

**STUDIES ON THE MORTALITY PATTERN IN BIRDS
AS AFFECTED BY SPECIES, SEX, AGE AND
MONTHS OF THE YEAR**

By

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B.V.Sc. & A.H. (Hons.)**



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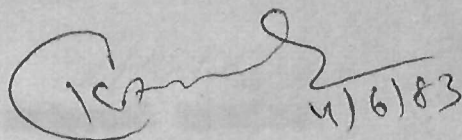
To
my MOTHER,
my 'ultimate' inspiration.

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CERTIFICATE I

This is to certify that this thesis entitled, "Studies on the mortality pattern in birds as affected by species, sex, age and months of the year" submitted for the degree of Master of Veterinary Science in Livestock Production and Management (Poultry Science), is a bonafide research work carried out by Subash Chander Sunaja under my supervision and that no part of this thesis has been submitted for any other degree.

The assistance and help received during the course of investigation have been fully acknowledged.

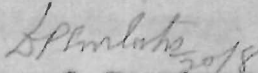


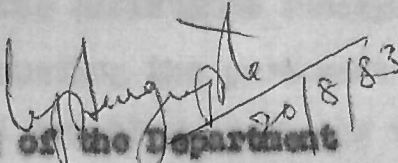
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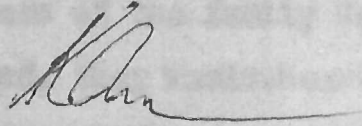
CERTIFICATE II

This is to certify that the thesis entitled, "Studies on the mortality pattern in birds as affected by species, sex, age and months of the year" submitted by Subash Chander Suneja to the Haryana Agricultural University in partial fulfilment of the requirements for the degree of Master of Veterinary Science in Livestock Production and Management (Poultry Science) has been approved by the Student's Advisory Committee after an oral examination on the same, in collaboration with an External Examiner.


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INTRODUCTION

In a country like India where malnutrition is a gigantic problem, poultry meat and eggs which are rich sources of animal protein can put up a challenging fight against this malady. There has been a tremendous development in the field of poultry production in the last one and a half decade, during which value of poultry has increased by 400 per cent to Rs.6,500 million, egg production by 150 per cent to 13,000 million and broiler production by 650 per cent to 30 million (Panda, 1982).

Poultry industry in India has been recognised by Government as well as financial institutions as having enough employment potentials. From a backyard venture this has now been accepted as a full time business by rural as well as educated masses in urban areas. Even the First Five-Year Plan recognised poultry as a vital tool for the socio-economic uplift of a large majority of rural masses (Rao, 1981). Since better and quicker dividends could be obtained from poultry as compared to other sectors of animal husbandry and agriculture, this has had the preferential choice of many to be adopted as a profession in the last few years and has been picking up very rapidly as a consequent thereof. To meet the enhanced demand of chicks, franchise hatcheries came up on a large scale in the country. These hatcheries as

well as Government agencies imported exotic germplasm, alongwith which were imported, though unintentionally, certain diseases, too.

With the concentration and intensification of poultry development programmes, the disease problem has also increased. Many hitherto unknown diseases have emerged in our country, some of which have already been diagnosed and others are in the process of being diagnosed (Mohanthy, 1982).

For profitable poultry farming, adequate knowledge of management, breeding and feeding is of vital importance but this knowledge will be rendered meaningless if proper health cover is not provided to birds. To maintain a flock in ideal state of health and production, and prevent losses due to mortality, knowledge of important diseases and the factors which influence their incidence is indispensable. Accurate and prompt diagnosis of diseases is a key to economically viable poultry keeping. Not commonly realized is the fact that a disease which kills even 10 per cent of the birds cuts off all profits (Anon., 1981).

Since the incidence of diseases is likely to vary in different species, age groups and sexes as well as in different parts of the country in different seasons, this prompted us to undertake studies on the prevalence of

various diseases in different species of birds as affected by age, sex, and season. Such an information will be of great significance while preparing plans for prevention and control of different diseases.

The knowledge of poultry diseases in an area will be of great avail to take measures and advance precautions to minimise and/or even eliminate them by concerted efforts at state, regional and national level (Kothandaraman, 1976).

The present study was therefore, undertaken with the following broad objectives in mind:

1. To study the incidence of various diseases in chicken, duck, turkey and quails maintained at Haryana Agricultural University farm.
2. To find out, if any, the effect of age, sex and season/months of the year on the prevalence of various poultry diseases.

REVIEW OF LITERATURE

Mortality pattern in birds is dependent upon large number of factors. Amongst these age, sex and season are likely to have an appreciable bearing. The interaction of these three factors alongwith the place of occurrence (location) is important to find the incidence of various diseases as well as the pattern of mortality so that requisite preventive measures can be taken at appropriate time.

Mortality pattern by age

Dougherty et al. (1955) found that 55 per cent of the total ducks suffering from Serositis belonged to two to eight weeks of age.

Winter and Funk (1956) reported that with increase in age the growing chicks showed a higher incidence of Coccidiosis and Lymphomatosis whereas the mature chickens were more likely to suffer from Cholera, Fowl typhoid and Pullorum.

Watts and Mac (1958) reported that the greatest single factor causing death in first ten days of life of 30,746 chicks was Omphalitis, which was responsible for 49.7 per cent deaths. The other diseases found during this age were Unabsorbed yolk sac, Pneumonia and Pullorum.

Dougherty and Richard (1963), on the basis of one lakh necropsies in ducks, observed that Amyloidosis was most common in birds over ten weeks of age and Perihepatitis with or without ascites in two to ten weeks of age.

Kosaka and Mimura (1964) reported that Coccidiosis was more common between 50 to 100 days age and Ascariidiasis was mainly found in older birds.

According to Kozic and Petrovic (1966), approximately 20 per cent of the total mortality in the first 16 days of life of turkey poults was due to naval infection.

Lohligler and Schubert (1967) observed that approximately 50 per cent of the total mortality in quails occurred during the first week of life followed by about 16 per cent in the second week. The mortality was significantly low in later life.

Schneider and Hassa (1968) found that Ulcerative enteritis (quail's disease) occurred in fowl chicks 8 to 15 week old. The disease was found to run a chronic course without any mortality.

Aggarwal and Sengupta (1971) studied the mortality at different ages in white Leghorn, Rhode Island Red, Deel and their reciprocal crosses. It was found that the per cent mortality decreased with increase in age in almost all the genetic groups.

Bryant et al. (1973) reported that Ulcerative enteritis

was a major disease problem in concentrated poultry raising areas and comprised of one to nine per cent of all poultry diseases between 4 and 20 weeks of age.

Demoderan and Thanikachalam (1974) studied the occurrence of mortality in different ages in fowls. They found that the mortality rate was 4.6 per cent during first week of life, 73.9 per cent at 1 to 12 weeks, 6.6 per cent at 12 to 20 weeks and 14.91 per cent over 20 weeks of age.

Kaushik (1977) observed an increasing trend of Colibacillosis in 6 to 15 week old birds.

Mohan *et al.* (1978) studied the incidence of chick mortality in four white Leghorn strains and found that maximum mortality occurred between hatching to eight weeks of age. Coccidiosis was found to be the cause of maximum mortality in all the strains.

Reid (1978) reported that outbreaks of Coccidiosis which were common at four to six weeks seldom occurred at less than 11 days of age.

Kralj *et al.* (1979) found that Ulcerative-necrotic enteritis in birds occurred between 11 and 70 days of life and lasted from 1 to 18 days. The mortality due to this condition was 15.2, 7.75 and 3.1 per cent in 1974, 1975 and 1976 respectively.

Pathore and Khara (1979) compiled the data of post-mortem reports from nine different centres all over India.

A total of 2,64,222 birds were included in this study. During first month, Ophthalmitis, Pneumonia and Coccidiosis were the main causes of death followed by Pneumonia, Coccidiosis and Enteritis during second month; Chronic Respiratory Disease, Coccidiosis and Enteritis during third to fifth month and Chronic Respiratory Disease, Salpingo-peritonitis and Lymphoid leucosis over five months of age.

Chandra and Singh (1980) studied the kidney lesions of about 7400 chickens during April, 1978 to March, 1979 and found that these were highest during 13 to 18 weeks of age.

The results of disease investigation in chickens conducted by Chatterjee (1980) revealed that a maximum mortality of 49.65 per cent occurred during 3 to 12 weeks of life. From day old to three weeks of age the mortality was 43.66 per cent. Only 6.69 per cent of the birds died after 12 weeks of age.

Shukla *et al.* (1980) studied the cases of Hemorrhagic syndrome in Nepal. It was revealed that pullets and layers 6 to 12 months of age were mostly the victims of this condition.

Srinivasan *et al.* (1980) carried out a survey of mortality in turkeys at Haryana Agricultural University farm and reported that the prevalence of mortality ranged

between 5.3 to 32.2 per cent during five years (1972 to 1977) period. The maximum mortality was observed during first six weeks of life.

The results of post-mortem examination conducted in the Department of Veterinary Pathology (Anon., 1982) revealed that in chicks below one week of age, Omphalitis was the most important cause of mortality while in birds of one to six weeks of age, Pneumonia, Colibacillosis and Coccidiosis were most common.

Panda and Pradhan (1982) studied the incidence of Marek's Disease, on the basis of necropsy findings in five White Leghorn flocks. They found that birds below eight weeks of age did not show cardinal symptoms of Marek's Disease causing death. The death due to Marek's Disease was found to be highest among birds of 18 to 24 weeks of age.

Mortality pattern by sex

deGruchy (1966) studied the mortality pattern in a flock of 3000 turkeys during one complete rearing season. He found that there were no significant differences with regard to sex in mortality due to Chilling, Coccidiosis, Nephritis and Black head diseases. The incidence of Picked vent and Staphylococcus infection was more in males than in females.

Hensley (1965) conducted a survey of disease outbreaks in broiler chicken flocks. He recorded a comparatively higher incidence of Oedema of lungs, Perosis and Ascites in male chickens.

Purchase and Biggs (1967) reported that females were more susceptible to Marek's Disease than males. The gonads were involved more frequently in females than in males in Rhode Island Red and Brown Leghorn. In Rhode Island Red there was a greater incidence of liver lesions in females than in males.

Jackson et al. (1972) observed that 72 per cent of deaths due to Oedema of lungs, 75 per cent due to Perosis and 70 per cent due to Ascites were recorded in males. In addition males had a significantly higher incidence of Infectious Bronchitis (73 per cent of deaths). They further reported a significantly higher incidence of Marek's Disease in females and debility in males. The latter condition could be attributed to higher incidence of other diseases in males which might lead to debility.

Jagadeesh Babu et al. (1974) reported that mortality due to Marek's Disease and Coccidiosis was higher in male birds of younger age group with a peak at 10 to 15 weeks of age. In the female birds, the Coccidiosis and Marek's Disease reached their peak at 5 to 10 and 10 to 15 weeks, respectively while other diseases were more frequent at 25 to 30 weeks of age.

Jones et al. (1978) in a survey found reproductive disorders, Cellulitis, Cannibalism, Kidney lesions, Liver hemorrhage, Marek's Disease and Staphylococcal synovitis as quite common conditions in females while Staphylococcal synovitis and Acute heart failure in males. The incidence of Staphylococcal synovitis was eight times higher in males as compared to females.

Mortality pattern by season

Hensley (1964) reported that the incidence of respiratory diseases, in general, was lower in summer as compared to winter months.

Hall et al. (1969) analysed the results of diagnosis from forty two laboratories belonging to eleven states of the United States of America. It was observed that Air-sac disease was more prevalent from December to April, Coccidiosis in May and June and Colibacillosis in March and June. The Enteritis was reported to occur all the year round.

Hall et al. (1974) studied the effect of season on various poultry diseases. It was revealed that incidence of Air-sac disease was highest in January to March, Coccidiosis in April to June followed by in July to September and Omphalitis in April to June followed by in January to March. Colibacillosis had almost the same pattern throughout the year.

Chatterjee (1980) presented the results of investigation of disease problem in about 1000 poultry farms in and around

Calcutta. It was found that the prevalence of various diseases in different months of the year was: Ranikhet disease (April, May, June and August), Fowl pox (September), Avian Leucosis Complex (October), Fowl Cholera (October), Pseudomoniasis (January, February, July, August and September), Intestinal Coccidiosis (March to September), Caecal Coccidiosis (March, May and August), Brooder Pneumonia (May, September and October), Sinusitis and Pneumonia (January to December), Hemorrhagic-syndrome (June, July and September), Fatty Liver syndrome (July and August) and Tapeworm infection (July and August).

Hartmann *et al.* (1980) studied the incidence of mortality in three Leghorn lines and their crosses reared in cold and normal environment. The mortality due to Marek's Disease differed in different genotypes only in cold environment which indicated the existence of an interaction between genotype and season.

Thakur *et al.* (1981) observed that Brooder Pneumonia was not very common in summer season. This was more frequently noted in winter affecting mostly the young chicks.

Common diseases causing mortality in birds

Tanner (1948) reported that out of a total of 5087 dead birds examined during the period 1936 to 1947 in Finland, Coccidiosis was the main cause of death (in 887

birds) followed by Fowl paralysis (814), Tuberculosis (763), Salpingo-peritonitis (447), Pullorum disease (357) and Visceral gout (225).

Becker (1954) observed that Coccidiosis and Pullorum disease accounted for well over half the deaths in chicks during 1952-53.

Reis and Nobrega (1955) found that Coccidiosis followed by Helminth infestation, Leucosis-Complex, Spirochaetosis, Fowl Cholera, Coryza, Gout and diseases of reproductive system were commonest causes of death in birds during 1950 to 1953.

Ford (1956) observed Naval infection, Coccidiosis, Gizzard erosion/impaction and Ulcerative enteritis as main causes of death in three turkey flocks.

According to Siegmann (1963), infectious and parasitic diseases along with Leucosis were main causes of death in poultry in West Germany.

In a survey, Jansen and Wemmenhove (1967) noted that *Salmonella* infection, Tuberculosis and Amyloidosis of liver were common diseases found in ducks during 1960 to 1966. Peritonitis-salpingitis was observed in female ducks.

Pastianco (1968) studied the incidence of diseases in laying hens in an intensive unit in Torino during 1966 to 1968. He found that Leucosis, Marek's Disease and Peritonitis caused the greatest number of deaths.

Reports from 12 states in North-Central region in U.S.A. indicated that the most prevalent diseases in poultry

were - Air-sac disease, Aspergillosis, Fowl Cholera, Colibacillosis, Enteritis, Hemorrhagic syndrome, Leucosis Complex, Paratyphoid, Staphylococcus infection, Ascaridiasis and Coccidiosis (McDowell, 1968).

Bryant *et al.* (1968) detected Ascaridiasis, Aspergillosis, Infectious Bursal Disease, Chronic Respiratory Disease, Coccidiosis, Colibacillosis, Enteritis, Leucosis Complex, Omphalitis, Peritonitis and Infectious synovitis as the most common causes of death in poultry in North Eastern region of U.S.A.

In Rhodesia, Huchzermeyer (1972) observed that Coccidiosis and Ulcerative enteritis were two main causes of death in poultry.

McCausland (1972) found that Lymphoproliferative diseases and Internal parasitism were two commonest conditions found in poultry in Northern New Zealand.

Pettit and Top (1973) reported that infections with E. coli, Staphylococci, Escheria and Roundworms as well as diseases affecting respiratory tract were most common in chicken and turkey in Ontario, Canada during the year, 1971. Lymphoid leucosis and Fatty liver syndrome which were found in significant proportion in chicken were not noticed in turkey.

Danodaran and Thanikechalem (1974) found Debility, Yolk sac infection, Coccidiosis, Ascaridiasis, Enteritis, Avian Leucosis Complex and Egg peritonitis as important diseases

in birds in Tamil Nadu.

According to Dexter and Lowndes (1974), the principal diseases recorded in fowl and turkey in Ireland during 1972-73 were - Chronic Respiratory Disease, Pneumonia, Coccidiosis, E. coli infection, Lymphoid Leucosis, Marek's Disease, Internal parasites and Peritonitis.

Gerencer et al. (1974) on the basis of post-mortem examination in North-Eastern USA and Canada reported Ascaridiasis, Aspergillosis, Coccidiosis, Colibacillosis, Ulcerative enteritis, Fatty liver syndrome, Lymphoid leucosis, Marek's Disease, Peritonitis and Respiratory infections as the important diseases of poultry.

