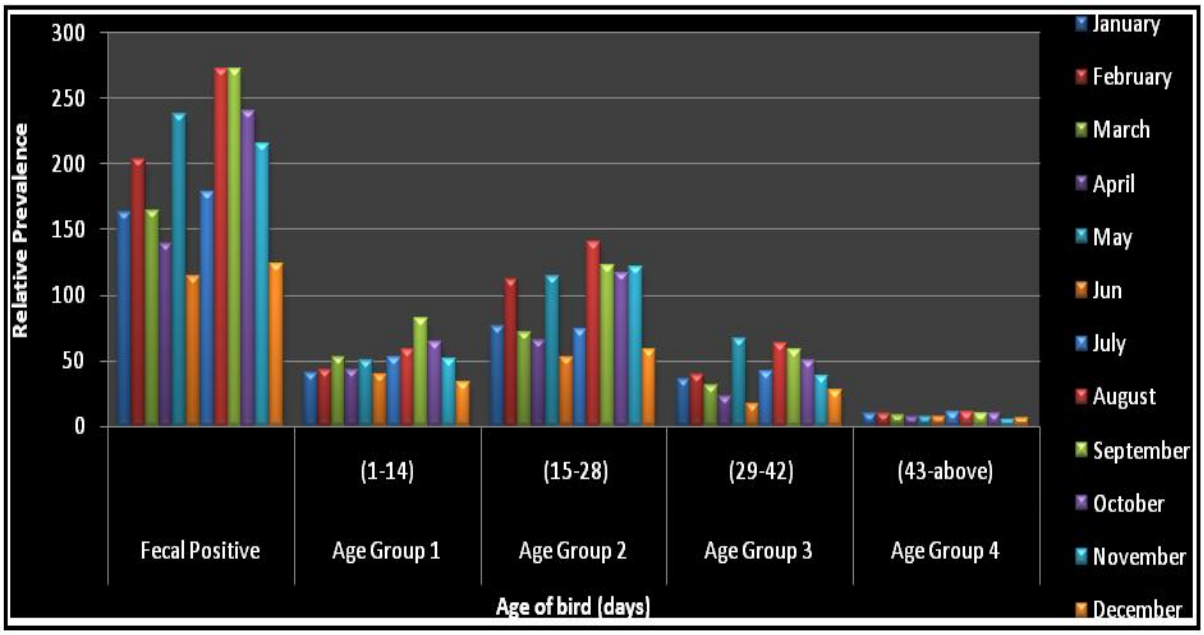

Fig. 4. Total Age Wise prevalence (Days) (Fecal) 2013-2017.

Prevalence of coccidiosis and mortality of birds reported in different age groups age group 1 was 29.11%, age group 2 was 38.95%, age group 3 was 20.74% and age group 4 was 5.20%. Most mortality was observed in age group 2 followed by age group 1. High outbreaks and mortality was observed in August and September, when environment was hot and humid. Poor outbreaks and low mortality was observed in Jun dry and hot weather (Fig 5).

