Current Status of Poultry Coccidiosis in Developing India

ABSTRACT

To overcome nutritional demand of world as well as India in future, poultry sector is best source of animal protein. The broiler production is only the source which fulfills the future demand of food. Many diseases in chicken hamper the production of chicken in organized and unorganized poultry. Chicken coccidiosis and other zoonotic diseases cause pathological impact on growth of the chicken. In spite of the availability of effective drugs and other medicine, coccidiosis is great threat to poultry industry. All over the world seven species of *Eimeria* produces morbidity and mortality, poor weight, and loss of egg production causing huge economic loss to the poultry sector.

Indian poultry majorly affected by coccidia in monsoon season followed by winter and summer. The percentage prevalence of coccidiosis is higher in unorganized poultry than organized. Poor management practices and less care may increase the percentage of diseases among chicks in the early stage of life. *Eimeria tenella* and *Eimeria necatrix* are potential killer species in the poultry coccidiosis.

Keywords: Population; poultry; chicken; coccidiosis; developing India etc.

1. INTRODUCTION

India is on top in the world population among populated nine countries i.e. Nigeria, Democratic Republic of the Congo, Pakistan, Ethiopia, Tanzania, USA, Uganda and Indonesia [1]. To meet this ever growing population food, shelter and clothing become imperative. Only food production determines the existence of human beings, so there is much demand in agriculture and agro based industries. To overcome the nutritional demand of the world as well as India in the future, the poultry sector is the best source of animal protein [2]. Many diseases in chicken hamper the production of chicken in broiler industry. The poultry sector in developing countries mostly suffers from various diseases like avian influenza, Newcastle disease, coccidiosis due to lack of biosecurity and proper vaccination [2]. Mcdonald SC reported that Eimeria infection causes increased pathogen carriage. *E. tenella* increases *Campylobacter jejuni* and *Salmonella enteric Typhimurium* infection load in the intestine of chicken [3,4]. Coccidia and its co infection causes necrotic enteritis by *Clostridium* (Gram positive intestinal bacteria) and necrotic enteritis increases the indirect expenses to poultry owner [5,6]. Coccidia free chicken is one of the challenges in front of poultry owner because omnipresent nature, higher spreading and reproduction ability of coccidia oocysts [7].

Population and growth of poultry in India: India is one of the most ~~amongst the~~ populated country in the world accounting for one ~~-~~ sixth of world's population. According to the united nation (UN) India is estimated to overtake China at the end of April 2023 [1].

Current poultry production status of India: In the era of modern technology, poultry sector in India has taken an abrupt change during last four decades, emerging from conventional to commercial poultry production. According to the ~~s per~~ 20th livestock census, the poultry population of India is 851.81 million, with an egg production of ~~and~~ approximately~~around~~ 129.60 billion. The ~~egg production and~~ per capita availability is estimated to be around 95 eggs annually for the year ~~per annum during~~ 2021-22. India shows 6.19 % positive growth in eggs production in 2021-22 [8].

Table 1. Increased production of eggs (2011 to 2022)

Sr. No.	Year	Egg Production in Billions
1	2011-12	66.45
2	2012-13	69.73
3	2013-14	74.75
4	2014-15	78.48
5	2015-16	82.93
6	2016-17	88.14
7	2017-18	95.22
8	2018-19	103.80
9	2019-20	114.38
10	2020-21	122.05
11	2021-22	129.60

(Source: https://dahd.nic.in/sites/default/filess/ FINALREPORT2023ENGLISH.pdf}

Host range and infection: Though, percentage prevalence of coccidiosis is predominant in birds. But it also reported from platyhelminthes, arthropod, mollusca and all five classes of vertebrates. In the avian group Anseriforms, charadiforms,columbiformes, galliformes and piciformes shows great threat of coccidia [9]. Basically all the species of Eimeria parasitize the epithelial cell of the intestine, colon, rectum colon, rectum, caecum and its associated glands [9] .