Kumar (1974) found Paratyphoid, Hepatitis, Colibacillosis, Coccidiosis, Air-sac disease, Fowl Cholera, Staphylococcus infection, Lymphoid leucosis and Marek's Disease as main causes of death in poultry in North-Central area of U.S.A.

Grimes (1975) stated that Marek's Disease, Leucosis, Prolapse and Cannibalism of vent, Oge-layer fatigue, Fatty-liver syndrome and Reproductive disorders were main findings on post-mortem in birds in two flocks in Australia.

Important diseases causing death in birds in Andhra Pradesh as reported by Ahmed et al. (1975) included Ranikhet Disease, Fowl pox, Fowl Cholera, Salmonella infection, Coryza, Coccidiosis and Parasitic infestation.

Novilla et al. (1975) found Chronic Respiratory

Disease, Colibacillosis, Newcastle Disease, Paratyphoid and Coryza as important diseases in birds in Philippines.

Kothandaraman (1976) studied the incidence of poultry diseases in Tamil Nadu. He found that Ranikhet disease and Fowl pox were prevalent throughout the state. Avian Leucosis Complex, Marek's Disease, Respiratory infections, Coli-septicaemia, Ascaridiasis, Coccidiosis and Cout were other disease conditions commonly encountered in poultry.

Kaira (1978) reported that main diseases observed in poultry during the last eight years in Haryana were - Coccidiosis, Hemorrhagic enteritis, Colibacillosis, Spirochaetosis, Chronic Respiratory Disease, Ranikhet Disease, Marek's Disease, Lymphoid leucosis, Fowl pox, Aspergillosis, Avitaminosis-A, Vitamin B deficiency, Ascaridiasis and Tapeworm infection.

Srinivasan *et al.* (1980) found Pneumonia, Unabsorbed yolk, Enteritis, Air sacculitis, Aspergillosis and Egg peritonitis as main causes of death in turkey at the Haryana Agricultural University farm between 1972 and 1977.

On the basis of post-mortem examinations conducted in the Department of Veterinary Pathology (Anon., 1980), Haryana Agricultural University during 1979-80, the important diseases observed were: Ophthalmitis, Pneumonia, Reproductive disorders, Colibacillosis and Chronic Respiratory Disease in chickens, Hepatitis/Bile duct

hyperplasia/Hepato-cellular-carcinoma, Omphalitis and Aspergillosis in ducks, *E. coli* infection, Omphalitis and/or retained yolk, Aspergillosis, turkey pox and Pneumonia in turkeys and Pneumonia, Enteritis, Omphalitis and Colibacillosis in quails. Almost similar disease pattern was recorded in the year 1980-81. In addition, Coccidiosis was also found to be an important cause of death in chicken. Other conditions showing appreciable impact in chicken, duck, turkey and quails were Heat stroke, Cannibalism, Internal hemorrhage, Fractures, Fatty-liver syndrome, Gout and impaction of crop. In 1981-82, Egg bound condition/ Egg peritonitis in layers claimed a sizeable percentage of mortality in young chicken (Anon., 1982). Other diseases were same as reported in the previous two years.

Panda *et al.* (1982) studied the incidence of diseases in five White Leghorn strains on the basis of necropsy findings over a period of three years at Central Avian Research Institute, Izatnagar. The disease pattern observed included Enteritis, Colibacillosis, Coccidiosis, Omphalitis, Nephritis, Hepatitis, Cannibalism, Unabsorbed yolk, Marek's Disease and Gout as important diseases in poultry.

A further detail of diseases associated with mortality in birds, as recorded by different workers in India and abroad is presented in table 1.

Table 1. Per cent mortality (within parenthesis) due to various diseases in birds.

Author	Diseases in descending order of frequency	Species affected	Place and period
1	2	3	4
deGruchy, 1956	Chilling (24.04), Coccidiosis (17.86), Picked Vent (12.14), Black-head (4.76), Staphylococcus infection (4.26).	Turkey	
Jordan, 1956	Accident and injury (20.0), Chilling (18.0), Tumours (16.5), Caecal Coccidiosis (11.0).	Chicken	Mid-wales (England)
Watts and Ree, 1958	Omphalitis (48.7), Unabsorbed yolk (30.7), Pneumonia (6.0), Uricemia (7.8), Pullorum disease (4.6).	Chicken (upto 10 days only)	England
Schilling, 1963	Helminth infection (12.1), Salpingo- peritonitis (10.1), Leucosis (8.8), Newcastle disease (8.8), Poisoning (8.3), Non- specific enteritis (5.6), Pullorum disease (6.5), Tuberculosis (5.6), Ectoparasites (4.6), Liver diseases (4.3), Marek's Disease (4.1), Visceral gout (1.7), Coccidiosis (1.6), Colligranuloma (1.5).	Chicken	Hanover (1939-1958)
Nosaka and Mimura, 1964.	Parasitic diseases (29.8 - Coccidiosis 53 per cent and Ascaridiosis 33 per cent of these), Enteritis (16.4), Leucosis complex (7.1), Peritonitis (6.1), Cannibalism (5.2).	Chicken	Japan (1956-1961)

Table 1. (Contd.)

1	2	3	4
Pruses, 1964	Coccidiosis (30.0), Faulty nutrition and husbandry (27.0), Pullorum disease (22.5), Fowl paralysis (6.4), Ascariidiasis (3.0), Gout (2.5).	Chicken	Berlin (1953-1962)
Luthgen and Lucas, 1966.	(a) Black head (40.0), Coccidiosis (36.0) (b) Salmonellosis (28.0 ducklings, 3.0 adults), Metabolic disorders (24.0), Histomoniasis (6.0).	Turkey Duck	Frankfurt (1948-1963)
Lobliger and Schubert, 1967.	Reproductive disorder (24.0), Digestive disorders (23.0), Emaciation (20.0), Lymphoid leucosis (8.0).	Quails	
Hall et al., 1969	Leucosis complex (28.51), Coccidiosis (26.73), Helminth infestation (10.45), Enteritis (7.52), Air-sac disease (7.44), Colibacillosis (4.96), Paratyphoid (3.39), Infectious synovitis (3.2), Staphylococcal infection (2.58), Chronic Respiratory Disease (2.46), Ulcerative enteritis (1.36), Aspergillosis (1.03).	Chicken	U.S.A. (1962)
Mostafa et al., 1969	(a) Newcastle disease (27.0), Visceral type of leucosis (19.0), Egg peritonitis and salpingitis, Salmonellosis (12.0), Gout (12.0). (b) Coccidiosis (32.5), Newcastle disease (26.0), Sinusitis (19.0), Infectious Laryngotracheitis (11.0).	Mature fowls Chicks	Boghdad 15 Contd...19.

Table 1. (Contd.)

1	2	3	4
Sivadas et al., 1970	Diseases of respiratory tract and pericardium (15.0), Coccidiosis (14.0), Internal parasites and enteritis (13.3), (a) Intestinal Coccidiosis (14.1), Marek's Disease (12.0), Pneumonia (9.3), Lymphoid leucosis (8.4), E. coli septicaemia (7.5), (b) Pneumonia (22.0), Colic septicaemia (11.0) Impaction of gizzard/bowel (11.0), Aspergillosis and mucormycosis (7.0), Yolk sac infection (6.2), Chronic Respiratory Disease (6.0).	Chicken	Kerala (India) (1967-1969)
Dexter et al., 1972		Chicken	Ireland (1971-1972)
		Turkey	
Jackson et al., 1972	Yolk sac/naval infection (1.21), Oedema of lungs (0.65), Starvation syndrome (0.53), Infectious Bronchitis (0.54).	Chicken	Australia
Hall et al., 1974	Cephalitis (12.15), Air-sac disease (6.29), Colibacillosis (5.9), Ascariasis (5.59), Infectious synovitis (4.76), <u>Sisnhylococcus</u> infection (3.41), Marek's Disease (3.19), Aspergillosis (3.01), Fatty-liver syndrome (2.62), Chronic Respiratory Disease (2.29), Caecal Coccidiosis (2.2), Ulcerative enteritis (2.19), Lymphoid leucosis (1.71), Reproductive disorders (1.36), Intestinal Coccidiosis (1.14).	Chicken	U.S.A. (1973)

Table 1 (Contd.)

1	2	3	4
Deves et al., 1977	a) Cecidiosis (6.9), Air-sacculitis (6.8), Staphylococcal synovitis-arthritis (6.4), Marek's Disease and other tumours (3.5), Newcastle disease (0.2). b) Marek's Disease and other tumours (27.6) Cecidiosis (22.7), Air-sacculitis (15.4), Staphylococcal synovitis-arthritis (2.0), Newcastle disease (0.5). Digestive disorders (25.0), E. coli and Salmonella infection (14.3), Liver diseases (10.3), Parasites (8.5), Respiratory Diseases (7.8), Gout (6.3), Infestations (5.8), Mycosis (6.4). Kidney lesions (20.0), Reproductive disorders (15.0), Cannibalism and other injury (11.0), Marek's Disease (10.6), Obesity, fatty liver and ruptured liver (7.7), Staphylococcal infection (7.0). Staphylococcal synovitis (37.0), Reproductive disorders (24.9), Acute heart failure (14.3), Cellulitis (12.0), Cannibalism (12.0), Kidney lesions (9.8), Liver hemorrhage (7.1), Marek's Disease (4.9). Cecidiosis (26.0), Ascites (10.2), Omphalitis (9.6), Nephrosis (7.2), Enteritis (4.6), Avitaminosis-A (2.7), Pneumonia (2.4), Hepatitis (1.9), Air-sacculitis (1.9).	Belgium (1976)	12
Kronberger and Schuppel, 1977		Belgium (1967)	
Randal et al., 1977		Chicken	
Jones et al., 1978		Chicken	May, 1978 to February, 1977
Mohan et al., 1978		Chicken	India

Contd...22.

Table 1. (Contd.)

1	2	3	4
Rama Rao, 1979	Aflatoxicosis (36.0), Airsacculitis, Pneumonia and Hepatitis (8.0), Intestitis (7.33), Peritonitis (2.0), Emaciation (2.0), Egg peritonitis (1.33), Ascites (1.33).	Ducks	Andhra Pradesh (India), 2.12.74 to 19.10.79
Chatterjee, 1980	Pneumonia and sinusitis (38.45), Coccidiosis (25.16), Aspergillosis (21.76) Haemorrhagic-syndrome (4.09), Ratty-liver syndrome (3.69), Fowl Cholera (1.16), Vitamin deficiency (1.09), Ranikhet disease (0.58).	Chicken	Calcutta, India, 1979
Guarda <u>et al.</u> , 1980	Chronic Respiratory Disease (31.0), Escherichia enteritis (15.0), Coccidiosis (10.0), Coryza (8.5).	Chicken	
Viswanathan <u>et al.</u> , 1980	Debility (35.6), Digestive disorders (29.5), Parasitic infestation (11.7), Cannibalism (7.1), Neoplastic diseases (4.2).	Chicken	India
Ahmed, 1981	NewCastle disease (17.5), Colibacillosis (5.31), Oviduct prolapse (5.1), Spirochaetosis (4.42), Cannibalism (3.26), Heat exhaustion (1.34), Nutritional deficiency (0.42), Lymphoid leucosis (0.16).	Chicken	Lahore (Pakistan)
Madhakar <u>et al.</u> ,	Coccidiosis (22.6), Ranikhet disease (15.73), Colibacillosis (9.59), Miscellaneous causes (6.1), Fowl Cholera (5.6), Tapeworm infection (5.21), Ascaridiasis (3.5), Pox (2.6), Gout (1.9), Coryza (1.8).	Chick	India (1976-1980)

Contd...23.

Table 1. (Contd.)

1	2	3	4
Rheumiah and Rama Rao, 1962		Chicks	India
	(a) Coccidiosis (16.36), Yolk-sac infection (10.61), Catarthal enteritis (6.87), Heat stroke (2.41), Ascites (1.73), Marek's Disease (0.88), Ranikhet disease (0.76).		
	(b) Coccidiosis (19.7), Marek's Disease (10.69), Lymphoid leucosis (9.86), Catarthal enteritis (8.67), Ranikhet disease (6.74), Tapeworm and Roundworm infections (5.87), Caecal Coccidiosis (4.11), Gout (1.14), Heat Stroke (0.61).	Growers	
	(c) Tapeworm and Roundworm infection (16.63), Lymphoid leucosis (7.05), Ranikhet disease (2.38), Coccidiosis (1.68), Catarthal enteritis (1.63), Marek's Disease (1.38), Hemorrhagic enteritis (0.48), Fatty-liver syndrome (0.48), Gout (0.45).	Adult chicken	

Changing pattern of diseases in birds

The incidence of diseases in birds has been changing in the last few years. Some diseases which were dreaded at one time have either disappeared or are encountered at a low key. Advancement in the knowledge of poultry management, development of diagnostic facilities and vaccines against important diseases in birds, awareness of farmers towards diseases, nutrition and environmental changes are probably a few factors due to which this change in the pattern of occurrence of diseases has taken place. The shift from extensive poultry farming and from raising poultry on floor to cage-keeping is reflected by a changing spectrum of diseases (Khram, 1981). A review of few research reports indicating the changing pattern of diseases in birds is summarised in the following pages.

Tanner (1948) conducted a study on poultry mortality in Finland for the period 1936 to 1947. He observed that Pullorum disease occurred only in early years of this period.

Fabey and Crawley (1954) found that in Canada during 1952-53, the incidence of Chronic Respiratory Disease was on an increase.

Neumann (1966) observed a steady decline in the prevalence of Pullorum disease from 1949 to 1963, though this was still the most common disease of poultry.

Leucosis, the second most important disease showed an alarming increase during this period.

According to Gylsterff (1960) the proportion of death from Fowl paralysis, Leucosis and Coccidiosis in fowls was increasing while it was decreasing from Pullorum, Fox, E. coli infection and Tuberculosis in Bavaria during the period 1948 to 1959.

Jansen and Wemmenhove (1960) reported that incidence of Leucosis and tumours showed increase but Tuberculosis, Pericarditis, Coccidiosis, Fox and Coryza had decreased since 1932.

Ayfantis et al. (1961) reported complete absence of Pullorum disease in Greece during 1955 to 1960, but there was a marked increase in Fowl typhoid and Paratyphoid. Avian Leucosis Complex and Chronic Respiratory Disease were also increasing.

Gordon (1961) observed an increase in the number of outbreaks of Newcastle disease in Great Britain from 906 in 1955 to 2301 in 1960. Incidence of Infectious laryngotracheitis and Colisepticaemia was also increasing. But during 1960-1962, Long (1964) reported high incidence of Intestinal Coccidiosis.

Kurjana (1965) noted that Infectious laryngotracheitis was reported only from North Sumatra in Indonesia. The occurrence of Infectious Bronchitis was also rare.

Dorn (1966) found that Newcastle disease which was earlier a sporadic disease was now an endemic one in mild or latent forms throughout West Germany. Infectious Laryngotracheitis was also quite mild and endemic. Acute Fowl Cholera did not exist at all. Cecal Coccidiosis was suppressed to a great extent while Intestinal Coccidiosis had increased. Osteomalacia also increased in the recent past.

According to Devos et al. (1966), the incidence of Fox, Coryza, Salmonellosis and Gumboro disease had increased in Belgium during 1965, while a decline was noted in the occurrence of Fowl Cholera, Staphylococcal infection, Ophthalmitis, Encephalomalacia, Exudative diathesis and Rickets. During 1967, a considerable decrease in the number of deaths due to Helminths diseases was reported (Devos et al., 1968). Further studies (Devos et al., 1970) revealed that locomotory disorders mainly due to Marek's Disease were quite common in 1969. There was no change in the incidence of Chronic Respiratory Disease and Coccidiosis during this period. However, in 1970, a decline in the incidence of Marek's Disease and Coccidiosis was noted (Devos et al., 1971). Intestinal parasitism also decreased while Chronic Respiratory Disease and Avian arthritis increased in this period.

In India, during 1969, Chronic Respiratory Disease was found to be the main problem in birds. Aspergillosis,

Aflatoxicosis and Quail's disease were fairly new to birds in the country (Anon., 1969).