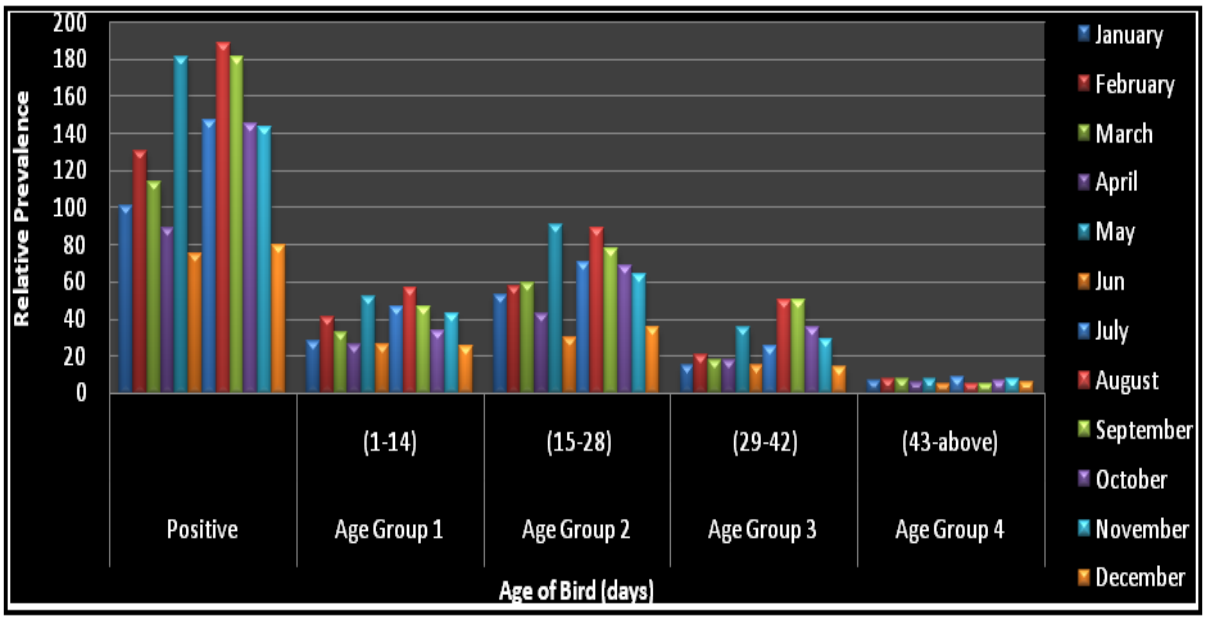

Fig. 5. Total Age Wise prevalence (Days) (Gut) 2013-2017.

Summer rainy season promote the incidence of coccidiosis and hot and dry Jun is first month of summer has least outbreaks of diseases. August was most prominent in outbreaks and mortality of birds in flocks, Jun is first month of summer has least (Fig 6). Postmortem studies of dead birds indicate following percentage of samples have parasite 24% in Winter, 26.53% in Spring, 29.60% Summer and 16.06% in Autumn.

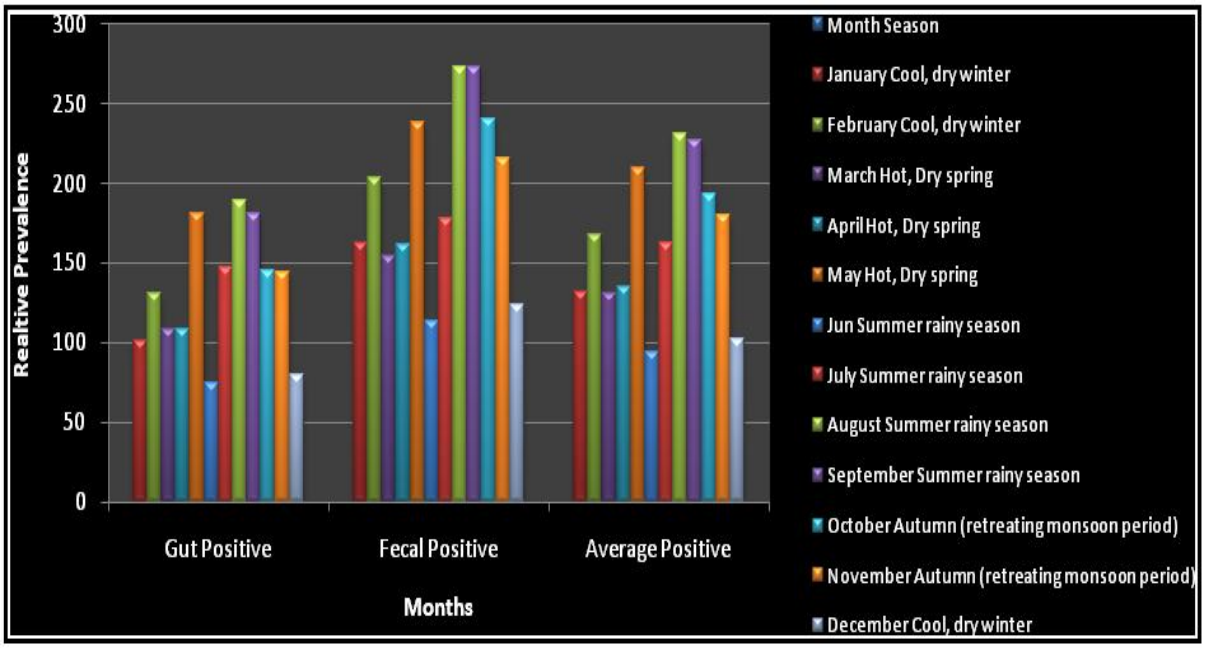

Fig. 6. Month wise Seasonal prevalence (2013 -2017).