Native Chicken Breeds of India: Eighteen native chicken breeds has been recognized and registered in India. *Ankaleshwar, Aseel, Busra,Chittagong, Danki, Daothigir, Ghagus, Harringhata Black, Kadaknath, Kalasthi Kashmir Favorolla, Miri, Nicobari, Punjab Brown, Tellichery,Mewari, Kaunayen, Hansli, Uttara* [10]. All different native wild breed can survive up to three to seven ~~year~~years longer, some backyard chicken may live a decade or more [11]. The life span of commercial broiler bird is 42-43 days. Life span of commercial layer and broiler breeder is 72 weeks and 68 weeks respectively [12]. Some of them under threat of extinction due to various environmental as well as anthropological factors. So, it is responsibility of government to protect and conserve native breed as well as backyard poultry sector in future [10].

Etiology (Life cycle): Outbreak of coccidiosis is species specific and site specific which may either cecal or small intestinal coccidiosis [13]. Multiplication of coccidian oocyst occurs in the intestinal tract causes tissue damage which interrupts the digestion process, blood loss, loss of skin pigmentation and increased susceptibility to other disease [14]. Genus *Eimeria* from sub kingdom Protozoa and phylum Apicomplexa causes coccidiosis in domestic and wild species of chicken and other animals. [15] *Eimeria* recorded from chicken completed their fecal oral life cycle within 5-7 days depending on species. Life cycle starts with ingestion of unsporulated oocyst through oral route [15]. Replication of unsporulated oocyst to sporulated oocyst and formation of sporozoite occurs inside the host's intestine cells. Asexual replication (merogony or schizogony) and sexual reproduction (gametogony) is completed inside the host cell. At the end of cycle number of oocysts are produced which is excreted with faeces and sporulated in environment outside the body of chicken [15].

Current Indian scenario: India ranks 3rd in egg and 5th in chicken meat production. Occurrence of coccidiosis in India is similar to globe one. However, the growth of the poultry sector is greatly affected by coccidian [16]. The growth rate of layer and broiler market is 6 % to 7% and 8% to 10% respectively. 75% egg production from the commercial poultry and 25% from house hold or backyard poultry [16]. Saurabh Sharma et al. [17] from Jammu region found highest prevalence (53.61%) in unorganized (Backyard poultry) as compared to organized (25.55%) in monsoon with *Emirian* species [9]. Percentage may high due to poor management practice. Abiodum Josehph Fatoda et al. 2018 in his update focused on genomic study of diversity of *Eimeria* parasitesbecome imperative for effective vaccine design against coccidiosis. Dwivedi et al. 2020 worked on financial analysis of broiler production unit from J&K [18]. They noted that three group of broiler unit group I below 2000 birds, group II 2001-5000 birds and group III 5001 and above birds. The benefit- cost ratio per farm pet lot observed on highest on group III i.e. 1:52 followed by 1.35 and 1.17 in Group II and group I respectively on sampled farm in Kathua district of Jammu and Kashmir [18]. Coccidia cause great loss due to morbidity and mortality, poor weight,

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and loss of egg production. In spite of the availability of effective drugs and other medicine coccidiosis is great threat to poultry industry [19]. Singh M, Kaur P, Singla LD, Kashyap N, Bal MS (2021) while assessment of risk factor associated with prevalence of gastrointestinal parasites in poultry showed that coccidiosis was the predominant infection among all GIT parasites based on fecal and intestinal tract content analysis [20]. The risk factors associated with the prevalence of GIT parasitic infections were geographical location, deep litter system, broilers, age, crossbred breeds, and monsoon season [20]. Das M [20,21] from subtropical hilly region of Meghalaya recorded the overall prevalence of Eimeria sp. in the backyard poultry was 30.12%. Eight species of *Eimeria* viz. *E. tenella* (24.63%), *E. necatrix* (10.84%), *E. maxima* (0.98%), *E. mitis* (1.48%), *E. brunetti* (1.97%), *E. praecox* (1.48%), *E. mivati* (0.98%) and *E. acervulina* (2.96%) were recorded. Mixed infections were recorded in 54.68% chicken from backyard poultry [21,22]. Biswajit Singh et al. [23] reported overall prevalence of coccidia is 77.9% among 1304 backyard poultry chicken [23]. The most of the coccidia infected backyard poultry chicken shows *Eimeria tenella, Eimeria necatrix* and *Eimeria brunetti*. The highest prevalence was recorded in rainy (95.2%), followed by summer (83.76%) and lowest in winter (44%) [23].