Zurech (1972), on the basis of post-mortem examination of poultry from 1960 to 1969, reported that Newcastle disease did not play an important role in the causation of mortality as also the incidence of Pullorum disease had greatly decreased. Caecal Coccidiosis decreased while Intestinal Coccidiosis, Marek's Disease and Lymphoid leucosis increased during this period.

Pena (1973) observed that in Argentina during 1968 to 1971, there was a drop in the incidence of Coccidiosis, Ascariidiasis and Fowl Cholera whereas a rise was noted in the prevalence of Marek's Disease, Colibacteriosis and Fowl Pox.

Kulasegaram (1975) reported a decline in the distribution of Caecal Coccidiosis in Ceylon in 1963 to 1972 whereas Intestinal Coccidiosis became more frequent. Salmonellosis was more common during 1962 and 1963 but declined thereafter. It reappeared in 1973 and 1974. There were several outbreaks of Marek's Disease in 1974.

Nayak (1976) observed that incidence of Intestinal Coccidiosis in Karnataka (India) was on an increase.

In Gurgaon area of Haryana, Kaushik (1977) found that the incidence of Ranikhet disease had increased during the last two years. Marek's Disease was well under control and sporadic cases of Lymphoid leucosis were noted. It

was noticed that during the last five years, Colibacillosis was increasing while Chronic Respiratory Disease was on decline. Infectious Bronchitis, Infectious Laryngo-tracheitis, Infectious Bursal Disease and Avian Encephalomyelitis were never reported in this region. In 1976, a very high incidence of Goccidiosis was recorded. The occurrence of Spirochaetosis was noticed very rarely.

Shreem (1981) studied the mortality pattern in Swiss poultry industry during the last 15 years and found that Parasitoses became less frequent whereas viral infections increased in number. The incidence of obesity and Fatty-liver syndrome increased in laying hens as also the bone diseases in broilers.

MATERIAL AND METHODS

Different species of birds - namely - chicken, duck, turkey and quails maintained by the departments of Livestock Production and Management, Animal Breeding, Animal Nutrition and Animal Production Physiology, Haryana Agricultural University, Hisar were included in this study. The data were collected on all the birds dying between April, 1982 to March, 1983.

The requisite information with regard to the total strength in each month of a particular age group in the flock from where the bird died was taken from the concerned department. As the number of birds in each age group was not constant throughout the month, because of addition or subtraction on account of age transfer and/or sale, the method of weighted mean was used to calculate the average strength of birds in a particular age group during a particular month. For this purpose, following formula was used:

$$\frac{1}{N} (a_1 d_1 + a_2 d_2 + \dots + a_n d_n)$$

- where, a_1 = initial number of birds at the start of each month
- a_2 to a_n = the number of birds present on different days of the month after addition or subtraction from a_1 .
- d_1 to d_n = the number of days ^{for} which birds numbering from a_1 to a_n remained on the strength of the flock.
- $N = (d_1 + d_2 + \dots + d_n)$ = total number of days of the month for which the birds remained on the strength of the flock.

The age groups were classified into 0-1, 1-6, 6-12, 12-18, 18-24 and above 24 weeks (adults) for chicken, duck and turkey. However, for quail the age groups were 0-1, 1-6 and above 6 weeks (adults).

The data were taken for each month separately from April, 1982 to March, 1983. The information regarding temperature and humidity for these months was obtained from the Department of Agricultural Meteorology, which has been presented in table 2.

The dead birds from all the four departments (mentioned earlier) were subjected to daily post-mortem examination in the department of Veterinary Pathology. The sex of each bird was recorded/confirmed by opening the carcass. The cause of death was established, as far as possible, on the basis of gross changes observed on post-mortem examination. Wherever necessary, the material collected at the time of post-mortem examination was subjected to histopathological and bacteriological examinations for confirmation.

On the basis of these findings, the incidence of various diseases in chicken, duck, turkey and quail was studied with respect to age, sex and season/months of the year.

The data were classified into total strength, number of birds died and per cent mortality by age, sex and season/months for further analysis. Chi-square test was

applied to test the significance, if any, of months, age and sex on per cent mortality. The pair-wise comparisons were made with this test, wherever the expected number was less than five, Chi-square test with Yates correction (Bailey, 1959) was applied.

Table 2. Meteorological data* for the year 1932-33.

Month	Maximum Temperature °C		Minimum Temperature °C		Morning (7.30 AM)		Relative humidity (%) Afternoon (2.30 PM)	
	Range	Average	Range	Average	Range	Average	Range	Average
April, 1932	27.0-37.6	33.5	11.7-22.7	16.9	64-96	82	21-69	36
May, 1932	24.2-43.3	35.6	14.8-24.5	21.2	68-98	82	20-86	44
June, 1932	31.4-43.4	40.0	20.2-30.1	26.6	36-83	62	12-65	28
July, 1932	29.3-42.4	37.7	22.5-29.3	26.7	51-97	75	25-90	46
Aug., 1932	30.0-36.3	34.9	23.0-27.5	25.7	70-97	81	40-85	61
Sept., 1932	33.1-38.7	37.0	17.3-24.4	22.3	67-90	77	15-50	34
Oct., 1932	30.4-35.6	33.6	12.4-21.8	18.1	65-92	75	16-43	38
Nov., 1932	24.0-32.0	28.3	3.7-19.0	11.7	54-83	76	22-51	32
Dec., 1932	12.4-29.3	22.5	2.6-12.3	6.0	67-90	86	24-85	41
Jan., 1933	12.5-22.6	19.8	0.2-13.4	4.8	84-97	93	35-89	40
Feb., 1933	16.3-25.6	20.7	1.8-11.7	6.2	80-97	91	36-85	51
March, 1933	22.0-32.9	27.6	5.0-15.2	11.8	63-86	86	23-73	32

*As recorded by the Department of Agricultural Meteorology, U.S.A., U.S.G.P., U.S.C.R.

RESULTS AND DISCUSSION

This study pertains to the year 1982-83 with respect to the incidence of mortality in different species of birds maintained by the departments of Livestock Production and Management, Animal Breeding, Animal Nutrition and Animal Production Physiology of the College of Animal Sciences, Haryana Agricultural University, Hissar. It was undertaken with a view to find the effect, if any, of age, sex and months/season on the mortality percentage as well as the incidence of various poultry diseases. The poultry carcasses were subjected to post-mortem examination to ascertain the cause of death, as far as possible, on the basis of gross changes. The strength of birds was noted from the records of various departments mentioned above. The total strength and the number of chickens, ducks, turkeys and quails died by months and age have been presented in tables 3 to 6, respectively. However, total losses recorded during the period of study in different age groups of these species of birds are given in table 7. From these tables it is clear that barring a few cases, the total number of observations available in most of the columns of the tables were fairly large, on the basis of which some conclusions could be drawn but where this number was small, the results have been interpreted with caution. Chi-square test of independence was used for making pair-wise comparisons and the results of the same have been presented in the tables of means using superscripts.

Table 3. Total strength and number died (within parentheses) in chickens at HAU farm during April, 1932 to March, 1933.

Months	0-1 week	1-5 week	6-12 week	12-18 week	18-24 weeks		Above 24 weeks (Adults)	
					Male	Female	Male	Female
April	3646 (318)	5406 (134)	948 (30)	1 (1)	6 (0)	27 (0)	33 (0)	127 (4)
May	846 (72)	5718 (168)	5016 (55)	558 (1)	1 (0)	13 (0)	14 (0)	9 (3)
June	38 (0)	1397 (21)	5730 (182)	1678 (27)	-	-	-	8 (0)
July	660 (46)	638 (10)	911 (9)	3106 (25)	124 (5)	592 (25)	716 (30)	8 (0)
August	1020 (94)	1333 (12)	314 (10)	1667 (15)	679 (13)	2231 (44)	2910 (57)	68 (0)
September	-	1349 (31)	-	6 (1)	721 (5)	2175 (18)	2896 (26)	276 (12)
October	369 (42)	939 (7)	494 (23)	-	109 (2)	632 (2)	741 (5)	982 (26)
November	826 (31)	806 (33)	10 (0)	7 (0)	-	-	-	884 (9)
December	1125 (38)	1703 (115)	162 (5)	7 (0)	-	-	-	842 (4)
January	1036 (26)	2328 (48)	1314 (27)	56 (17)	7 (0)	14 (0)	21 (0)	803 (6)
February	408 (2)	997 (13)	1717 (26)	229 (8)	7 (0)	14 (2)	21 (2)	657 (4)
March	1266 (52)	1986 (19)	667 (5)	137 (9)	55 (0)	90 (0)	145 (0)	178 (2)
								1532 (39)
								3421 (52)
								3591 (55)
								3368 (33)
								3082 (30)
								2737 (18)
								1710 (48)

Blank spaces indicate that birds of these age groups for corresponding months were not maintained.

Table 4. Total strength and number died (within parentheses) in ducks at H.M. farm during April, 1932 to March, 1933.

Months	0-1 week		1-6 week		6-13 week		13-18 week		18-24 weeks		Above 24 weeks (Adults)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
April	53 (0)	49 (1)	4 (0)	-	-	-	-	-	40 (3)	63 (6)	100 (9)	
May	51 (11)	212 (6)	31 (6)	-	-	-	-	-	37 (4)	52 (6)	89 (10)	
June	32 (4)	168 (7)	184 (9)	9 (2)	-	-	-	-	32 (2)	47 (7)	79 (8)	
July	-	79 (6)	255 (18)	43 (6)	2 (0)	5 (0)	7 (0)	7 (0)	29 (3)	40 (6)	69 (9)	
August	-	-	145 (0)	50 (2)	2 (0)	5 (0)	7 (0)	7 (0)	17 (0)	27 (4)	44 (4)	
September	-	-	81 (0)	74 (0)	25 (0)	33 (0)	58 (0)	58 (0)	16 (2)	26 (4)	42 (6)	
October	-	-	-	70 (0)	23 (0)	46 (0)	69 (0)	69 (0)	57 (1)	83 (2)	140 (3)	
November	40 (6)	-	-	-	9 (0)	20 (0)	29 (0)	29 (0)	78 (1)	133 (3)	211 (4)	
December	104 (39)	109 (21)	-	-	-	-	-	-	77 (0)	131 (4)	208 (4)	
January	51 (2)	245 (26)	67 (0)	-	-	-	-	-	56 (1)	116 (2)	172 (3)	
February	-	82 (1)	234 (6)	33 (0)	-	-	-	-	19 (0)	91 (1)	110 (1)	
March	-	-	121 (0)	161 (2)	10 (0)	23 (0)	33 (0)	33 (0)	19 (0)	90 (5)	109 (5)	

Blank spaces indicate that birds of these age groups for corresponding months were not maintained.

Table 5. Total strength and number died (within parentheses) in turkeys at H.A. farm during April, 1982 to March, 1983.

Months	0-1 week		1-6 week		6-12 week		12-18 week		18-24 weeks		Above 24 weeks (adults)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
April	178 (53)	276 (89)	106 (5)	172 (1)	18 (0)	23 (0)	41 (0)	26 (0)	232 (2)	260 (2)		
May	42 (19)	236 (111)	166 (3)	173 (0)	49 (1)	76 (1)	125 (2)	20 (2)	207 (0)	227 (2)		
June	-	28 (12)	209 (37)	83 (6)	91 (2)	186 (1)	276 (2)	29 (6)	200 (13)	229 (19)		
July	-	-	66 (9)	154 (0)	62 (0)	127 (1)	189 (1)	45 (1)	256 (2)	301 (3)		
August	-	-	57 (0)	102 (5)	50 (0)	83 (0)	133 (0)	57 (2)	223 (4)	340 (6)		
September	-	-	-	70 (0)	43 (1)	94 (3)	237 (4)	47 (2)	264 (6)	311 (8)		
October	-	-	-	-	29 (0)	72 (0)	101 (0)	47 (1)	294 (5)	341 (6)		
November	53 (16)	-	-	-	4 (0)	9 (0)	13 (0)	51 (4)	351 (2)	402 (6)		
December	121 (41)	90 (24)	-	-	-	-	-	43 (0)	340 (3)	383 (3)		
January	207 (91)	312 (100)	55 (5)	-	-	-	-	37 (0)	329 (1)	366 (1)		
February	70 (20)	417 (124)	237 (11)	26 (0)	-	-	-	35 (0)	326 (0)	361 (0)		
March	72 (6)	205 (60)	369 (12)	118 (1)	-	-	-	31 (0)	323 (3)	354 (3)		

Blank spaces indicate that birds of these age groups for corresponding months were not maintained.

Table 6. Total strength and number died (within parenthesis) in quails at HAU farm during April, 1982 to March, 1983.

Months	0-1 week	1-6 week	Above 6 weeks (Adults)		
			Male	Female	Total
April	384 (155)	384 (23)	451 (6)	719 (13)	1170 (19)
May	447 (77)	902 (176)	335 (5)	803 (2)	838 (7)
June	367 (132)	451 (92)	413 (20)	767 (36)	1180 (56)
July	263 (38)	261 (80)	475 (106)	969 (140)	1444 (246)
August	-	223 (0)	372 (19)	844 (30)	1216 (49)
September	-	-	373 (20)	855 (51)	1228 (71)
October	487 (260)	601 (130)	220 (20)	577 (46)	797 (66)
November	188 (147)	851 (136)	206 (1)	492 (21)	698 (22)
December	146 (17)	250 (26)	450 (5)	777 (20)	1227 (25)
January	617 (186)	482 (60)	538 (8)	927 (21)	1465 (39)
February	-	993 (204)	457 (1)	843 (15)	1300 (16)
March	-	360 (10)	683 (4)	1126 (23)	1869 (37)

Blank spaces indicate that birds of these age groups for corresponding months were not maintained.

Table 7. Total number of chicken, duck, turkey and quails died during the year 1982-83.

Age group	Chicken	Duck	Turkey	Quail
0-1 week	722	71	246	1011
1-6 week	611	68	529	937
6-12 week	372	39	82	:
12-18 week	104	12	13	:
<u>18-24 week</u>				:
Male	29	0	4	:
Female	91	0	6	:
Total	120	0	10	:
<u>*Adults</u>				:
Male	72	17	18	215
Female	344	50	41	439
Total	416	67	59	643
Total	2344	267	939	2591
				<u>6131</u>

*Above 24 weeks in chicken, duck and turkey and 6 weeks in quails.

I. Effect of Months/Season, Age and Sex on per cent Mortality

(a) Effect of rearing month/season on per cent mortality Chicken

The per cent mortality observed in chickens during different months of the year has been presented in table 8.

During the brooding period, the ranking of mortality in 0 to 1, 1 to 6 and 6 to 12 week age groups for various months of the year was not similar. The mortality during 0 to 1 week ranged from 0 to 11.38 per cent, the highest being in the month of October, followed by about 7 to 9 per cent during April, May, July and August and below 4 per cent from November to March and June. The differences in the mortality for the months of April, May, July and August were not significant. Similarly no significant differences were observed in per cent mortality during November to January. The results gave some indication that mortality was high in hot months of April, May, July and August with the exception of June, where the number of observations were only 38, and low in cold or mild weather from November to March.

The mortality during 1 to 6 weeks of age ranged between 0.75 to 6.75 per cent. The highest mortality (6.75%) was observed in the month of December followed by 4.09 per cent in November. In January, April, May and September, the per cent mortality was about 2 to 3

Table 8. Per cent mortality in chickens during different months of the year 1982-83.

Months	Age (weeks)					
	0-1	1-6	6-12	12-18	18-24	Above 24 (adult)
April	bc ^d 8.72	abcd 2.47	cd ^{am} 3.16	-	abcd 0.0	efgh 2.03
May	cd ^l 8.62	ab 2.93	ghik 1.09	f 0.17	abcd 0.0	bcdef 3.07
June	ijklm 0.0	efgh 1.51	bc ^{dj} 3.17	d 1.60		a 6.91
July	d ^l 6.96	defghi 1.56	hik 0.98	ef 0.80	a 4.18	ab 4.76
August	abcd ^l 9.21	hi 0.90	abcd ^j 4.67	def 0.89	b 1.95	fghi ^j 1.98
September	-	bcdefg 2.29	-	abc 16.66	cd 0.89	def 2.43
October	ab ^{cm} 11.38	i 0.75	abcd ^j 4.75	-	d 0.67	hi ^j 1.52
November	efg ^j 3.75	j 4.09	ijklm 0.0	abcdef 0.0	-	ghi ^j 1.53
December	fg ^j 3.37	k 6.75	def ^l 3.08	abcdef 0.9	-	jk 0.97
January	g ^j 2.50	defg 2.06	ef ^l 2.05	a 30.35	abcd 0.0	ijk 0.97
February	hi 0.49	ghi 1.30	fghik 1.51	c 3.49	a 9.82	k 0.65
March	efk 4.09	fghi 1.47	ik 0.74	bc 6.56	bcd 0.0	odef 2.45

Figures having a superscript in common don't differ significantly at 5% level of probability (within a column), as tested by Chi-square test of independence.