Summer stand prominent in outbreaks and infestation rate of *Eimeria* and Least number of Positive samples were reported in autumn. Same pattern was observed in fecal isolate (Fig 7).

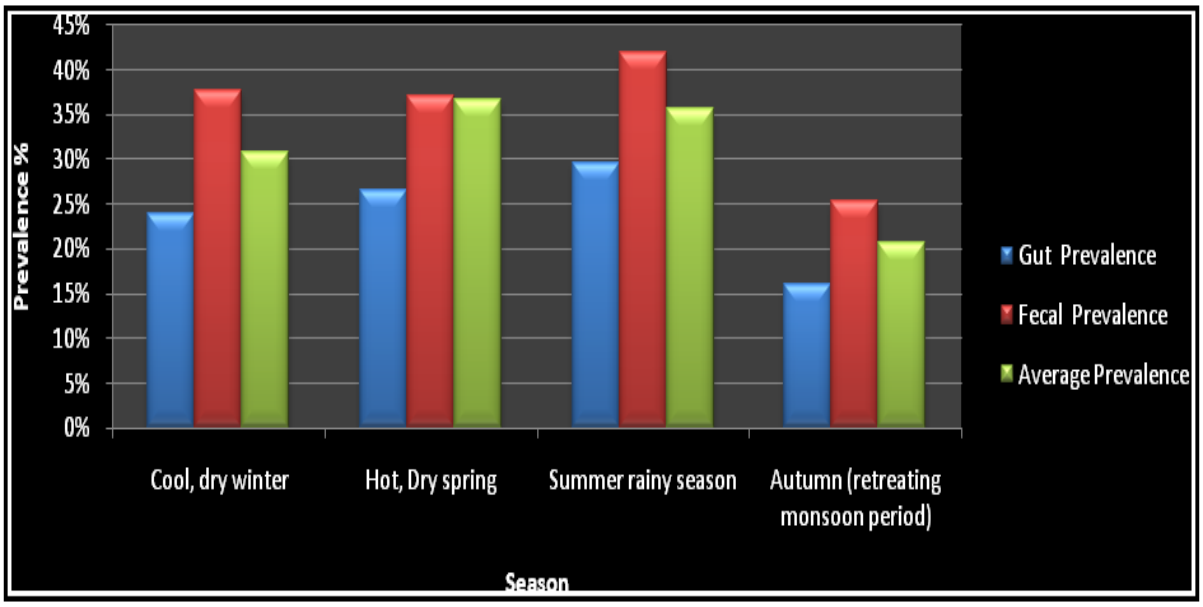

Fig. 7. Seasonal Prevalence during 2013-2017 in intestinal and fecal samples collected from local area.

It was reported in each and every part of world in all management system, all types of flocks and management system. Prevalence of *Eimeria* was 34.25% in district Sahiwal. Samples were collected from poultry farms revealed coccidiosis was present in clinical and subclinical forms, 40.39% of observed poultry have clinical form of coccidiosis and 59.61% of local intensive poultry forms have subclinical infestation of *Eimeria*. Rate of incidence in were 22.87% in good, 31.20% in Normal and 45.21% in poor management condition.

It revealed from data collected that by improving management numbers of outbreaks was reduced to half. Prevalence of coccidiosis was 76.23% and 22.39% of outbreaks were observed in layers. More

parasite burden was found in rice hull containing bedding materials. 55.81% of isolates collected from poultry farms having rice hulls was positive. Wood shavings were also used as bedding material and infestation rate of isolates from these samples was 43.65% (Fig 8).

