

# MORBIDITY PROFILE OF PHULE TRIVENI

by

**Miss. Yedme Gayatri Vilasrao**

Reg. No. 016/110

A Thesis submitted to the  
**MAHATMA PHULE KRISHI VIDYAPEETH,  
RAHURI - 413 722, DIST. AHMEDNAGAR,  
MAHARASHTRA, INDIA**

in partial fulfilment of the requirements for the degree

of

**MASTER OF SCIENCE (AGRICULTURE)**

in

**ANIMAL HUSBANDRY**



**DEPARTMENT OF ANIMAL HUSBANDRY AND DAIRY SCIENCE**

**POST GRADUATE INSTITUTE,  
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RAHURI - 413 722, DIST. AHMEDNAGAR,  
MAHARASHTRA, (INDIA)**

**2018**

## CANDIDATE'S DECLARATION

I hereby declare that this thesis or part  
there of has not been submitted  
by me or other person to any  
other University or Institute  
for a Degree or  
Diploma

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## **CERTIFICATE**

This is to certify that the thesis entitled “**MORBIDITY PROFILE OF PHULE TRIVENI**”, submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra (India), in partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE (AGRICULTURE)** in **ANIMAL HUSBANDRY**, embodies results of piece of bonafide research work carried out by **Miss. YEDME GAYATRI VILASRAO**, under my guidance and supervision and that no part of the thesis has been submitted to any other degree or diploma.

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Place : MPKV, Rahuri

Date :     /     /2018

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Place : MPKV, Rahuri

(G.V. Yedme)

Date : / /2018

## CONTENTS

| Chapter No. | Title  | Page No.  |
|-------------|--|-----------|
|             | CANDIDATE'S DECLARATION                                  | iii       |
|             | CERTIFICATE OF RESEARCH GUIDE                            | iv        |
|             | CERTIFICATE OF HEAD OF DEPARTMENT                        | v         |
|             | CERTIFICATE OF ASSOCIATE DEAN                            | vi        |
|             | ACKNOLWEDGEMENTS   | vii       |
|             | CONTENTS   | viii      |
|             | LIST OF TABLES   | ix        |
|             | LIST OF FIGURES  | ix        |
|             | LIST OF ABBREVIATIONS                                    | x         |
|             | ABSTRACT   | xi        |
| <b>1.</b>   | <b>INTRODUCTION</b>                                      | <b>1</b>  |
| <b>2.</b>   | <b>REVIEW OF LITERATURE</b>                              | <b>4</b>  |
| <b>3.</b>   | <b>MATERIAL AND METHODS</b>                              | <b>12</b> |
|             | 3.1 Source of data                                       | 12        |
|             | 3.2 Collection of data                                   | 14        |
|             | 3.3 Classification of data                               | 14        |
|             | 3.4 Statistical analysis                                 | 15        |
| <b>4.</b>   | <b>RESULTS AND DISCUSSION</b>                            | <b>17</b> |
|             | 4.1 Morbidity in Phule Triveni                           | 17        |
|             | 4.1.1 Disease wise morbidity in Phule Triveni            | 17        |
|             | 4.1.2 Yearwise morbidity rates in Phule Triveni          | 17        |
|             | 4.1.3 Age wise morbidity rates in Phule Triveni          | 19        |
|             | 4.1.4 Sexwise morbidity in Phule Triveni                 | 20        |
|             | 4.1.5 Seasonwise morbidity in Phule Triveni              | 20        |
|             | 4.1.6 Birth weight group wise morbidity in Phule Triveni | 21        |
|             | 4.2. Estimation of clinical efficacy                     | 22        |
|             | 4.2.1. EAMR  | 22        |
|             | 4.2.2. Annual morbidity rates and its clinical efficacy  | 23        |
| <b>5.</b>   | <b>SUMMARY AND CONCLUSIONS</b>                           | <b>24</b> |
|             | 5.1 Morbidity in cattle                                  | 24        |
|             | 5.2 Estimation of clinical efficacy                      | 25        |
|             | 5.3 Conclusion   | 25        |
| <b>6.</b>   | <b>LITERATURE CITED</b>                                  | <b>27</b> |
| <b>7.</b>   | <b>VITAE</b>   | <b>35</b> |