Blank spaces indicate that birds of these age groups in the corresponding months were not maintained.

per cent whereas in the remaining months it ranged between 1 and 1.5 per cent.

During 6 to 12 weeks of age the highest mortality (4.75%) was observed in October followed by 4.67 per cent in August. During January, April, June and December, it was about 3 per cent. The other months showed a reasonably low mortality percentage.

There was no definite trend to indicate that the mortality was affected by environmental temperature and humidity prevalent during the period of brooding. Since during this period, the birds are raised under controlled environment and the temperature of the brooder is adjusted according to the need of heat by the chicks, the seasonal influence is likely to have less effect on mortality as compared to certain extraneous factors like failure of electricity, huddling of chicks, drowning in water and vices like cannibalism. However, very extreme weather conditions, where control of brooding temperature is not possible, can be expected to have an appreciable bearing on the mortality in chicks. Because, the factors mentioned above differed in different months, the ranking of mortality was also found to be different. From this it can be inferred that during brooding period mortality occurs as a result of an interaction between such extraneous factors and the environmental temperature, which is prevalent during the months, in which brooding is done.

During 12 to 18 weeks of age, the highest mortality (30.36%) was observed in January followed by 16.66 per cent in September. The number of observations during these months were 56 and 6 respectively, which are not sufficient to arrive at a definite conclusion. However, in January, the average minimum temperature was also very low (4.8°C). Therefore these figures of per cent mortality should be considered with caution. Amongst rest of the months, mortality was higher in March (6.56%) and February (3.49%), which can be attributed to relatively low temperature (11.5°C and 6.2°C , respectively) observed during these months (table 2). In other months, the mortality was less than 2 per cent which, in most of the cases, was non-significant on a statistical scale.

The highest per cent mortality during 18 to 24 weeks of age was observed in the month of February (9.52%), but the result cannot be relied upon because of small number (21) of observations. During the months of July and August, the mortality was 4.18 and 1.95 per cent, respectively compared to less than one per cent in other month. This may possibly be because of higher environmental temperature ^{and humidity} than needed by pullets and cockrels.

In adult birds, the minimum mortality was observed during October to February. After this the mortality started increasing, reaching maximum in June (6.91%).

The per cent mortality in July and May was 4.76 and 3.07, respectively. From this it appears that mortality in adult birds is higher in hot months as compared to other months of the year.

On the basis of foregoing discussion, it could be concluded that upto 12 weeks of age, under controlled brooding system, the cause of mortality can be attributed to many extraneous factors in addition to the environmental temperature. During 12 to 18 weeks of age, higher per cent mortality was recorded in February and March. The general trend, however, was that after 12 weeks, per cent mortality was higher in summer than in other months of the year.

Duck

The data for per cent mortality in ducks during different months of the year 1982-83 have been presented in table B.

Below one week of age, highest mortality (37.60%) was observed in the month of December. This differed significantly from per cent mortality observed during all other months. No significant differences were observed in the months of April, May, June and November with regard to per cent mortality, which was 16.98, 21.56, 12.50 and 16.0, respectively. In January, a comparatively low per cent mortality (3.92) was recorded.

Table 9. Per cent mortality in ducks during different months of the year 1982-83.

Months	Age (weeks)					
	0-1	1-6	6-12	12-18	18-24	Above 24 (adult)
April	16.98 ^{abc}	2.04 ^{bcd}	0.0 ^{ghij}	-	-	9.00 ^{ef}
May	21.86 ^{abc}	2.97 ^{de}	19.35 ^j	-	-	11.23 ^{cdof}
June	12.50 ^{cd}	4.16 ^{cde}	4.89 ^{abcdi}	22.22 ^{abg}	-	11.39 ^{bcdof}
July	-	7.59 ^{abcd}	7.05 ^{alm}	13.95 ^{abg}	0.0	13.04 ^{abode}
August	-	-	0.0 ^{efg}	4.0 ^{bcdof}	0.0	9.09 ^{def}
September	-	-	0.0 ^{defg}	0.0 ^{def}	0.0	14.28 ^{abode}
October	-	-	-	0.0 ^{ef}	0.0	2.14 ^{ghijk}
November	15.00 ^{bed}	-	-	-	0.0	1.89 ^{ijk}
December	37.50 ^e	19.26 ^f	-	-	-	1.92 ^{hijk}
January	3.92 ^d	10.61 ^{ab}	0.0 ^{bcdofg}	-	-	1.74 ^{jk}
February	-	1.03 ^e	2.56 ^{cdefg}	0.0 ^{fg}	-	0.90 ^k
March	-	-	0.0 ^{fg}	1.24 ^{cdef}	0.0	4.58 ^{fghijk}

Figures having a superscript in common do not differ significantly at 5% level of probability (within a column), as tested by Chi-square test of independence.

Blank spaces indicate that birds of these age groups in the corresponding months were not maintained.

During 1 to 6 weeks of age, higher mortality was observed in the coldest months - December and January, followed by hot-humid months of July and June. In February, April and May, the mortality was quite low (1 to 3%). The high mortality during December and January may be associated with inclement weather, electric failures and certain other unknown factors. In-breeding and adaptability problem of imported ducks under Indian conditions may also be contributory factors towards this high mortality. Rearing of ducks in houses where facilities for generator during brooding are not available could be other reasons of higher mortality in this species compared to chicken, turkey and quail. This indicated that, similar to chicken, the mortality during brooding period was the result of a number of factors and is not wholly dependent upon season.

The per cent mortality in 6 to 12 weeks of age was highest in hot and hot-humid months of May, June and July. In other months, it was quite low. Since ducks require comparatively lesser period of brooding than chickens, because of relatively higher growth rate, the stress of cold should be lesser in this species compared to chicken. The results of present study confirm this observation.

The pattern of mortality during 12 to 18 weeks of age for various months was almost similar to the one recorded for 6 to 12 weeks of age. Highest mortality (22.22%) was

observed in the month of June followed by 13.95 per cent in July and 4 per cent in August. During 18 to 24 weeks of age, no mortality was observed in ducks from July to November and March. In adults, the mortality was higher in summer months as compared to winter months.

From these observations, it can be noticed that a considerably high mortality occurred during brooding period whereas after six weeks, the birds performed better in most of the months except April to September.

Turkey

The per cent mortality observed in turkey during the period of study is presented in table 10.

In poults from 0 to 1 week of age, the per cent mortality was very high ranging from 26.31 per cent in February to 46.23 per cent in May, except in March when it was 8.33 per cent. During 1 to 6 weeks of age, the mortality continued to be high (24.24% in December to 47.03% in May). From general experience, it has been observed that the poults are more susceptible to cold as compared to other species of the birds. Being sluggish, these birds are a little difficult to brood and hence a high mortality could be expected during the brooding period. From the history of the flock, it was gathered that the flock under study had become resistant to most of the antibiotics which had a positive contribution towards

Table 10. Per cent mortality in turkeys during different months of the year 1982-83.

Months	Age (weeks)					
	0-1	1-5	6-12	12-18	18-24	Above 24 (adults)
April	30.81 ^{cde}	32.24 ^{cdef}	4.76 ^{cdefg}	0.58 ^{efg}	0.0 ^a	0.76 ^{hij}
May	45.23 ^{abcd}	47.03 ^a	1.80 ^g	0.0 ^g	1.60 ^a	0.88 ^{efghij}
June	-	42.85 ^{abode}	17.70 ^{ab}	7.22 ^{abc}	1.08 ^a	8.29 ^k
July	-	-	13.63 ^{ab}	0.0 ^{fg}	0.52 ^a	0.99 ^{defghij}
August	-	-	0.0 ^{efg}	4.90 ^{abcd}	0.0 ^a	1.76 ^{abodefgh}
September	-	-	-	0.0 ^{cdefg}	2.01 ^a	2.57 ^{abodefgh}
October	-	-	-	-	0.0 ^a	1.75 ^{bodefgh}
November	30.18 ^{de}	-	-	-	0.0 ^a	1.49 ^{cdefghij}
December	33.88 ^{bode}	24.24 ^f	-	-	-	0.78 ^{ghij}
January	43.96 ^{abcd}	34.93 ^{bode}	9.09 ^{bode}	-	-	0.27 ^{ij}
February	25.31 ^e	29.73 ^{def}	4.64 ^{cdefg}	0.0 ^{bodefg}	-	0.0 ^j
March	8.33 ^f	29.36 ^{ef}	3.30 ^{fg}	0.84 ^{cdefg}	-	0.84 ^{fghij}

Figures having a superscript in common do not differ significantly at 5% level of probability (within a column), as tested by Chi-square test of independence.

Blank spaces indicate that birds of these age groups in the corresponding months were not maintained.

occurrence of heavy mortality. It was hard to conclude the superiority of a particular month over the other with respect to survivability of the birds.

The per cent mortality, during different months ranged from 0 to 18 per cent in 6 to 12 week age group. The mortality was higher in the months of June, July and January compared to that in February, March, April and May. In 12 to 18 weeks of age, the highest mortality was observed in the month of June as in the preceding age-group. In the month of August, it was 4.9 per cent whereas in all other months, mortality remained below one per cent.

No significant effect of months was observed during 18 to 24 weeks of age on per cent mortality which ranged between 0 and 2.91 per cent. In adults, the highest mortality (8.29%) was recorded again in the month of June, which was significantly different from per cent mortality in all other months.

Although it is difficult to attribute the environmental conditions prevailing in a particular month as the cause of mortality in turkeys, yet it appeared that during brooding period, extra care is needed if the flock is to be commercially exploited. After 12 weeks of age, the mortality was higher in the month of June as compared to other months which may be due to the fact that highest environmental temperature of the year was recorded in this month (table 1).

Quail

The per cent mortality in quails for different months of the year 1982-83 has been reported in table 11. It ranged from 11.64 to 78.19 per cent during 0 to 1 week of age. The differences for mortality in various months were highly significant. The high mortality percentage during this period could be due to huddling and crushing of birds by pen-mates after electric failures or disturbances, which resulted in heavy mortality figures on single days. It may be of interest to note that during the month of November and April when per cent mortality was as high as 78.19 and 54.57 respectively, as many as 62 and 53 chicks of 0 to 1 week age died on a single day.

During 1 to 6 weeks of age, the mortality ranged between 0 to 30 per cent. A high mortality percentage was observed in July (30.65), October (21.63), February (20.54), June (19.95) and May (19.51). After six weeks, the mortality was higher during the period from June to October. This gave an indication that high temperature in quail houses results in high mortality and hence is undesirable.

(b) Effect of age on per cent mortality

The per cent mortality observed in different age groups of chicken, duck, turkey and quail has been presented in table 12. Chi-square test was employed to see the effect of age on mortality and the results have been shown in the same table using superscripts.

Table 11. Per cent mortality in quails during different months of the year 1982-83.

Months	Age (weeks)		
	0-1	1-6	Above 6 (adults)
April	54.57 ^{ab}	3.98 ^e	1.02 ^{ghi}
May	17.22 ^{cd}	19.51 ^c	0.83 ⁱ
June	49.43 ^b	19.95 ^{bc}	4.74 ^{abc}
July	14.44 ^{cd}	30.65 ^g	17.03 ^j
August	-	0.0 ^h	4.02 ^{bc}
September	-	-	5.73 ^a
October	53.38 ^{ab}	21.63 ^{abc}	8.28 ^k
November	78.29 ^a	15.98 ^d	3.15 ^{cdef}
December	11.64 ^d	7.42 ^e	2.03 ^{efgh}
January	29.98 ^f	13.27 ^d	1.97 ^{fgh}
February	-	20.54 ^{abc}	1.23 ^{hi}
March	-	2.77 ^f	2.04 ^{defgh}

Figures having a superscript in common do not differ significantly at 5% level of probability (within a column), as tested by Chi-square test of independence.

Blank spaces indicate that birds of these age groups in the corresponding months were not maintained.

42238

636.508

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Table 12. Per cent mortality by age in chicken, duck, turkey and quail for the year 1982-83.

Age group	Chicken	Duck	Turkey	Quail
0-1 week	6.42 ^c	21.45 ^c	32.97 ^a	37.45 ^a
1-6 week	2.55 ^d	7.20 ^d	33.63 ^a	16.05 ^b
6-12 week	2.16 ^c	3.47 ^{ab}	6.51 ^d	:
12-18 week	1.39 ^b	2.72 ^b	1.44 ^{bc}	:
18-24 week	1.60 ^{ab}	0.0 ^c	0.98 ^c	:
Adult*	1.77 ^a	4.87 ^{ab}	1.52 ^{bc}	4.47 ^c

Figures having a superscript in common do not differ significantly at 5% level of probability (within a column), as tested by Chi-square test of independence.

*Above 24 weeks in chicken, duck and turkey and above 6 weeks in quail.

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A definite pattern of mortality was observed in almost all the species. The per cent mortality declined with increase in age in all the species. Similar results have been reported by Aggarwal and Sapra (1971).

In chickens, the per cent mortality during 0 to 1, 1 to 6 and 6 to 12 weeks of age differed significantly with each other as well as with other age groups. Highest per cent mortality (6.42) was noticed in 0 to 1 followed by 2.55 per cent in 1 to 6 weeks of age. This is in conformity with the results of Mohan *et al.* (1978), who reported maximum mortality between hatching to eight weeks of age. No significant differences were observed for per cent mortality between 12 to 18 and 18 to 24 week groups. The adults and 18 to 24 weeks age groups also did not differ significantly in per cent mortality.

In ducks, the mortality percentage in 0 to 1 and 1 to 6 week age groups (21.45 and 7.20) was significantly higher than all other ages. Within these two age groups, the differences were significant on a statistical scale. No mortality was noticed during 18 to 24 weeks of age.

In turkeys, 32.97 and 33.63 per cent mortality was recorded in 0 to 1 and 1 to 6 weeks of age, respectively. This observation is similar to the findings of Srinivasan *et al.* (1980), who observed that maximum mortality in turkeys occurred during first six weeks of life. The per cent mortality in 0 to 1 and 1 to 6 week age groups differed

significantly from all other groups.

In quails, the mortality was 37.46, 16.06 and 4.47 per cent in 0 to 1, 1 to 6 and above 6 weeks (adult) age groups. There were significant differences in per cent mortality among the three age groups. Almost similar results that per cent mortality decreased with increase in age have been reported by Lohlinger and Schubert (1967).

(c) Effect of sex on per cent mortality

The effect of sex above 18 weeks of age in chicken, duck and turkey and 6 weeks of age in quail on per cent mortality was estimated and has been presented in table 13 with the help of superscripts. The sex-wise per cent mortality below these age groups could not be calculated for want of the information regarding total strength of birds by sex (for these ages) and hence could not be presented.

The differences in per cent mortality in males and females of 18 to 24 weeks of age in chicken and turkey were not significant. There was no mortality during this age in ducks.

In adults, no significant differences in mortality were observed in the two sexes of chicken, duck and quail. However, in turkey, mortality in males was significantly higher than that in females. This needs further investigation as the total number of observations in males during the present study was much less as compared to the number of females maintained for breeding.

Table 13. Per cent mortality by sex in chicken, duck, turkey and quail for the year 1982-83.

Age group and sex	Chicken	Duck	Turkey	Quail
18-24 weeks				
Male	1.69 ^a	0.0	1.15 ^a	:
Female	1.21 ^a	0.0	0.89 ^a	:
Adults				
Male	1.49 ^b	3.56 ^b	3.82 ^b	4.32 ^b
Female	1.84 ^b	5.58 ^b	1.20 ^c	4.55 ^b

Figures having a superscript in common do not differ significantly at 5% level of probability (for each age group in each species separately), as tested by Chi-square test of independence.

- * Above 24 weeks in chicken, duck and turkey and above 6 weeks in quails.