Kalita, A., Kakati, P. and Sarmah, P.C. [24]. rReported successful result of PCR analysis performed in gut tissues of experimentally infected broiler chickens indicated gut tissue as a better option to oocysts for molecular identification of *Eimeria* species from field cases [24].

Present finding also revealed higher incidence of coccidiosis in the farms with flock size of more than 1000 birds [25]. The epidemiological investigation of coccidia in Uttarakhand revealed that prevalence of coccidiosis is maximum (56.25%) in August to September in broiler farm while it is equal33.3% June to November and *Eimeria tenella* was most (66.6%) prevalent followed by *E. necatrix, E. maxima, E. acervulina* [26]. The mortality rates were 3.1% and 4.4% for broilers and layers, respectively in and around Tarai Region of Uttarakhand [26]. Praveen et al. 2021 studied socio economic status and constrains faced by broiler farmers in Uttarakhand state, found that most of farmers choose poultry as their subsidiary occupation [27]. Large sized farm and proper knowledge of poultry business found most profitable. Higher expenditure on feed, day old chick and medicine and daily fluctuation of price were the major problem faced by the poultry owner [27].

B. Chengat Prakashbabu et al. 2017 worked on *Eimeria* genetic diversity among various geographic regions of Northern and Southern parts of India. They noted uneven occurrence of highly pathogenic species *E. tenella and E. necatrix* polymorphism in genetic variation population structure described previously [28]. Poornima Gumasta, et al. [29] worked on post-mortem study of 421 Kadaknath chicken and recorded various microscopic organism which produce great pathological impact in the intestine of Kadaknath chicken in Chhattisgarh he recorded infection of coccidia, helminths, pneumonia etc [29]. ND Hirani et al. (2018) from Agricultural University, Anand, Gujarat, studied comparative efficacy of four commonly used coccidioststh through haematological alteration in experimentally *Eimeria tenella* infected birds [30]. Aarthi S. et al. 2010 molecular prevalence and preponderance of *Eimeria* species among chickens in Tamil Nadu.TA Vijayalingum from Ramnathapuram District of Tamilnadu reported that desi chicken is resistant to coccidiosis, along with breed up gradation, wet deep litter conditions, poor ventilation are main factors in outbreak of coccidia among desi chicken [31]**.** Pooja GM 2021 reported 37.66 % occurrence of Eimeria species in and around Thrissur, Kerala state [32]. The rate of infection is higher in backyard poultry than organised farm. Additionally, the study He reported that *E. tenella* was found to be significantly higher compared to *E. necatrix E. maxima* [32]. S.V. Nikam et al 2012 gives comparative prevalence of chicken coccidiosis among eight district of Marathwada. She reported average 25.40% prevalence of coccidiosis in Marathwada [33,34].

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2. CONCLUSION

All over the world seven species of *Eimeria* produces huge economic loss to the poultry sector. Indian poultry majorly affected by coccidia in monsoon season followed by winter and summer. The percentage prevalence of coccidiosis is higher in unorganized poultry than organized. Poor management practices and less care may increase the percentage of diseases among chicks in the early stage of life.*Eimeria tenella* and *Eimeria necatrix* are potential killer species in the poultry coccidiosis. Genetic diversity also noted by certain researchers which may increases curiosity in genetic biodiversity among coccidia in relation to different geographic

conditions. Recently, many farmers selected poultry (organized or unorganized) as a subsidiary business for economic support as insurance against crop failure due to unevenness in climatic conditions. To uplift the conditions of Indian poultry system, need to percolate scientific knowledge of poultry to the inexperienced poultry owner to avoid loss in poultry.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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