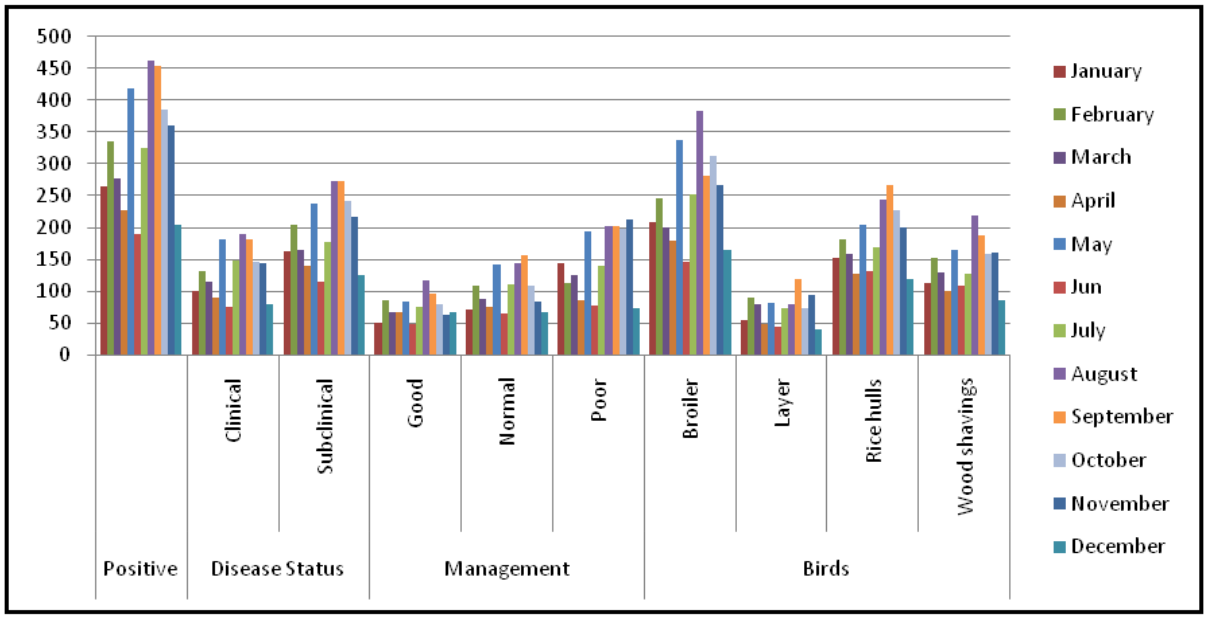

Fig. 8. Total Status of Disease and Management practice revealed in collected fields isolates (2013-2017).

Discussion

Prevalence of *Eimeria* was 34.25% in district Sahiwal. Continue increase in commonness of disease was detected from 2013 to 2016, it decreases in 2017. Much higher incidence was reported by number of researchers 90% Amer *et al.,* (2010), 88.4% in Argentina, Mc-Dougald & Mattiello, (1997), 88.37% McDougald *et al.,* (1997), 82.24% Khelfa (1982), 78.7% Lee *et al.,* (2010), 78% in Jordan (Al-Natour *et al.,* 2002), 75%, in Western Iran (Gari *et al.,* 2008). Higher infection rate was reported 71.9% in Pakistan (Khan *et al.,* 2006), 71.1% reported by Dinka and Tolossa (2012), 71.43% in layers and backyard poultry 70 % (Williams 1999), 70.9% in Ethiopia (Elmira *et al.,* 2012), 69% by Olanrewaju and Agbor (2014), 66.7% (Lawal *et al.,* 2016).

Moderate rate of infestation was reported in number of studies of 58.9% Lawal *et al.,* (2016), 56% Defar (2017), 55.96% Nematollahi *et al.,* (2009), 54.3% in Turkey Karaer *et al.,* (2012), 53.61 % by Sharma *et al.,* (2015), 52.9% in Nigeria Muazu *et al.,* (2008), 52.9% recorded by Mohammed and Sunday (2015). Moderatly low infection of coccidiosis was observed 50.8% (Fessessework, 1990), 50% (Al-Natour *et al.,* 2002), 48.2% (Methusela, 2001), 46.04 % by Jadhav *et al.* (2011), 43.9% by Ahmed *et al.* (2003), 41.5% (Agishi *et al.,* 2016), 40.3% (Ngele, 2017), 39.6% in India (Sharma *et al.,* 2013), 37.95% (Ayaz *et al.,* 2003), 36.6% prevalence rate as reported by Dakpogan and Salifou (2013).