II. Effect of Months/Season, Age and Sex on the incidence of various diseases

Chicken

During the period of study from April, 1982 to March, 1983 a total of 2344 chickens of various age groups were subjected to post-mortem examination in order to ascertain the possible cause of death. Out of these, 593 birds were unfit for examination because of putrefactive changes. In the remaining birds, important disease conditions encountered in descending order of frequency were - Pneumonia, Unabsorbed yolk and/or omphalitis, Enteritis, Egg-bound condition, Intestinal Coccidiosis, Debility/Emaciation, Ascariidiasis, Internal haemorrhage/rupture of liver, Heat stroke, Caecal Coccidiosis, Avitaminosis-A, Brooder pneumonia, Lymphoid leucosis, Air-sacculitis and Visceral gout. The detailed occurrence of these diseases in different age groups, sex and months of the year is given in table 14.

The highest mortality in chickens was caused by Pneumonia which was observed throughout the year in birds of all age groups. However, maximum number of deaths (206) was noticed in 1 to 6 weeks of age. These findings simulate with the observations of Rathore and Khora (1979), who have also reported pneumonia to be the most important cause of death during second month of life. Almost similar findings have been reported by the department of Veterinary Pathology, Haryana Agricultural University (Anon., 1982). A comparatively

Table 14. Number of chickens died due to various diseases by age, sex and months
(April, 1962 to March, 1963).

Age (weeks)		Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
Pneumonia (23,993)															
0-1	M	26	9	-	-	-	1	-	10	0	15	4	0	0	65/147
	F	23	20	-	-	-	1	-	17	2	11	5	1	2	83
1-6	M	16	14	2	1	1	-	4	1	7	35	13	3	2	98/206
	F	15	39	2	1	1	-	0	1	5	29	8	6	2	108
6-12	M	5	3	6	-	-	-	-	3	-	-	3	2	1	23/31
	F	0	2	4	-	-	-	-	0	-	-	1	1	0	5
12-18	M	-	1	-	0	0	-	0	-	-	-	-	-	-	1/3
	F	-	0	-	1	1	-	1	-	-	-	-	-	-	2
18-24	M	-	-	-	1	1	1	2	1	-	-	-	-	-	5/11
	F	-	-	-	1	1	2	2	1	-	-	-	-	-	6
Above 24	M	0	0	-	-	-	-	3	8	0	0	2	-	1	14/22
	F	0	1	-	-	-	-	0	1	1	1	2	-	2	8
Total	M	47	27	8	2	2	2	9	23	7	50	22	5	4	206/430
	F	33	62	6	3	3	3	3	20	3	41	16	8	6	214
= (20.24) (21.19) (3.33) (1.19) (1.19) (2.86) (10.24) (3.57) (21.67) (9.05) (3.09) (2.38)															
Unabsorbed yolk and/or oviductitis (21,474)															
0-1	M	63	10	-	21	4	-	-	4	16	2	7	-	20	162/339
	F	117	12	-	19	2	-	-	5	3	2	1	-	26	187
1-6	M	6	1	-	3	2	-	-	3	0	3	-	-	3	21/37
	F	3	0	-	0	0	-	-	0	2	3	-	-	3	16
Total	M	74	11	-	24	6	-	-	7	16	5	7	-	23	173
	F	120	12	-	19	2	-	-	5	5	5	1	-	34	203/373
= (51.6) (6.11) (11.44) (2.13) (3.19) (5.58) (2.66) (2.13) (15.16)															

Table 14 (Contd.)

Age (weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
<u>Enteritis (10,055)</u>														
0-1	M	1	-	-	-	0	-	2	3	2	-	-	-	8
	F	0	-	-	-	3	-	4	4	3	-	-	-	14
1-6	M	6	2	1	0	-	2	1	2	8	4	-	0	26
	F	3	1	0	-	-	0	0	1	3	2	-	2	13
6-12	M	4	3	1	1	-	-	3	-	-	6	1	0	19
	F	3	5	3	0	-	-	1	-	-	7	2	1	22
12-18	M	0	-	-	0	-	-	-	-	-	2	1	1	4
	F	1	-	-	1	-	-	-	-	-	6	1	3	12
18-24	M	-	-	-	-	1	0	1	-	-	-	-	-	3
	F	-	-	-	-	2	1	0	-	-	-	-	-	3
Above 24	M	2	0	-	0	0	0	6	0	0	1	1	1	11
	F	4	1	-	1	1	5	4	4	6	6	4	7	43
Total	M	13	5	2	1	1	2	13	5	10	13	3	2	70
	F	11	7	3	2	6	6	9	9	12	21	7	13	103
* (13.64) (6.52) (2.94) (1.7) (3.92) (4.55) (12.5) (7.95) (12.5) (19.32) (6.68) (8.52)														
<u>Res-bound condition (8,284)</u>														
12-24	F	-	-	-	5	14	7	1	-	-	-	-	-	27
Above 24	F	5	12	18	17	1	4	8	20	7	6	5	15	118
Total	F	5	12	18	22	15	11	9	20	7	6	5	15	145
* (3.45) (8.28) (12.41) (15.17) (10.34) (7.59) (6.21) (13.79) (4.83) (4.14) (3.45) (10.34)														

Table 14 (Contd.)

Age (weeks)		Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
<u>Intestinal coccidiosis (7,945)</u>															
1-6	H	-	-	1	-	-	-	-	-	-	4	2	-	-	7 11
	F	-	-	0	-	-	-	-	-	-	4	0	-	-	4 11
6-12	H	-	-	2	36	2	1	-	10	-	4	6	5	-	66 107
	F	-	-	1	27	1	2	-	4	-	1	3	2	-	41 107
12-18	H	-	-	-	0	0	-	-	-	-	-	4	3	-	7 14
	F	-	-	-	1	1	-	-	-	-	-	2	3	-	7 14
18-24	H	-	-	-	-	-	-	-	-	-	-	-	0	-	0 2
	F	-	-	-	-	-	-	-	-	-	-	-	2	-	2 2
Above 24	H	-	-	1	-	-	-	-	-	-	-	0	0	-	1 5
	F	-	-	0	-	-	-	-	-	-	-	2	2	-	4 5
Total	H	-	-	4	36	2	1	-	10	-	8	12	8	-	81 139
	F	-	-	1	28	2	2	-	4	-	5	7	9	-	58 139
* (3.8) (46.04) (2.33) (2.16) (10.07) (9.36) (13.67) (12.29)															
<u>Caecal coccidiosis (1,495)</u>															
1-6	H	1	1	6	-	-	-	-	-	-	1	1	1	-	10 15
	F	2	2	0	-	-	-	-	-	-	1	0	2	-	5 15
6-12	H	-	-	0	1	-	-	-	1	-	-	-	1	0	3 11
	F	-	-	2	2	-	-	-	0	-	-	-	3	1	8 11
Total	H	1	1	6	1	-	-	-	1	-	1	1	2	0	13 26
	F	2	2	2	2	-	-	-	0	-	1	0	5	1	13 26
* (11.53) (30.76) (11.53) (7.69) (3.85) (26.22) (3.85)															

Age (weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
<u>Rehilly/Amagiation (4,932)</u>														
0-1	M	-	2	-	1	-	-	-	-	-	-	-	1	4
	F	-	0	-	0	-	-	-	-	-	-	-	1	1
1-6	M	0	5	2	-	-	1	-	-	1	-	-	-	9
	F	1	7	0	-	-	0	-	-	0	-	-	-	8
6-12	M	-	3	9	-	0	-	-	-	-	-	-	1	13
	F	-	1	7	-	1	-	-	-	-	-	-	0	9
12-18	M	-	-	3	1	2	-	-	-	-	-	-	0	6
	F	-	-	0	2	3	-	-	-	-	-	-	2	7
18-24	M	-	-	-	0	-	-	-	-	-	-	-	-	0
	F	-	-	-	1	-	-	-	-	-	-	-	-	1
Above 24	M	0	0	0	0	-	2	4	2	1	0	1	-	10
	F	1	1	1	1	-	0	1	1	1	1	0	-	8
Total	M	0	16	14	2	2	3	4	2	1	1	1	2	47
	F	2	9	8	4	4	0	1	1	1	1	0	3	34
<u>Brooder mortality (1,145)</u>														
0-1	M	-	0	-	-	-	-	-	-	-	-	-	-	0
	F	-	1	-	-	-	-	-	-	-	-	-	-	1
1-6	M	6	4	1	-	-	0	1	1	1	-	-	-	14
	F	1	3	0	-	-	1	0	0	0	-	-	-	5
Total	M	6	4	1	-	-	0	1	1	1	-	-	-	14
	F	1	4	0	-	-	1	0	0	0	-	-	-	6
<u>Brooder mortality (1,145)</u>														
0-1	M	-	0	-	-	-	-	-	-	-	-	-	-	0
	F	-	1	-	-	-	-	-	-	-	-	-	-	1
1-6	M	6	4	1	-	-	0	1	1	1	-	-	-	14
	F	1	3	0	-	-	1	0	0	0	-	-	-	5
Total	M	6	4	1	-	-	0	1	1	1	-	-	-	14
	F	1	4	0	-	-	1	0	0	0	-	-	-	6

Table 14 (Contd.)

Age (weeks)		April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
Accidents (4.115)														
1-6	M	-	-	2	-	-	-	-	-	-	-	-	-	2
	F	-	-	1	-	-	-	-	-	-	-	-	-	1
6-12	M	-	4	8	2	-	-	-	-	-	-	-	-	14
	F	-	0	5	0	-	-	-	-	-	-	-	-	5
12-18	M	-	-	1	1	0	-	-	-	-	-	-	0	2
	F	-	-	1	1	1	-	-	-	-	-	-	1	4
18-24	M	-	-	-	1	-	1	-	-	-	-	-	-	2
	F	-	-	-	1	-	0	-	-	-	-	-	-	1
Above 24	M	-	0	0	-	-	1	1	1	2	1	-	-	6
	F	-	7	25	-	-	0	1	0	2	0	-	-	35
Total	M	-	4	11	4	0	2	1	1	2	1	-	0	26
	F	-	7	32	2	1	0	1	0	2	0	-	1	46
- (15.28) (59.72) (8.39) (1.39) (2.78) (2.78) (1.39) (5.55) (1.39)														
Accidents (3.175)														
6-12	M	-	0	-	-	2	-	-	-	-	-	-	-	2
	F	-	1	-	-	0	-	-	-	-	-	-	-	1
12-18	M	-	-	-	-	-	-	-	-	-	-	-	1	1
	F	-	-	-	-	-	-	-	-	-	-	-	0	0
18-24	M	-	-	-	0	1	-	-	-	-	-	-	-	1
	F	-	-	-	2	0	-	-	-	-	-	-	-	2
Above 24	M	-	-	-	0	-	-	-	3	1	1	-	0	5
	F	-	-	-	1	-	-	-	3	2	0	-	6	12
Total	M	-	0	-	0	3	-	-	3	1	1	-	1	9
	F	-	1	-	3	0	-	-	3	2	0	-	6	16
- (4.17) (12.5) (12.5) (25.0) (12.5) (4.17) (99.16)														

Table 14 (Contd.)

Age (weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
Internal Hemorrhage/rupture of liver (2.22)														
C-1	M	1	-	-	-	-	-	-	-	1	-	-	-	2
	F	2	-	-	-	-	-	-	-	1	-	-	-	3
1-6	M	1	2	-	-	-	-	-	-	1	1	-	-	5
	F	0	2	-	-	-	-	-	-	0	0	-	-	2
6-12	M	-	0	-	1	-	-	-	-	-	-	0	-	1
	F	-	1	-	0	-	-	-	-	-	-	1	-	2
12-18	M	-	-	-	-	0	-	-	-	-	-	-	-	0
	F	-	-	-	-	1	-	-	-	-	-	-	-	1
18-24	M	-	-	-	-	0	-	-	-	-	-	-	-	0
	F	-	-	-	-	1	-	-	-	-	-	-	-	1
Above 24	M	0	1	0	0	0	0	0	0	0	0	-	-	1
	F	1	0	3	2	1	5	3	2	3	2	-	-	23
Total	M	2	3	0	1	0	0	0	0	3	1	0	-	9
	F	3	3	3	2	3	5	3	2	4	2	1	-	40
* (12.5) (15.0) (7.5) (7.5) (12.5) (7.5) (5.0) (15.0) (7.5) (3.5)														
Lowfield leucosis (0.22)														
18-24	M	-	-	-	-	0	-	-	-	-	-	-	-	0
	F	-	-	-	-	3	-	-	-	-	-	-	-	3
Above 24	M	0	-	-	-	-	1	1	-	0	0	1	0	3
Total	M	0	0	0	0	0	1	1	-	0	0	1	0	3
	F	1	-	-	-	3	2	0	-	1	1	0	1	13
* (3.33)														

Contd...62

Table 14 (Contd.)

Age (years)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
Heat stroke (2,172)														
1-6	M	-	-	-	-	3	-	-	-	-	-	-	-	3
	F	-	-	-	-	0	-	-	-	-	-	-	-	0
6-12	M	-	-	0	-	-	-	-	-	-	-	-	-	0
	F	-	-	2	-	-	-	-	-	-	-	-	-	2
12-18	M	-	-	0	3	-	-	-	-	-	-	-	-	3
	F	-	-	3	2	-	-	-	-	-	-	-	-	5
18-24	M	-	-	-	2	5	-	-	-	-	-	-	-	7
	F	-	-	-	4	10	-	-	-	-	-	-	-	14
Above 24	M	-	-	-	0	0	1	-	-	-	-	-	-	1
	F	-	-	-	1	1	1	-	-	-	-	-	-	3
Total	M	-	-	0	5	8	1	-	-	-	-	-	-	14
	F	-	-	5	7	11	1	-	-	-	-	-	-	24
* (19.16) (31.68) (50.0) (5.26)														
Air-sampling (0.575)														
1-6	M	-	2	-	-	-	4	-	-	-	-	-	-	6
	F	-	0	-	-	-	3	-	-	-	-	-	-	3
6-12	M	-	-	-	-	-	-	-	-	0	-	-	-	0
	F	-	-	-	-	-	-	-	-	1	-	-	-	1
Total	M	-	2	-	-	-	4	-	-	0	-	-	-	6
	F	-	0	-	-	-	3	-	-	1	-	-	-	4
* (20.0) (70.0) (10.0)														

Contd...63

Table 14 (Contd.)

Age (weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
<u>Visceral leish (0.57%)</u>														
1-6	M	-	-	-	-	-	-	-	-	-	1	-	-	1
	F	-	-	-	-	-	-	-	-	-	0	-	-	0
6-12	M	-	-	1	-	-	-	-	-	-	-	-	-	1
	F	-	-	0	-	-	-	-	-	-	-	-	-	0
13-24	M	-	-	-	-	-	1	-	-	-	-	-	-	1
	F	-	-	-	-	-	0	-	-	-	-	-	-	0
Above 24	M	-	-	-	-	-	-	3	-	-	1	-	-	4
	F	-	-	-	-	-	-	1	-	-	2	-	-	3
Total	M	-	-	1	-	-	1	3	-	-	2	-	-	7
	F	-	-	0	-	-	0	1	-	-	2	-	-	3
											(40.0)			

M= Male, F=Female

*Figures within parentheses denote per cent deaths in each month due to the disease under reference.

higher incidence of pneumonia was observed in the months of April, May, December and January. This may be attributed to the extreme environmental conditions, which are said to be pre-disposing factors for respiratory infections. Amongst 420 birds which died of this condition, 206 were males and 214 females. One hundred and twenty three of these cases died due to chilling, in which the lesions observed were congestion of lungs, retained yolk and empty crop. In addition, ten young chicks (9 of 1 to 6 and 1 of 6 to 12 weeks of age) showed air-sac infection and 20 chicks (19 of 1 to 6 and 1 of 6 to 1 weeks of age) had lesions of Brooder pneumonia, the majority (15) being in the month of April and May. The common occurrence of Brooder pneumonia in the month of May has also been recorded by Chatterjee (1980). However, Thakur (1981) has reported that cases of Brooder pneumonia were more common in winter than in summer.