## LIST OF TABLES

| Table No. | Title  | Page |
|-----------|--|------|
| 1.        | Disease wise morbidity rate in Phule Triveni       | 17   |
| 2.        | Yearwise and causeswise morbidity in Phule Triveni | 18a  |
| 3.        | Agewise morbidity in Phule Triveni                 | 19   |
| 4.        | Sexwise morbidity in Phule Triveni                 | 20   |
| 5.        | Seasonwise morbidity in Phule Triveni              | 21   |
| 6.        | Birth weightwise morbidity in Phule Triveni        | 22   |
| 7.        | Causes of morbidity                                | 23   |
| 8.        | Annual morbidity rate and clinical efficacy        | 23a  |

## LIST OF FIGURES

| No. | Title  | Between page |
|-----|--|--------------|
| 1.  | Disease wise morbidity rate in Phule Triveni | 18-19        |
| 2.  | Age wise morbidity                           | 20-21        |
| 3.  | Season wise morbidity                        | 22-23        |
| 4.  | Birth weight wise morbidity                  | 22-23        |

## LIST OF ABBREVIATIONS

|               |   |                                   |
|---------------|---|-----------------------------------|
| CCR           | : | Case Culling Rate                 |
| CFR           | : | Case Fatality Rate                |
| CRR           | : | Case Recovery Rate                |
| EAMR          | : | Equivalent Average Morbidity Rate |
| $E_i$         | : | Expected value                    |
| <i>et al.</i> | : | Et alli (and others)              |
| FAO           | : | Food and Agriculture organization |
| Fig.          | : | Figure                            |
| GDP           | : | Gross Domestic Product            |
| Kg            | : | Kilogram                          |
| M             | : | Meter                             |
| No.           | : | Number                            |
| $O_i$         | : | Observed value                    |
| Viz           | : | Videlicet (Namely)                |
| %             | : | Per cent                          |

## ABSTRACT

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### MORBIDITY PROFILE OF PHULE TRIVENI

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|                       |   |
|-----------------------|---|
| <b>Research Guide</b> | <b>: Dr. S.D. Mandakmale</b>                |
| <b>Department</b>     | <b>: Animal Husbandry and Dairy Science</b> |

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The research entitled, “Morbidity profile of Phule Triveni” was undertaken by utilizing data generated at RCDP on Cattle, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra. The data of 1787 animals were recorded over the period from 2000 to 2016 were utilized for the present study.

The morbidity of animals were recorded at various age groups *viz.*, 0-3, 3-6, 6-12 month and adult group in relation to year, age, sex, season, birth weight and causes of morbidity observed. The significance of various factors under study was tested by chi-square test.

The overall morbidity of Phule Triveni was 49.07 per cent. The highest morbidity was recorded in the age group of 12 month above with the advancement of age according to the birth weight, the highest morbidity was found in the birth weights below 20 kg than the heavy weights.

According to season the highest morbidity was occurred in rainy season followed by winter and summer season. The morbidity was higher in females than the male in all age groups studied.

The maximum number of animals were morbid due to mammary gland disorder (40.73 %), followed by injury disorder (26.97 %) and reproductive disorder (11.08 %). In mammary gland disorder, mastitis was the major cause, while in injury disorder, wound, vaginal wound, knee and leg wound accounted for higher morbidity in Phule Triveni.

The CRR,CFR,CCR were highest in mammary gland disorders, followed by injury disorder, reproductive disorder, digestive disorder, specific disorder, eye disorder and lowest in case of parasitic disorders.

The study on morbidity of Phule Triveni had given typical direction and pin pointed a specific age i.e. above 12 month and birth weight below 20 kg on which special attention should be given to achieve higher birth weights prenatal calf management especially in nutrition should be undertaken and the age group below 3 months of age should be targeted to reduce morbidity.In general the adult (above 12 month) and lower weight calf are the victims of morbidity.