Our result are in agreement with 35.45% Belal (2018), 33.07% (Sultana *et al.,* 2009), 33.33 % Sood *et al.* (2009), 31.7% in India (Nikam *et al.,* 2012), 31.8% Lawal *et al.,* (2016), 31.7% in India Jadhav and Nikam (2014). Number researcher detected less prevalence than our findings 29.87 % (Ahad *et al.,* 2015), 25.8 % Ashenafi *et al.* (2004), 23.80% Yousaf *et al.,* (2017), 20.6% Gari *et al.,* (2008) 19.6% Yunus *et al.* (2008), 19.3% Gebremeskel and Endale (2016), 14% Adamu *et al.* (2009), 11.4% Grema *et al.* (2014), 9.59 % Shamim *et al.,* (2015).

In our study seven species of *Eimeria* was detected. In agreement to our study number of researchers reported seven species of *Eimeria* in commercial poultry farms (Shirley, 1986; Thebo *et al.,* 1998;

Mattiello *et al.,* 2000; Al-Natour *et al.,* 2002; Ayaz *et al.,* 2003; Lee *et al.,* 2010). In disagreement to our study number of researcher reported less number of species, Six species was reported by (Williams, 1995; McDougald *et al.,* 1997), five by (Haug *et al* 2008; Sun *et al.,* 2009; Shirzad *et al.,* 2011; Sharma *et al.,* 2013; Sharma *et al.,* 2015), four by (Ashenafi, 2000; Methusela, 2001; Khan *et al.* 2006; Györke *et al.,* 2013; Bachaya *et al.,* 2015; Jamil *et al.,* 2016), three (Nematollahi *et al.,* 2009), two (Shakshouk, 1984; Singh *et al.,* 2015), Single species detected by (Gari *et al.,* 2008). *Eimeria* species and their prevalence vary greatly within the different geographical areas (Chapman, 1997; Adib-Nishaboori *et al.,* 2000; Györke *et al.,* 2013; Zhang *et al.,* 2013; Sharma *et al.,* 2016).

Our results have little difference with 39% by Mohammad. Findings of other researchers were, *E. tenella* (50%) by Akhtar *et al* (2003), 50% by Ayaz *et al.,* (2003) and 27.04%) by Awais *et al.,* (2012). *Eimeria tenella* was also reported by other researchers in following ratio, 40.9% by Bachayha *et al,* (2015) and Gari *et al.,* (2008), *E tenella.* Few authors reported higher prevalence rate of *E tenella*, 90% in China by Sun *et al.,* (2009), 67.8% by (Shakshouk, 1984), (61.5%) by Kaboudi *et al.,* (2016). As compare to our results lower prevalence rate of *E tenella* was (25%) reported by (Iqbal *et al* 2010), 18.13% by (Ahad *et al.,* 2015), 17.14% (Kumar *et al.,* 2015).

Prevalence and impact of *E tenella* on poultry industry was reported by many authors across the globe (McDougald *et al.,* 1997; Iqbal *et al* (1999); Jithendran 2001; Haug *et al.,* 2008; Aarthi *et al.* 2010; Hamidinejat *et al.,* 2010; Iqbal *et al* (2010); Hadipour *et al.,* 2011; Jadhav *et al.* 2011; Oljira *et al.,* 2012; Györke *et al.,* 2013; Sharma *et al.,* 2013; Amin *et al.,* 2014; Ahad *et al.,* 2015; Blake *et al.,* 2015; Kumar *et al.,* 2015; Singh *et al.,* 2015; Shamim *et al* 2015; Sharma *et al.*, 2015; Singh and Meitei (2015); Clark *et al.,* 2016 and Ngele, (2017). Same pattern was noted in intestinal and fecal samples. Other important species of *Eimera* were in following percentage *E. praecox* 11.85%, *E. acervulina* 35.21%, *E. necatrix* 10.85%, *E. maxima* 11.29% and *E brunette* 5.67% are also confirmed by other researchers (Akhtar *et al* 2003; Sun *et al.,* 2009; Bachayha *et al,* 2015; Shamim *et al* 2015; Sharma *et al.*, 2015; Kaboudi *et al.*, 2016).

Our result that *E. mitis* was least occurring or circulatory species of poultry industry are supported by (Oikawa *et al.,* 1979; Long and Reid, 1982; Williams *et al.,* 1996; McDougald *et al.,* 1997; Graat *et al.,* 1998; Ngele, 2017). *Eimeria* species and their prevalence vary greatly within the different geographical areas (Chapman, 1997; Gyorke *et al.,* 2013; Zhang *et al.,* 2013).