Unabsorbed yolk and/or omphalitis was observed mainly in birds of 0 to 1 week of age. In this age group, a total of 722 birds died during the year (Table 7), out of which 339 (46.95%) died due to this condition. Watts and Rao (1958) have reported 48.7 per cent deaths due to this condition in first ten days of life, which is in concurrence with our findings. Damodaran and Thanikachalam (1974) have also reported unabsorbed yolk as one of the major causes of death in chicken in Tamil Nadu. Rathore

and Khara (1979) compiled the data of post-mortem reports from nine different centres all over India. They have also reported omphalitis to be the major cause of death in birds below one month of age. The highest number (194) of these cases was observed in the month of April which is in accordance with the findings of Hall *et al.* (1974), who observed a high incidence of omphalitis in the month of April in Southern states of U.S.A. Although the environmental condition of the two places may not be identical, the results were quite similar.

Coccidiosis was another major cause of mortality. Both caecal as well as intestinal forms of this disease were noticed during the course of present study but the prevalence of intestinal coccidiosis was more as compared to caecal coccidiosis. This observation goes in confirmation with the findings of other workers (Kulasagaram, 1976; Nayak, 1976). Among 139 birds that died of this condition, the disease was comparatively more prevalent in males (81) than in females (58). Jagadeesh Babu *et al.* (1974) have also reported a higher incidence of this disease in males. Although the intestinal coccidiosis was noticed in all ages except 0 to 1 week age group, highest incidence (107) was recorded in 6 to 12 week old chicks. Hosaka and Mimura (1964) have also reported that the condition is more prevalent in 50 to 100 days of age. Caecal coccidiosis was mainly observed in the month of May while intestinal

coccidiosis in June. An optimum temperature and humidity (in the poultry house) is required for the growth of coccidia. This might have been the reason of its common occurrence in these months. Similar findings have also been recorded by Hall *et al.* (1969; 1974).

Mortality due to enteritis was observed in 176 birds (70 males and 106 females) which constituted 19.05% of the total losses. According to Panda *et al.* (1982) who carried out a survey of necropsy findings for a period of three years at the Central Avian Research Institute, Izatnagar, enteritis was found to be one of the common causes of mortality in birds. The condition was prevalent throughout the year affecting all age groups. The occurrence of enteritis all the year round has been reported by Hall *et al.* (1969). In 38 birds the lesions of enteritis were of haemorrhagic nature while in 19 birds, pneumonic lesions in addition to enteritis were recorded.

Among the various round worm infections in chicken, Ascariidiasis is not commonly associated with decreased egg production, reduced body weight and mortality. During the period under report, a total of 72 birds (26 males and 46 females) were found to have moderate to heavy infestation with *Ascaridia galli*. Though the cases were observed in almost all age groups, the prevalence was comparatively more in female adult birds. This may be due to the fact

that number of adult females kept at the farm was much higher than that of adult males. Hosaka and Mimura (1964) have also recorded the common occurrence of this condition in older birds. More than 50 per cent of the deaths due to Ascariidiasis were detected in the month of June. This may be attributed to optimum conditions of temperature and humidity (in the poultry house), which help in the development of eggs to infective stage.

Internal haemorrhage/rupture of liver was the cause of death in 40 birds. Majority (23) of these cases were found in adults, although its occurrence was noticed in all age groups. Rupture of liver in young chicks may be as a result of trampling by the pen-mates while in adults, high energy diet and stress of laying have been attributed to predispose the birds to this conditions (Pekham, 1978). This may hold true in the present study as 22 of the 23 cases in adults were observed in females.

It has been observed that birds cannot withstand high environmental temperature. Because of lack of sweat glands, their only means of cooling off is by rapid respiration with mouth open, wings relaxed and hanging loosely at their sides (Pekham, 1978). High temperature and humidity predispose the birds to heat stroke. During this study, 38 birds were found to have lesions of heat stroke, and all these cases were detected between June and September.

Emaciation/debility was found to be the only post-mortem change in 81 birds (47 males and 34 females), the majority of the birds (40) being between 6 to 18 weeks of age. Maximum deaths due to debility were noticed in the month of May/ and June. It is a well known fact that total feed consumption is reduced with the rise in environmental temperature. The higher incidence of this condition in the growing period may be the result of reduced feed intake leading to poor weight gain and ultimately the death. Besides these 24 birds (9 males and 15 females) above 6 weeks of age were found to have lesions suggestive of vitamin A deficiency, which plays an important role in the development of resistance in birds. Visceral form of gout was noticed in 10 birds (7 males and three females).

Egg bound is the term used to describe the condition in which an egg is lodged in the cloaca but cannot be laid. Contact of the egg contents with peritoneum may lead to peritonitis. Young pullets laying an unusually large egg are more prone to this condition (Pekham, 1978). During the present investigation, 145 cases of egg bound/egg peritonitis were detected in birds above 18 weeks of age and were distributed throughout the year. A high incidence of egg bound condition was earlier recorded by the department of Veterinary Pathology during 1981-82 (Anon., 1982).

Isolated cases of Lymphoid leucosis were observed during post-mortem examination of 12 birds. This was not found to be

an important cause of mortality in chickens as reported earlier by Schilling (1963), Hall *et al.* (1968), Dexter *et al.* (1973) and Jagadeesh Babu *et al.* (1974). Majority of the cases were observed in adults and none in birds below 18 weeks of age. The disease is said to be rare in chicken under 14 weeks of age and the incidence is usually highest at about sexual maturity (Calnek, 1975).

There were 119 birds (47 males and 72 females) that died due to certain miscellaneous conditions. These conditions have been tabulated according to age, and sex in table 15. A rare case of traumatic hepatitis was recorded in a male chick of 1 to 6 week age group. The condition of the carcass was found to be poor and emaciated on post-mortem examination. About one inch long nail was found piercing through the wall of gizzard into the left lobe of the liver (Fig.1). The liver parenchyma at the point of penetration of nail was disrupted and necrotic.

Examination of 43 birds, (12 males and 31 females) did not reveal any specific lesions, so no diagnosis could be made in these cases.

Duck

Two hundred and fifty seven ducks died during the course of present study. Of these, 87 were putrified and as such unfit for examination. Among the rest, most common disease conditions observed in descending order of frequency were - Pneumonia, Unabsorbed yolk and/or encephalitis,

Table 15. Number of chickens died due to various miscellaneous conditions by age and sex during the year 1932-33.

Disease/condition	Age in weeks and sex												Total
	0-1		1-4		5-12		12-18		18-24		Above 24		
	M	F	M	F	M	F	M	F	M	F	M	F	
Vent Block	3	0	2	2	0	1	-	-	-	-	-	-	5 3
Eaten by predator/ external injury	1	4	7	3	3	11	4	0	0	1	2	11	17 30
Cannibalism	-	-	2	1	2	1	1	0	-	-	-	-	5 2
Hepatitis	-	-	0	1	3	0	-	-	-	-	1	1	4 2
Muscular hemorrhage	-	-	1	0	-	-	-	-	-	-	-	-	1 0
Fibrinous pericarditis	-	-	5	5	-	-	1	0	-	-	3	0	0 5
Hematoza	-	-	0	1	1	0	-	-	0	1	-	-	1 2
Paralysis	-	-	-	-	0	1	-	-	-	-	-	-	0 1
Leg fracture	0	1	-	-	-	-	-	-	-	-	0	6	0 7
Prolapse of cloaca	-	-	-	-	-	-	0	1	0	1	0	2	0 4
Peritonitis	-	-	0	1	-	-	0	1	-	-	-	-	0 2
Tapeworm infection	-	-	-	-	-	-	-	-	-	-	0	1	0 1
Traumatic hepatitis	-	-	1	0	-	-	-	-	-	-	-	-	1 0 ²⁰
Salpingitis	-	-	-	-	-	-	-	-	-	-	0	1	0 1
Traumatic gastritis	-	-	-	-	-	1	0	-	-	-	-	-	1 0

Contd...71



Fig.1. Traumatic hepatitis in a chick. The needle is penetrating the liver parenchyma.

Hepato-cellular-carcinoma, Hepatitis, Enteritis, Debility/ emaciation and Egg bound condition. The distribution of these cases according to age, sex and months of the year is given in table 16.

Pneumonia was found to cause maximum deaths in ducks. Sixty five birds (25 males and 40 females) died due to this condition, the prevalence being comparatively more in the colder months of December and January. The ducklings upto six weeks of age were found to be the principal victims of this condition. Thirty eight birds showed lesions of chilling in this age. Retention of yolk alongwith congestion in lungs was noticed in these cases. Four birds showed changes of Brooder pneumonia and one of air-sacculitis. The incidence of pneumonia appeared to be high in ducks when compared with the observations of Rama Rao (1979), who reported Pneumonia, air-sacculitis and neoplasms in eight per cent of the cases in Andhra Pradesh. This may be because of the fact that the climatic and managemental conditions are not identical at these two places.

Unabsorbed yolk and/or omphalitis was the second important condition which accounted for the death of 30 ducklings (17 male and 13 females). More than 90 per cent ducklings were of 0 to 1 week of age and the condition was noticed only in those months when new batches of ducklings were added to the flock. The occurrence was most common

Table 16. Number of ducks died due to various diseases by age, sex and months
(April, 1982 to March, 1983).

Age (weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
<u>Pneumonia (32-345)</u>														
0-1	M	-	-	-	-	-	-	-	1	8	1	-	-	10 33
	F	-	-	-	-	-	-	-	0	23	0	-	-	23
1-6	M	0	0	-	1	-	-	-	-	4	6	0	-	11 26
	F	1	1	-	1	-	-	-	-	5	5	1	-	14
6-12	M	-	2	0	-	-	-	-	-	-	-	-	-	2 3
	F	-	0	1	-	-	-	-	-	-	-	-	-	1
Above 24	M	-	1	-	0	-	-	1	-	-	-	-	-	2 4
	F	-	1	-	1	-	-	0	-	-	-	-	-	2
Total	M	0	3	0	1	0	0	1	1	12	7	0	-	25 55
	F	1 (1.54)	2 (7.33)	1 (1.54)	2 (4.62)	-	-	0 (1.54)	0 (1.54)	28 (61.63)	5 (18.46)	1 (1.54)	-	40
<u>Unabsorbed yolk and/or embryonitis (17-361)</u>														
0-1	M	5	6	0	-	-	-	-	2	2	-	-	-	16 27
	F	3	3	1	-	-	-	-	3	2	-	-	-	12
1-6	M	-	-	1	1	-	-	-	-	-	-	-	-	2 2
	F	-	-	0	0	-	-	-	-	-	-	-	-	0
Total	M	5	6	1	1	-	-	-	2	2	-	-	-	17 29
	F	3 (37.53)	3 (31.03)	1 (16.3)	0 (2.45)	-	-	-	3 (17.24)	2 (13.79)	-	-	-	12 22
<u>Egg-bound condition (0-591)</u>														
Above 24	F	-	-	-	-	-	-	-	-	1 (399.0)	-	-	-	1 1

Table 10 (Contd.)

Age	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
Enteritis (7,362)														
0-1	M	-	-	-	-	-	-	-	-	1	-	-	-	1
	F	-	-	-	-	-	-	-	-	0	-	-	-	0
1-6	M	-	-	-	-	-	-	-	-	1	2	-	-	4
	F	-	-	-	-	-	-	-	-	3	-	-	-	3
6-12	M	-	-	-	-	-	-	-	-	-	-	-	-	0
	F	-	-	-	-	-	-	-	-	-	-	1	-	1
Above 24	M	-	-	-	-	-	-	0	-	-	-	-	-	0
	F	-	-	-	-	-	-	1	-	-	-	-	-	1
Total	M	-	-	-	-	-	-	0	-	2	3	0	-	5
	F	-	-	-	-	-	-	1	-	3	2	1	-	7
• (5.33) (41.67) (41.67) (5.33)														
Remittent/Exacerbation (4,122)														
0-1	M	-	-	-	-	-	-	-	-	1	-	-	-	1
	F	-	-	-	-	-	-	-	-	0	-	-	-	0
1-6	M	-	-	-	-	-	-	-	-	-	0	-	-	0
	F	-	-	-	-	-	-	-	-	1	-	-	-	1
6-12	M	-	-	-	0	-	-	-	-	-	-	-	-	0
	F	-	-	-	2	-	-	-	-	-	-	-	-	2
12-18	M	-	-	-	-	-	-	-	-	-	-	-	-	0
	F	-	-	-	-	-	-	-	-	-	-	-	-	0
Above 24	M	-	-	-	0	-	-	-	-	-	-	-	-	0
	F	-	-	-	1	-	-	-	-	-	-	-	-	1
Total	M	-	-	-	0	0	-	-	-	1	0	-	0	1
	F	-	-	-	1	2	1	-	-	0	1	-	1	6
• (14.29) (28.57) (14.29) (14.29) (14.29)														
Contd... 75														

Table 16 (Contd.)

Age (weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
<u>Hemato-cellular carcinoma (15,885)</u>														
1-6	M	-	-	-	-	-	-	-	-	0	-	-	-	0
	F	-	-	-	-	-	-	-	-	1	-	-	-	1
6-12	M	-	0	-	-	-	-	-	-	-	-	1	-	1
	F	-	1	-	-	-	-	-	-	-	-	4	-	6
12-18	M	-	-	-	1	-	-	-	-	-	-	-	0	1
	F	-	-	-	0	-	-	-	-	-	-	-	1	1
Above 24	M	1	0	1	0	0	0	0	0	0	-	-	-	2
	F	1	2	2	3	1	2	1	3	1	-	-	-	18
Total	M	1	0	1	1	0	0	0	0	0	-	1	0	4
	F	1	2	2	3	1	2	1	3	2	-	4	1	23
*(7.41)(11.11)(11.11)(14.92)(3.7)(7.41)(3.7)(11.11)(7.41)(18.52)(3.7)														
<u>Hemangioma (8,415)</u>														
1-6	M	-	-	-	-	-	-	-	-	0	-	-	-	0
	F	-	-	-	-	-	-	-	-	1	-	-	-	1
6-12	M	-	-	-	0	-	-	-	-	-	-	-	-	0
	F	-	-	-	1	-	-	-	-	-	-	-	-	1
12-18	M	-	-	-	0	-	-	-	-	-	-	-	-	0
	F	-	-	-	2	-	-	-	-	-	-	-	-	2
Above 24	M	0	-	-	1	-	1	-	-	0	1	0	0	3
	F	2	-	-	0	-	0	-	-	1	2	1	2	8
Total	M	0	-	-	1	-	1	-	-	0	1	0	0	3
	F	2	-	-	3	-	0	-	-	2	2	1	2	13
*(18.75)(25.0)(6.25)(12.5)(18.75)(6.25)(12.5)														

M=Male; F=Female; * Figures in parentheses indicate per cent deaths in each month due to the disease under reference.

in April and May. The common prevalence of this condition has also been recorded by the department of Veterinary Pathology, H.A.U. (Anon., 1980).

Hepato-cellular carcinoma, a tumorous condition in ducks is an important cause of mortality in all areas where ducks are being reared (Rama Rao, 1979; Anon., 1980). It is considered to be caused by mouldy feed containing aflatoxins. In the present study, 27 cases (4 males and 23 females) of Hepato-cellular carcinoma/Aflatoxicosis were observed and 18 of these were adults. No particular season of the occurrence of this condition was noticed as the cases continued to occur throughout the year. In addition 16 birds (3 males and 13 females) showed lesions of hepatitis with no clear cut tumour formation. Twelve of the affected birds were adults. In many of the cases, it was associated with ascites. The occurrence of peri-hepatitis with or without ascites has also been recorded by Dougherty and Richard (1963).

Enteritis was the cause of death in 12 birds (5 males and 7 females) of which two had lesions of haemorrhagic nature. Out of the 12 ducks that died of this condition, 9 were of 1 to 6 weeks of age. Three ducklings had congestion of lungs in addition to the lesions of enteritis. Seven birds (1 male and 6 females) died due to debility/exhaustion. The condition was prevalent in all age groups except in 18 to 24 week old ducks. Only one case of egg

Table 17. Number of ducks died due to various miscellaneous conditions by age and sex during the year 1982-83.

Disease/condition	Age in weeks and sex									
	1-6		6-12		12-24		Above 24		Total	
	M	F	M	F	M	F	M	F	M	F
Cannibalism	-	-	0	1	-	-	0	1	0	2
Fibrous pericarditis	-	-	-	-	0	1	-	-	0	1
Fatty liver syndrome	-	-	-	-	-	-	1	0	1	0
Eaten by predator/ external injury	1	0	-	-	-	-	0	2	1	2
Infectious	-	-	-	-	-	-	0	1	0	1
									2	3

M= Male, F= Female.

bound condition was noticed in an adult female duck. The occurrence of these conditions causing mortality to a level almost similar to that observed in the present study have been reported by Rama Rao (1979). However, the prevalence of debility/emaciation was comparatively more (4.12%) in the present study than that reported by him (2.0%).