It is suggested that the calf should be cared according to prevailing environment condition. During high humidity, good ventilation should be provided in animal shed. Colostrum should be fed within 2 hours after the birth of calf and feeding of calf with milk according to their body weight at 2 to 3 intervals in a day. The hygienic management particularly while at a time of milking and clean barn should be provided to cover the morbidity due to mammary gland disorder.

# 1. INTRODUCTION

India is predominantly an agricultural country. Agriculture and livestock are complementary and supplementary to each other in their production. India has very large livestock production, which contributes to 31.6 per cent of the total income from agriculture and 5.21 per cent of the total G-gross Domestic Product (FAO STAT, 2012). India possesses 218 million cattle population in 2012 (FAO of the United Nations 2013) and having 57.77 million tones (45.18 %) milk from dairy cows (Basic Animal Husbandry Statistics 2013), productivity of animals and benefits to farmers is largely affected by livestock diseases. To minimize economic losses due to various diseases, studies of association of various factors such as age, gender, season and managerial practices with incidences of diseases have special importance in planning of prevention and control strategies designed to reduce the incidences of diseases in livestock.

Several causes have been noticed in morbidity and mortality of the crossbreed cows. The morbidity and mortality was the highest in calf and steadily declines with the advancement of the age. The climatic factors and seasonal variation also govern the rate of morbidity and mortality. The change in feeding and management can creates the problems in digestive system of animals.

Livestock is an important part of Indian economy which is principally maintained by the rural community as a source of livelihood. Livestock provides nutritional and economical security to the millions of marginal and small farmers and agricultural laborers. India is endowed with livestock resources of vast genetic diversity and accounts for 17 per cent of the world's livestock population having largest cattle and buffalo population in the world.

Livestock should regularly vaccinated to protect them from many infectious and contagious diseases. Animal diseases can cause enormous economic loss through morbidity and mortality. Therefore, its productivity is lowered.

In order to abrupt increase in milk production, the crossbreeding programme was initially started, at military dairy farms and afterwards systematic crossbreeding was planned at six centers as All India Co-ordinate Research Projects (AICRP) on Cattle during 1970. In Maharashtra State, this project was started at

Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri in 1970 by the Indian Council of Agricultural Research (ICAR), New Delhi and continued up till 1986. Later on the Maharashtra state government continued the same projects after termination of AICRP from 1986 onwards with the same objectives. This project was redesigned as Research Cum Development Project (RCDP) on Cattle. Under All India Co-ordinate Research Projects on Cattle at M.P.K.V., Rahuri, the Gir cow had been used as foundation stock, to produce a breed of cow which should have minimum milk production of 2000 kg per lactation with herd average of 3200 kg per lactation and fat content in milk should not be less than 3.5 per cent. For this purpose Gir cows were bred with semen of progeny tested Jersey and Holstein Friesian bulls to obtain half-breeds' and triple crosses.

Phule Triveni is one of the triple cross having blood level of 50 per cent Holstein Friesian, 25 per cent Jersey and 25 per cent Gir. The important feature of Phule Triveni cow is having 3000-3200L of milk with fat content in milk of 3.9-4.2 per cent. These cows are having considerable disease resistance and adaptability in various climatic conditions. Generally in crossbred animal's reproductive disorder like dystokia, uterine Prolapse, metritis, retained placenta etc have been noticed on a large scale. These disorders are affecting the postpartum reproductive performance viz; open period, service period, intercalving period etc. and the milk yield of crossbred cattle, which causes major economical losses to dairy farm.

According to Sreedhar *et al.* (2010) high survival rate in a dairy farm helps to increase the selection pressure which is one of the main factors controlling genetic gain and profitable returns. Mortality among dairy cattle results in financial loss, including the value of the lost cattle, cost of replacement, loss of milk production, and extra labour. Several herd-level risk factors for mortality have been identified, such as herd size, herd management, and milk yield. Mortality patterns in organized dairy herds serve as a useful indicator for assessing the status of herd health and the efficacy of management programs. A rise in mortality among a group of cattle can indicate suboptimal health and welfare. Calf mortality in every dairy and breeding farm results in financial and genetic loss. Therefore, reductions in morbidity and mortality rate are the first and foremost targets of dairy farm management. Identification of factors that are responsible for the death of cattle is an important prerequisite for avoiding excessive mortality.