It has been observed that coccidiosis was present throughout the year with variable monthly prevalence (Nnadi and George, 2010; Singh *et al.,* 2015). In our study prevalence rate of coccidiosis in August postmortem of dead birds 37.80% of cases shows characteristic lesion of circulatory species of *Eimeria*. Summer rainy season promote the incidence of coccidiosis and hot and dry Jun has least outbreaks of diseases. In Jun least prevalence of coccidiosis was 15% observed in gut collected. Summer rainy season started at the end of Jun and Prevalence suddenly jumped to 29.40% in July. In August postmortem of dead birds 37.80% of cases shows characteristic lesion of circulatory species of *Eimeria*. August was most prominent in outbreaks and mortality of birds in flocks due to wetting in bedding material that serve as breeding sanctuary for germination of Oocysts of *Eimeria*. September is last month of summer rainy season, 36.20% of intestinal samples were positive. In October Autumn (retreating monsoon period) result 29% of collected isolate was positive. Incidences of coccidiosis was in November was 36%. In December weather was cooled and dry resulting 20% of cases were positive and show presence of *Eimeria*. Similar trend was observed in fecal samples. On average prevalence of *Eimeria* was 33% January, 41.88% February, 26.30% March, 27.10% April, 41.90% May, 18.90% Jun, 32.50% July, 46.20% August, 45.40% September, 38.60% October, 45% November and

25.50% in December. In agreement to our study highest infection of *Eimeria* was reported by number of researchers in August (Amin *et al.,* 2014; Ahad *et al.,* 2015) and highest outbreak of coccidiosis was observed in September (Awais *et al.,* 2012), and October by Bachaya *et al* (2015) and Khan *et al.,* (2006).

Very close to our study lowest percentage was found in May due to hot and dry environment (Sharma *et al.,* 2015). Our result were not in line with discovery of other author, those reported high prevalence rate in November and lowest in July (Ola-Fadunsin SD, 2014; Ola-Fadunsin SD, 2017). The infection rate was high during month of August and September the prevalence of infection was 60.16% and 62.29% respectively (Amin *et al.,* 2014).

Average prevalence in different season were in following percentage, 36.65% in spring, 35.75% in summer, 30.89% in winter and 20.72% in autumn. Highest prevalence was in spring season and lowest was in autumn. In agreement to our study, there is some evidence of more rapid cycling in spring and summer than in fall and winter (Reid, 1978; Soulsby, 1982). Highest prevalence was observed in spring season which could be due to favourable environmental parameters for the sporulation of coccidial oocyst as reported elsewhere (Razmia and Kaliderib, 2000; Singh *et al.,* 2015; Sharma *et al.,* 2013). Our results are in disagreement with the lowest incidence of species circulation during spring season (Sultana *et al.,* 2009; Amin *et al.,* (2014). In disagreement to our observation lowest incidence was reported in summer (Hirani *et al.,* 2011; Sharma *et al.,* 2015). The prevalence was high due to warmth and moisture climatic condition favors transmission and contamination of the oocytes (Alawa *et al.,* 2001; Jithendran, 2001; Renaudeau *et al.,* 2012). Humid weather in district Faisalabad, humidity plays a vital role for the sporulation and transmission of the coccidial oocysts (Al-Natour *et al.,* 2002; Haug *et al.,* 2008; Bachaya *et al.,* 2012; Nikam, *et al.,* 2012). Humid weather, management, number and duration of different season, and geographical factors could be reason for high prevalence of coccidiosis in autumn (Al-Natour *et al.,* 2002; Haug *et al.,* 2008; Bachaya *et al.,* 2012; Nikam, *et al.,* 2012).

Young flocks of age 15-28 are most susceptible to coccidiosis and adult flocks of age 43-above are least prone to disease. Coccidiosis was most prevalent in young flocks as compared to adult. Similar observation was noted in got and fecal isolates. Less burden of infestation was observed in age group 1 was in line with Gharekhani *et al.,* (2014). In agreement to our study higher prevalence in birds of age group 2 was reported by many authors (William, 1996; Mc Dougald *et al.,* 1997; Al-Natour *et al.,* 2002; Yunus *et al.,* 2008; Sultana *et al.* 2009; Amin *et al.,* 2014). Prevalence rate of *Eimeria* and results of age group 3 are in line with findings of other authors (Hamsley, (1964); Lobago *et al.* 2003; Adhikari *et al.* 2008; Kumar *et al.* 2008; Yunus *et al.,* 2008; Nematollahi *et al.* 2009; Shamsa *et al.,* 2015; Sharma *et al.,* 2015). Rate of incidence of coccidiosis in age group 4 are in confirmation (Julie, 1999; Muazu *et al.,* 2008; Gharekhani *et al.,* 2014).