There were a few miscellaneous conditions associated with deaths in eight birds (3 males and 5 females) which are shown in table 17. No change of any pathological significance could be detected in five ducks.

Turkey

Post-mortem examination of 939 turkeys was conducted out of which 252 were found to be putrified. Pneumonia, Brooder pneumonia, Unabsorbed yolk and/or encephalitis, Air-sacculitis, Enteritis, Turkey-pox, Debility/emaciation, Visceral gout, Egg bound condition, Avitaminosis-A and Intestinal Coccidiosis were the main disease conditions (in descending order of frequency) encountered in the remaining birds. A detail of these conditions is given in table 18.

Diseases of the respiratory tract (Pneumonia, Brooder pneumonia and Air-sacculitis) constituted 62 per cent of the total losses in turkeys. Pneumonia was observed in 222 birds (102 males and 120 females) out of which 161 were in

Table 18. Number of turkeys died due to various diseases by age, sex and months (April, 1932 to March, 1933).

Age (weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
Passerella (32,321)														
0-1	M	-	-	-	-	-	-	-	-	12	13	-	-	25 52
	F	-	-	-	-	-	-	-	-	9	18	-	-	27 52
1-6	M	4	10	-	-	-	-	-	-	5	22	19	15	75 161
	F	4	9	-	-	-	-	-	-	5	32	23	13	86 161
6-12	M	0	-	-	1	-	-	-	-	-	0	-	0	1 6
	F	1	-	-	0	-	-	-	-	-	1	-	3	5 6
12-18	M	-	-	1	-	-	-	-	-	-	-	-	-	1 1
	F	-	-	0	-	-	-	-	-	-	-	-	-	0 1
Above 24	M	-	-	0	-	-	-	-	-	-	-	-	0	0 2
	F	-	-	1	-	-	-	-	-	-	-	-	1	2 2
Total	M	4	10	1	1	-	-	-	-	17	35	19	15	102 222
	F	5	9	1	0	-	-	-	-	14	51	23	17	120 222
Brooder mortality (20,593)														
0-1	M	2	-	-	-	-	-	-	-	-	3	1	-	6 13
	F	2	-	-	-	-	-	-	-	-	4	1	-	7 13
1-6	M	20	13	2	-	-	-	-	-	0	6	10	3	64 117
	F	23	9	3	-	-	-	-	-	1	0	4	4	53 117
6-12	M	-	-	-	-	-	-	-	-	-	1	4	1	6 8
	F	-	-	-	-	-	-	-	-	-	0	2	0	2 8
Total	M	22	13	2	-	-	-	-	-	0	10	15	4	75 133
	F	25	9	3	-	-	-	-	-	1	13	7	4	82 133
Brooder mortality (15,504)														
Brooder mortality (15,504)														

Table 18 (Contd.)

Age (weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
<u>Unabsorbed yolk and/or omphalitis (17.765)</u>														
0-1	M	15	2	-	-	-	-	-	6	2	14	10	1	50 111
	F	10	7	-	-	-	-	-	10	4	10	7	4	61 111
1-6	M	3	0	-	-	-	-	-	-	-	4	-	-	7 11
	F	3	1	-	-	-	-	-	-	-	0	-	-	4 11
Total	M	18	2	-	-	-	-	-	6	2	18	10	1	57 122
	F	22	8	-	-	-	-	-	10	4	10	7	4	65 122
									(13.11)	(4.92)	(22.95)	(13.93)	(4.1)	
<u>Air-sacculitis (9.615)</u>														
0-1	M	-	-	-	-	-	-	-	-	1	3	-	-	4 6
	F	-	-	-	-	-	-	-	-	0	2	-	-	2 6
1-6	M	-	5	1	-	-	-	-	-	2	0	10	5	23 50
	F	-	3	1	-	-	-	-	-	4	4	3	7	27 50
6-12	M	-	-	2	-	-	-	-	-	-	-	1	1	4 8
	F	-	-	1	-	-	-	-	-	-	-	1	2	4 8
12-18	M	-	-	-	-	1	-	-	-	-	-	-	-	1 1
	F	-	-	-	-	0	-	-	-	-	-	-	-	0 1
Above 24	M	-	-	-	-	-	-	-	-	0	-	-	-	0 1
	F	-	-	-	-	-	-	-	-	1	-	-	-	1 1
Total	M	-	6	3	-	1	-	-	-	3	3	11	6	32 56
	F	-	-	-	-	0	-	-	-	-	-	-	-	24 56
														(15.12) (15.64) (22.73) (22.72)

Contd...31

Table 18 (Contd.)

Age (weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
Enteritis (5.24)														
0-1	M	-	-	-	-	-	-	-	-	1	-	-	-	1
	F	-	-	-	-	-	-	-	-	1	-	-	-	1
1-6	M	-	-	-	-	-	-	-	-	2	2	1	0	5
	F	-	-	-	-	-	-	-	-	1	2	5	3	11
6-12	M	-	-	-	-	-	-	-	-	-	3	1	1	5
	F	-	-	-	-	-	-	-	-	-	0	2	2	4
12-18	M	0	-	-	-	0	-	-	-	-	-	-	1	1
	F	1	-	1	-	-	-	-	-	-	-	-	0	2
18-24	M	-	1	-	-	-	-	-	-	-	-	-	-	1
	F	-	0	-	-	-	-	-	-	-	-	-	-	0
Above 24	M	-	-	-	-	-	0	-	2	0	-	-	-	2
	F	-	-	-	-	-	2	-	0	1	-	-	-	3
Total	M	0	1	-	-	0	0	-	2	3	3	2	2	15
	F	1	0	-	-	1	2	-	0	3	2	7	5	21
		*(2.78) (2.78)				(2.78) (5.56)				(5.55) (16.67) (19.44) (25.0) (19.44)				
Turkey Cox (3.93)														
6-12	M	-	-	11	4	-	-	-	-	-	-	-	-	16
	F	-	-	9	2	-	-	-	-	-	-	-	-	11
Above 24	M	-	-	-	-	-	-	1	-	-	-	-	-	1
	F	-	-	-	-	-	-	0	-	-	-	-	-	0
Total	M	-	-	11	4	-	-	1	-	-	-	-	-	16
	F	-	-	9	2	-	-	0	-	-	-	-	-	11
				*(74.08) (22.22)				(3.7)						

Contd...

Table 18 (Contd.)

Age (weeks)		Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
D.M. 11 by Bandwidth (1.992)															
1-6	M	-	-	-	-	-	-	-	-	-	-	-	1	1	2
	F	-	-	-	-	-	-	-	-	-	-	-	0	0	0
6-12	M	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	F	-	-	-	-	-	-	-	-	-	-	-	-	0	0
18-24	M	-	-	-	-	-	-	0	-	-	-	-	-	-	0
	F	-	-	-	-	-	-	2	-	-	-	-	-	-	2
Above 24	M	-	-	0	1	-	-	-	-	-	-	-	-	-	1
	F	-	-	1	0	-	-	-	-	-	-	-	-	-	1
Total	M	-	-	0	1	-	-	0	-	-	-	-	1	2	4
	F	-	-	1	0	-	-	2	-	-	-	-	6	0	9
(7.69) (7.69) (15.38) (53.86) (15.38)															

Visceral count (0.872)															
1-6	M	-	2	-	-	-	-	-	-	-	-	-	-	-	2
	F	-	4	-	-	-	-	-	-	-	-	-	-	-	4
(100.)															
Res-band condition (0.872)															
18-24	F	-	1	-	-	-	-	-	-	-	-	-	-	-	1
	Above 24	F	-	-	2	-	1	-	1	-	-	1	-	-	5
Total	F	-	1	2	-	-	1	-	1	-	-	1	-	-	6
			(16.67) (32.22)				(16.67)		(16.67)			(16.67)			(61.5)

Contd..53

Table 18 (Contd).

Age (Weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
<u>Avitaminosis-A (0.20%)</u>														
Above 24	M	-	-	-	0	0	-	-	-	-	-	-	-	2
	F	-	-	-	1	1	-	-	-	-	-	-	-	2
					(50.0)	(50.0)								
<u>Intestinal spirocherosis (0.14%)</u>														
6-12	M	0	-	-	-	-	-	-	-	-	-	-	-	0
	F	1	-	-	-	-	-	-	-	-	-	-	-	1
		(100.)												

M= Male; F= Female; *Figures within parenthesis denote per cent deaths in each month due to the disease under reference.

1 to 6 week age group. The prevalence of this condition was higher in the months of December to March. In 37 poult, lesions were suggestive of chilling. They had congestion of lungs as well as retained yolk when examined on post-mortem. No case of pneumonia was seen in 18 to 24 week old turkeys. In 138 birds (76 males and 62 females) post-mortem examination revealed nodular lesions, suggestive of Brooder pneumonia, in the lung while in 66 birds (32 males and 34 females), there was no change in the lungs but the air-sacs were either beaded in appearance or contained cheesy exudate. Majority of the birds which died of Brooder pneumonia (117 out of 138) and air-sacculitis (50 out of 66) belonged to 1 to 6 week age group. The overall prevalence of respiratory conditions in turkeys appears to be high as compared to the findings of Dexter *et al.* (1972) and Byrne and Lowndes (1975), who also observed these conditions as an important cause of mortality in turkeys. This difference may possibly be due to the variation in environmental conditions under which the birds were reared. Importance of respiratory conditions in the causation of mortality in turkeys has also been highlighted by Pettit and Top (1973) and Dexter and Lowndes (1974) in their reports.

Unabsorbed yolk and/or cephalitis was found to cause death in 122 poult (57 males and 65 females), out of which

111 were of 0 to 1 week of age. The condition was most commonly prevalent in the months of January and April. Ford (1955) also reported encephalitis as one of the important causes of death in turkeys. According to Kozic and Petrovic (1965), 20 per cent of the total mortality in turkeys below 2 weeks of age was due to encephalitis which is in confirmation with the present observations.

Enteritis was noticed in 36 birds (15 males and 21 females), out of which 16 were in 1 to 6 week age group. In seven of these birds lesions were of haemorrhagic nature. The enteritis was mostly seen in birds which died between December and March. Only one turkey in 6 to 12 week age group was found to have lesions of intestinal coccidiosis in the present study, which shows that coccidiosis was not an important cause of mortality in turkeys. However, a high incidence of mortality due to coccidiosis in turkeys has been reported by Luthgen and Lucas (1966) and Byrne and Lowndes (1975).

Turkey pox, a specific pox disease affecting turkeys was found to be associated with mortality in 27 birds (16 males and 11 females). An outbreak of the disease occurred during the month of June involving turkeys between 6 to 12 weeks of age. The lesions were very severe in many of these birds. Involvement of skin around the eyes with resultant blindness might have been the cause of death in these birds. The occurrence of

Table 19. Number of turkeys died due to various miscellaneous conditions by age and sex during the year 1932-33.

Disease/condition	Age in weeks and sex												Total
	0-1		1-6		6-12		13-24		Above 24		Total		
	M	F	M	F	M	F	M	F	M	F			
Eaten by predator/ external injury	5	1	1	3	-	-	0	1	3	2	9	7	
Cannibalism	-	-	3	3	-	-	-	-	-	-	3	3	
Vent block	1	0	0	1	-	-	-	-	-	-	1	1	
Septicemia	-	-	-	-	1	0	-	-	-	-	1	0	
Peritonitis	-	-	-	-	-	-	-	-	1	3	1	3	
Intestinal obstruction	-	-	0	2	-	-	-	-	-	-	0	2	
Intussusception of intestine	-	-	-	-	-	-	-	-	0	1	0	1	
Brain hemorrhage	-	-	1	0	-	-	-	-	-	-	1	0	
Rupture of liver	-	-	-	-	-	-	-	-	0	1	0	1	
Heart stroke	-	-	-	-	-	-	0	1	-	-	0	1	
Hepatitis	-	-	-	-	0	1	-	-	1	2	1	2	
									17	22	39	56	

M= Male, F= Female.

turkey pox has already been reported by the department of Veterinary Pathology (Anon., 1980). It was interesting to note that the disease made its appearance despite vaccination of the flock with fowl pox vaccine. This shows that the disease in question is caused by turkey pox rather than fowl pox virus, which needs further investigation, so that an effective vaccine could be prepared for the control of this disease using pox strain isolated from turkey.

Debility/emaciation with no other apparent lesions of disease was noticed to be the only pathological change in 13 birds (4 males and 9 females). Eight of these were 1 to 6 week old. Lesions suggestive of avitaminosis-A were noticed in 2 turkeys. Changes of visceral form of gout were observed in 6 turkeys (2 males and 4 females) in 1 to 6 week age group. Egg bound condition was found in 6 birds above 18 weeks of age.

Certain miscellaneous causes were also recorded which were responsible for death in 39 turkeys (17 males and 22 females), the detail of which is given in table 19. In 9 turkeys (3 males and 6 females), no specific lesions of any disease were noticed and hence no diagnosis could be made in them.

Quail

A total of 2501 quails were examined on post-mortem and more than half of these (1321) were found to be unfit for examination due to advanced putrefactive changes.

Among the rest, the most common diseases in descending order of frequency were - Pneumonia, Unabsorbed yolk and/or omphalitis, Enteritis, Egg bound condition, Drowning death, Debility/emaciation, Internal haemorrhage/rupture of liver and Lymphoid leucosis. The detailed distribution of these diseases by age, sex and months of the year is given in table 20.

From this table, it appears that more than one third of the carcasses which were fit for examination had lesions of pneumonia. It was noticed in 485 quails (233 males and 252 females) belonging to all age groups but 1 to 6 week old birds were found to be most susceptible as 280 cases were recorded in this age only. Another 20 cases were associated with drowning. The incidence of pneumonia was high in the months of November and February, which can be attributed to a low environmental temperature.

Unabsorbed yolk and/or omphalitis was observed in 303 chicks (157 males and 146 females), out of which 291 chicks were below one week of age. The condition was most frequent in the month of January.

Lesions of enteritis were observed in 253 quails (122 males and 131 females) out of which 30 had lesions of haemorrhagic nature. Adult birds were comparatively more commonly affected. Though the condition occurred throughout the year, it was most frequently observed in the month of July.

Table 20. Number of quails died due to various diseases by age, sex and months
(April, 1982 to March, 1983).

Age (weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
<u>Pneumonia (32,435)</u>														
0-1	M	6	3	-	-	-	-	5	9	0	13	-	-	35
	F	10	2	-	-	-	-	12	5	1	7	-	-	37
1-5	M	3	14	8	4	4	-	8	24	5	10	55	2	134
	F	2	20	11	1	1	-	5	18	8	9	67	5	146
Above 6	M	2	0	4	39	6	0	6	-	3	3	1	0	64
	F	1	1	3	29	4	3	7	-	7	3	5	9	72
Total	M	11	16	12	43	6	0	19	33	8	26	57	2	233
	F	13	23	14	30	4	3	24	23	16	19	72	14	255
*(4.92) (8.0) (5.23)(14.96) (2.05) (0.61) (8.81)(11.47) (4.82) (9.22)(26.43) (3.18)														
<u>Unabsorbed yolk and/or embryonic (23,381)</u>														
0-1	M	14	5	11	-	-	-	20	35	-	57	-	-	152
	F	40	4	5	-	-	-	13	44	-	33	-	-	139
1-6	M	-	0	-	-	-	-	1	1	-	1	2	-	5
	F	-	2	-	-	-	-	3	0	-	0	2	-	7
Total	M	14	5	11	-	-	-	21	36	-	58	2	-	157
	F	40	6	5	-	-	-	16	44	-	33	2	-	146
*(17.83) (3.63) (5.28) (12.21)(26.4) (33.32) (1.32)														

Table 26 (Contd.)