Birds of very young age of age group 0–15 days were protected by the maternal immunity result in low prevalence of coccidiosis (Sharma *et al.,* 2015). Middle age birds were found more susceptible to infection than those aged above 3 weeks (Shamim *et al* 2015). Young birds are more susceptible to infection than in adult birds (Blake *et al.*, 2015) but in opposite to our reports of prevalence of coccidiosis was relatively higher incidences was observed in adult than young by Gebremeskel and Endale (2016).

In our study 40.39% of observed poultry have clinical form of coccidiosis and 59.61% of local intensive poultry forms have subclinical infestation of *Eimeria*. *Eimeria* infection was detected in birds in both clinical and sub-clinical forms.

The clinical form of the disease manifests through prominent signs of mortality, morbidity, diarrhoea or bloody faeces (Williams, 1999; Lillehoj and Lillehoj 2000, Lillehoj *et al.* 2004; Sandhu *et al.,* 2009).

Clinical coccidiosis was reported by number of researchers (Adib-Nishaboori *et al.,* 2000; Awais *et al.,* 2011; Shirzad *et al.,* 2011). In agreement to our study there are many authors, those reported both clinical and sub-clinical forms of coccidiosis (Williams, 1999; Sandhu *et al.,* 2009; Defar, 2017). Sub-clinical coccidiosis manifests mainly by poor weight gain and reduced efficiency of feed conversion and gives rise to highest proportion of the total economic losses (Williams, 1999).

The most problematic disease in the poultry industry worldwide is coccidiosis, mainly due to subclinical forms of diseases that interfere with body weight and feed conversion. It is estimated that 95.6-98.1% the economic losses in the commercial broiler industry are caused by coccidiosis (Williams, 1999; Bera *et al.,* 2010).

Some authors reported coccidiosis only in sub-clinical form (Williams, 1999; Razmi and Kalideri, 2000; Kabell *et al.,* 2006; Bera *et al.,* 2010). The severity and clinical and subclinical form of disease depends mainly on the extent of exposure or number of oocysts ingested by the host (McDougald, 1998, 2003b; Williams, 2005; Dalloul and Lillehoj, 2006; Pangasa *et al.,* 2007; Nematollahi *et al.,* 2009; Sun *et al.,* 2009; Gyorke *et al.,* 2013).

Prevalence of coccidiosis was 76.23% and 22.39% of outbreaks were observed in layers. Incidences of coccidiosis were in following percentage 82.34% in broiler and 17.66% in Layers.

Our study was in confirmation to Ola-Fadunsin, (2017), who reported that Broilers (99.8%) and cockerels (81.0%) were the bird types with the highest prevalence rate. Our finding are line with other authors, those reported high prevalence rate of coccidiosis in broiler as compared to layers (Long, 1984; Khan *et al.,* 1990; Vertommen, *1994*; Lunden & Thebo (2000); Ashenafi *et al.* (2004); Yunus *et al.* (2008); Sultana *et al.,* 2009; Sun *et al* 2009; Jadhav *et al.,* 2011; Nikam *et al.,* 2012; Sharma *et al.,* 2013; Gharekhani *et al.,* 2014; Ngele, 2017.

Coccidiosis was more prevalent in chicks and growers than in layers (Jagadeesh Babu *et al,* 1974; Ghodasara *et al,* 1992). In broiler farms, the prevalence of *Eimeria* spp. was higher (88.24 %) as compared to layer farms (71.43 %) and backyard poultry (70 %) (Williams 1999). Researchers in Nigeria had reported coccidia prevalence in broilers as 68.7% (Lawal *et al.,* 2016), cockerel as 70.0% (Olanrewaju and Agbor, 2014), layers as 41.5% (Agishi *et al.,* 2016), and indigenous chickens as 18.8% (Jatau *et al.,* 2012).

We detected 55.81% of isolates collected from poultry farms having rice hulls was positive. Wood shavings were also used as bedding material and infestation rate of isolates from these samples was 43.65%. Bedding material is one of most important factor that control prevalence rate of coccidiosis in poultry farms. Birds maintained on rice hull bedding were more likely to be exposed to oocysts as a consequence of faecal exposure, litter disturbance, moisture absorbance. Coccidiosis was the most common problem to chickens kept under intensive management system especially those on deep litter management (Taylor *et al.,* 2007). The littered floors provided good breeding grounds for protozoa as they are mostly damp with the 'excreted' wastes (faeces) of the birds (Soulsby EJL, 1968; Baines BS, 1972; Fraser *et al.,* 1987; Noordhuizen and Welpelo, J., 1996; Marta *et al.,* 2013).

Our results are in line with number of authors that litter or bedding material has important role in prevalence of coccidiosis (*Lunden et al., 2000*; Dakpogan and Salifou, 2013; Taylor *et al.,* 2007). Frequent removal of waste during flock cycles may exacerbate oocyst transmission as a consequence of litter disturbance (Fornace *et al.,* 2013). Exotic breeds of chickens were reared in rooms with concrete floor that had dry coffee husks and good ventilation (Adene and Oluleye, 2004; Shivaramaiah *et al.,* 2014). Birds raised in deep litter system have been reported to have a higher prevalence of coccidiosis compared to birds raised in battery cage (Agishi *et al.,* 2016). Higher percentage of coccidiosis was observed in house having soiled floor than those having cemented

floor (Sharma *et al.,* 2013; Amin *et al.,* 2014). Spread from bird to bird and from flock to flock depends on the survival of oocysts of the parasite in the bedding or soil (McDougald, 1998). In agreement to our study wetting of bedding material serve as breeding sanctuary for sporulation of *Eimeria* oocysts (Sultana *et al.,* 2009; Singh *et al.,* 2015; Lawal *et al.,* 2016).

Conclusion

(Deleted) *Eimeria* cause coccidiosis in local poultry industry. Seven species of *Eimeria* are present in local poultry farms. *E tenella* was dominant species of *Eimeria* in both broiler and layer flocks Young birds are more susceptible to infection of *Eimeria* and high mortality rate was observed in hot and humid environment. High Humidity, temperature, poor management are major contributory factors in outbreak of coccidiosis. Use of same chemical agent to control coccidiosis in local poultry industry may lead to development of resistance in local population of *Eimeria* results gradually increase outbreaks of disease. There is high prevalence of coccidiosis in broiler than in layers. High incidences of coccidiosis in broiler were due to lack of vaccination against *Eimeria* in broiler because of short life span of broiler and high cost of vaccine. Higher prevalence was detected in rainy season and lowest in dry and hot season.

Oocysts of *Eimeria* are present in each and every poultry farm. Both Clinical and Subclinical form of disease cause huge economic loss to local industry. Wood shaving is better bedding material as compared to rice hull in study area. Good management, rational use of coccidiostats, education level of farmers, continue surveillance of poultry flocks, use of disinfectant between successive flocks and better biosecurity measure improve overall health of layer and broiler flocks results least outbreaks of Red Dysentry of chickens.

Recommendation

More Epidemiological studies are needed to know the circulatory strain of *Eimeria* n local industry. Epidemiological survey helps us to combat disease in rapid and efficient way. Good management, bio-security Stander operating procedure, more awareness to local people about coccidiosis and other poultry disease, constant observation of birds health, consultation with practitioner are recommended. Vaccine development from local isolates of coccidiosis is only sustainable and long term solution to combat this menace of industry.

Acknowledgement

Authors acknowledge the Technical support of support of Dr Sher Ali (Field practioner). We are thankful to Mr Khalid Mahmood, Mr Syed Farzand Ali Shah, Mr Bashrat and Mr Aftab Ahmad for helping in samples collection and preservations of field Isolates. We appreciate the local poultry farmers' cooperation in our study. We are thankful to Adv Asif Naveed Gondal for providing transport, Contacts with local farmers and financial support in our study.

Conflict of interest

Authors declare that there is no conflict of interest. There studies was pour for scientific propose. There is no clash of interest between society, Industry and authors of this research article.

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