(Weeks) Sex		April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
<u>Enteroids (19,920)</u>														
0-1	M	-	-	-	-	-	-	-	14	-	-	-	-	14
	F	-	-	-	-	-	-	-	11	-	-	-	-	11
1-6	M	-	-	1	3	-	-	10	14	1	2	4	0	35
	F	-	-	0	0	-	-	12	16	1	5	11	2	47
Above 6	M	0	-	-	35	2	6	5	0	0	2	0	3	53
	F	1	-	-	39	1	9	7	6	6	10	5	9	93
Total	M	0	-	1	38	2	6	29	14	1	4	4	3	108
	F	1	-	0	39	1	9	30	22	7	15	16	11	151
*(0.39)		(0.39) (30.43) (1.19) (5.93) (23.32) (14.23) (3.16) (7.61) (7.91) (5.54)												
<u>Exe-bound condition (4,255)</u>														
Above 6	F	5	-	3	15	4	3	7	4	2	4	3	4	54
*(9.26)		(5.55) (27.78) (7.42) (5.55) (12.56) (7.41) (3.7) (7.41) (5.56) (7.43)												
<u>Drowning death (2,385)</u>														
0-1	M	-	-	-	-	-	-	1	-	-	-	-	-	1
	F	-	-	-	-	-	-	0	-	-	-	-	-	0
1-6	M	-	-	-	16	-	-	2	2	-	-	-	-	19
	F	-	-	-	8	-	-	0	0	-	-	-	-	8
Above 6	M	-	-	-	0	-	-	-	-	-	-	-	-	0
	F	-	-	-	1	-	-	-	-	-	-	-	-	1
Total	M	-	-	-	16	-	-	3	2	-	-	-	-	20
	F	-	-	-	9	-	-	0	0	-	-	-	-	9
*(52.75)		(52.75) (10.34) (6.9)												
														93

Cont'd 4-2-201

Table 20 (Contd.)

Age (weeks)	Sex	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Total
<u>FeM.14 ty/haematocrit (1.345)</u>														
1-6	M	-	-	2	-	-	-	0	1	2	-	-	-	5
	F	-	-	4	-	-	-	1	0	0	-	-	-	5
Above 6	M	-	-	0	1	-	-	0	-	-	1	-	-	2
	F	-	-	1	3	-	-	1	-	-	0	-	-	5
Total	M	-	-	2	1	-	-	0	1	2	1	-	-	7
	F	-	-	5	3	-	-	2	0	0	0	-	-	10
*(41.10) (23.53) (11.76) (5.98) (11.76) (5.98)														
<u>Internal haemorrhage/rupture of liver (0.635)</u>														
Above 6	M	1	-	-	1	0	1	0	-	0	-	-	-	3
	F	0	-	-	0	1	1	1	-	2	-	-	-	5
*(12.5) (12.5) (12.5) (25.0) (12.5) (25.0)														
<u>Leishoid leucosis (0.385)</u>														
Above 6	M	-	-	-	-	-	3	-	0	-	1	-	-	4
	F	-	-	-	-	-	0	-	1	-	0	-	-	1
*(60.0) (20.0) (20.0)														

M= Male; F= Female; *Figures within parentheses indicate per cent deaths in each month due to the disease under reference.

Fifty four adult female quails showed egg bound condition on post-mortem examination. Debility/emaciation was noticed in 17 quails (7 males and 10 females) above 1 week of age. Internal hemorrhage/rupture of liver was noticed in 8 quails, all of whom were adults.

The lesions of Lymphoid leucosis were observed in 5 adult quails (4 males and 1 female). In all three cases, liver was the principal organ involved. In one female adult quail, the affected liver was very much enlarged and had a mottled appearance because of small whitish foci (Fig.2). It occupied majority of the abdominal cavity. Microscopically, the sections from affected liver revealed marked proliferation of lymphoid cells which had replaced the normal hepatic parenchyma (Fig. 3 and 4). The Lymphoid leucosis is said to be of uncommon occurrence in quails and only isolated reports on the incidence of this condition are available. In the present study, the condition was diagnosed on the basis of gross and microscopic changes observed in the liver, which are in confirmation with the observations of Wight (1963). In 60 quails (28 males and 32 females), certain miscellaneous causes of deaths were observed, which are tabulated in table 21. No specific lesions were found in 53 quails (32 males and 21 females), hence no diagnosis could be made in them.



Fig.2. Lymphoid leucosis in a quail;
enlargement and mottling of the liver.

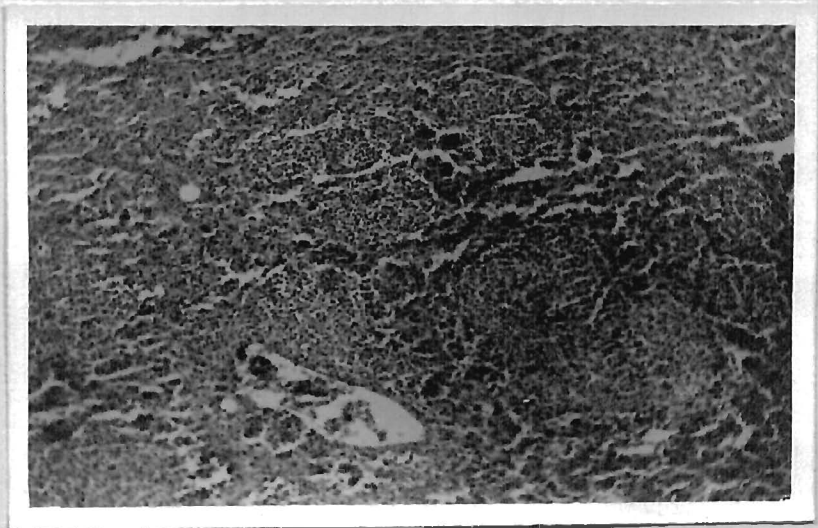


Fig.3. Proliferation of lymphoid cells replacing the hepatic cells in the liver of a quail. H.&E. x 70.

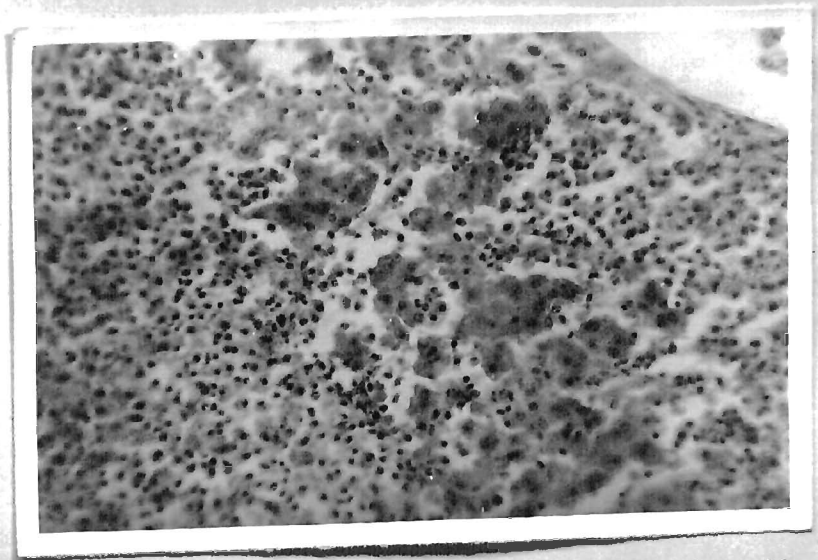


Fig.4. High power magnification of Fig.3 to show the proliferation of lymphoid cells in the liver. H.&E. x 480.

Table 21. Number of quails died due to various miscellaneous conditions by age and sex during the year 1962-63.

Disease/condition	Age in weeks and sex										Total
	0-1		1-6		Above 6						
	M	F	M	F	M	F	M	F	M	F	
Eaten by predator	1	0	10	3	2	3	13				6
Cannibalism	-	-	4	5	2	2	6				7
Prolapse of cloaca	-	-	-	-	0	2	0	2			2
Leg fracture	-	-	1	0	0	3	1				3
Necrosis of liver	-	-	-	-	0	1	0	1			1
Colicsepticemia	-	-	3	5	-	-	3				5
Fatty liver syndrome	-	-	-	-	1	0	1				0
Peritoneal cyst	-	-	-	-	1	0	1				0
Trachea blocked	1	0	-	-	-	-	1				0
Hydropericarditis	-	-	0	1	-	-	0				1
Oophoritis	-	-	-	-	0	2	0				2
Foot injury	-	-	-	-	0	1	0				1
Tumour in lungs	-	-	-	-	0	1	0				1
Hepatitis	-	-	-	-	0	3	0				3
Brooder pneumonia	-	-	-	-	2	0	2				0
							28				32
											60

M= Male; F= Female

Not much information is available on the prevalence of various diseases in quails as quail rearing is not as common as other species of birds particularly chicken. However, an almost similar disease pattern in quails of different age groups, as observed in the present study, has been reported by the department of Veterinary Pathology, H.A.U. (Anon., 1980 and 1982).

Comparative study on the prevalence of certain common diseases among chicken, duck, turkey and quail

The frequency of the occurrence of certain common disease conditions associated with mortality in chicken, duck, turkey and quail has been presented in Fig.5.

Pneumonia was the chief cause of mortality in quails followed by in ducks, turkeys and chickens. Incidence of unabsorbed yolk and/or omphalitis was highest in quails followed by in chickens, turkeys and ducks. Enteritis was the principal cause of death in quails followed by in chicken, ducks and turkeys. Debility/emaciation was responsible for maximum percentage of deaths in chickens, followed by in ducks, turkeys and quails. Egg bound condition was mainly observed in chicken followed by in quails, but it was not an important cause of death in turkeys and ducks. In chickens, it may probably be because of the fact that selection for high egg production is being practiced in this flock

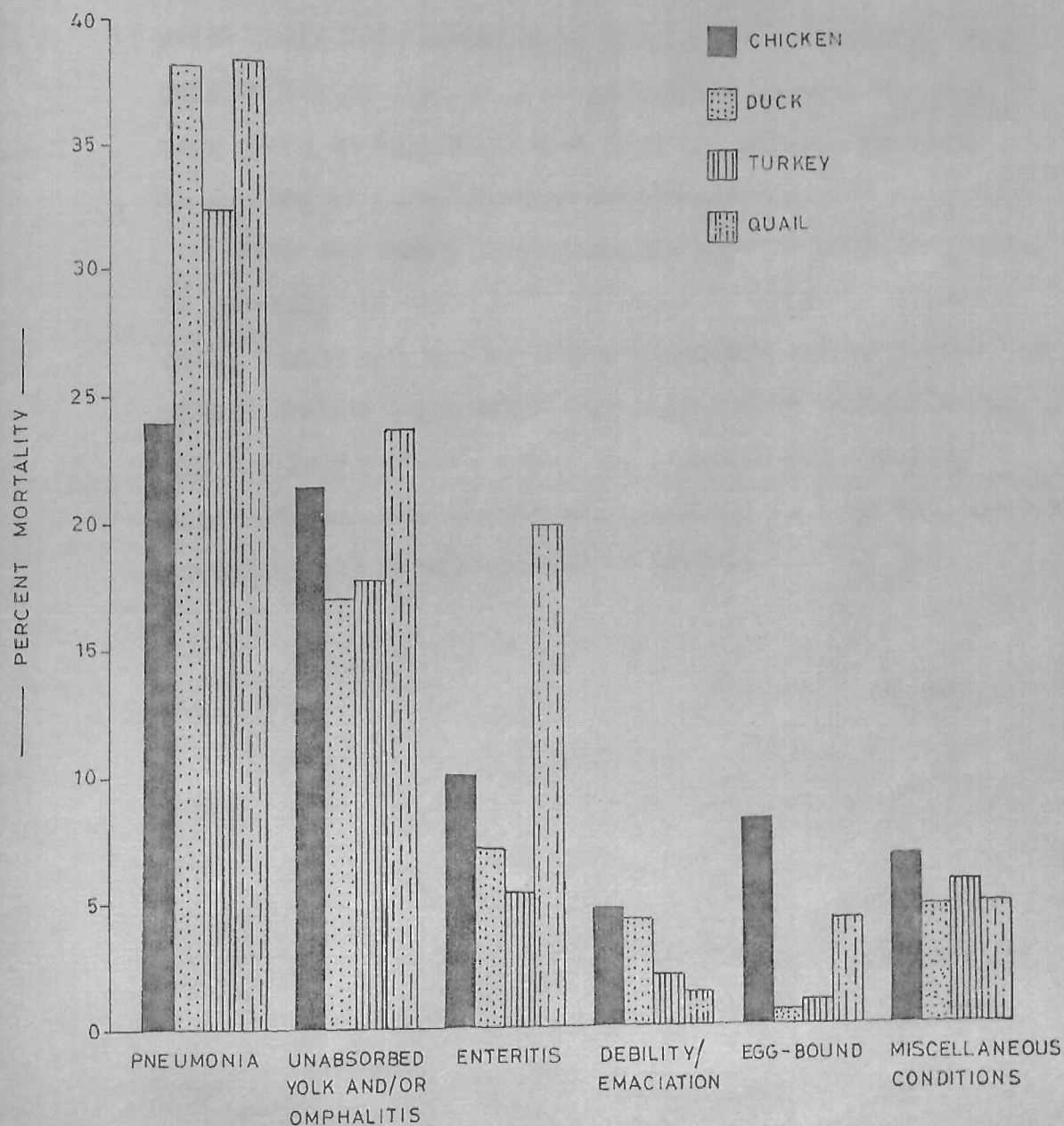


FIG.5 PER CENT MORTALITY DUE TO CERTAIN IMPORTANT DISEASES IN CHICKEN, DUCK, TURKEY AND QUAIL — A COMPARISON

which would have resulted in early sexual maturity. The pullets laying eggs at a comparatively younger age are more prone to this condition (Fekham, 1978). However, in quails, it needs further investigation.

From the above discussion, it appears that pneumonia, in general, was the principal cause of death in chicken, duck, turkey and quail. Other important causes associated with mortality were unabsorbed yolk and/or omphalitis in all the four species; enteritis in quail and chicken; hepato-cellular-carcinoma and hepatitis in duck and Brooder pneumonia and air-sacculitis in turkey.

SUMMARY AND CONCLUSION

A total of 6,131 birds comprising 2,344 chickens, 257 ducks, 939 turkeys and 2,591 quails died at the H.A.U. farm during the period from April, 1982 to March, 1983. These were subjected to post-mortem examination to ascertain the possible cause of death in each case.

Amongst the chicken, duck and quail, maximum deaths were recorded in birds upto one week of age but in turkey the mortality was higher in one to six week age group. More than two third of the total deaths noticed were in these two age groups of birds.

No definite pattern or trend giving an indication of the effect of months on mortality in chicks upto 12 weeks of age was noticed. The mortality in these age groups could not be attributed to the environmental temperature prevalent during the month. Factors other than environmental temperature and an interaction between these two could be responsible for deaths during this period. In birds above 12 weeks of age, per cent mortality, in general, was higher in summer than in winter months.

Since ducks require relatively shorter period of brooding than chickens because of higher growth rate, the stress of cold in this species was lower than that in other species. After six weeks, ducks performed better in most of the months except April to September.

As turkeys poults are comparatively sluggish and more prone to cold, they need a special care during brooding period. After 12 weeks of age, the mortality in turkeys was higher in the month of June as compared to other months.

In adult quails (above six weeks), mortality was high in June to October. No relationship could be established between months and mortality before this age.

The per cent mortality, in general, declined with increase in age in all the species.

There were no significant differences in per cent mortality with respect to sex, which was studied after 12 weeks of age in chicken, duck and turkey and six weeks of age in quail.

Pneumonia was found to be responsible for maximum deaths in all the four species and birds of one to six week age group were the principal victims of this condition. The losses were comparatively high in the months of April, May, December, January and February.

Unabsorbed yolk and/or omphalitis, another important condition, was mostly seen in 0 to 1 week old birds involving all the four species.

Egg-bound condition was an important cause of mortality in chicken and quail while it was not so in duck and turkey.

Prevalence of intestinal coccidiosis was more than that of caecal coccidiosis in chicken. However, it was not found

to be an important cause of death in the remaining three species.

Debility/emaciation was mostly noticed in 6 to 12 weeks of age and comparatively more in summer months.

Pox in turkeys was observed in 6 to 12 week age group despite the flock having a history of vaccination with fowl pox vaccine. Brooder pneumonia and air-sacculitis were the other important causes of mortality in turkeys.

Hepato-cellular carcinoma and hepatitis were found to be the important causes of death in adult ducks, mostly the females, throughout the year.

Isolated cases of lymphoid leucosis were noticed in adult chicken. Five quails were also found to have lesions of this condition, which is said to be of rare occurrence in this species of poultry.

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