Information on diseases occurring in the herd is essential for development of sound health management programme. Various organizations throughout the world, involved in research and control of animal diseases, are becoming increasingly aware of the need for valid information in the form of profile, so as to indicate the importance of each disease, annual variation in their occurrence and economic impact of diseases. The estimation of morbidity and its indices, assessing non-genetic factors influencing it and knowing different causes of morbidity are prerequisites for assessing the overall performance of the animals and is identify their susceptibility to diseases which in turn affect the overall productivity. The following objectives were considered for the present study

1. To study morbidity profile of Phule Triveni.
2. To determine the year, age, birth weight, season, and sex wise variations in morbidity.
3. To assess the different causes of morbidity.

## 2. REVIEW OF LITERATURE

India possesses vast genetic resources of cattle for ages, until recent years this species has been maintained mostly by a nomadic community and marginal farmers or landless labours. Majority of these people being illiterate or poor have not paid much attention to the scientific breeding, feeding management and health cover aspects of cattle. This has resulted in poor productivity and increased morbidity.

An attempt has been made in the following pages to review the research reports available on factors responsible for morbidity. The morbidity in cattle as studied in following aspects.

Britney *et al.* (1984) conducted a study on 460 calves from two institutional herds over a 7-year time frame. Cumulative disease incidences of calves having respiratory, gastro-intestinal, navel-joint, and other diseases prior to 4 months of age were 5.8, 3.3, 2.9, and 16.7 per cent, respectively. The study found no significant difference in milk production per completed first lactation between a disease free group and disease groups for respiratory, gastro-intestinal, navel-joint and other diseases.

Gardner *et al.* (1990) estimated mortality, morbidity, case-fatality, and culling rates were for endemic disease conditions in 43 randomly selected California dairy farms. Data were collected mainly by farmer interview. Age-specific mortality rates were: calves 22.8 per 1000 calf-months at risk; young stock 1.2 and cows 2.0 per 100 animal-years at risk. No bulls died during the observational period. For calves, diarrhoea/enteritis and pneumonia had the highest incidence rates, 115.8 and 76.5 per 1000 calf months at risk, respectively. Average incidence rates per 100 cow-years for the five most commonly reported cow diseases were: mastitis 30.3 per cent, infertility 7.9 per cent, metritis 7.0 per cent, foot rot 5.5 per cent and retained placenta 4 per cent. The highest case-fatality rate was 32 per cent for cows with traumatic reticulates (hardware disease). About 25 per cent of all cows were culled. Low production, infertility, and mastitis accounted for 87.6 per cent of all culled cows. Characteristics of participating herds and diagnostic criteria are presented. Limitations of the data and of the collection methods are discussed.

Traore *et al.* (1988) collected data on environmental pathological factors affecting morbidity and mortality of cattle, sheep and goats in traditional livestock production system in central Mali and reported that adult mortality was about 5, 12 and 13 per cent in cattle, sheep and goat, respectively.

Mannan *et al.* (1989) reported morbidity due to diarrheal disease and enterotoxaemia in Madhpurupzilla of Tangil district and observed maximum mortality due to diarrhoea 25.24 per cent and due to enterotoxaemia 23.30 per cent.

Debnath *et al.* (1990) conducted retrospective study of calf mortality and morbidity on 58 Upazila Veterinary Hospitals and 4350 smallholder traditional farms. Out of 15 840 clinical cases treated at the hospitals between January 1986 and June 1987 (both months inclusive) 52 per cent of all diagnoses were of gastro-enteritis. No specific disease was found to be of overriding importance. On-farm calf mortality up to 12 months of age was 9 per cent with no clear peak mortality related to age. A higher mortality was observed in the monsoon months, in *Bosindicus/B. taurus* cross-bred calves, and male vs. female calves. Malnutrition is argued to be the probable major cause of calf mortality. The results are discussed in relation to previously-observed inconsistencies in the age/sex structure of the national herd.

Pare *et al.* (1993) studied the effect of birth weight, total protein, serum IgG and packed cell volume on risk of neonatal Diarrhoea in calves on two California dairies. The objective of the study was to determine if there was a relationship between haematological, immunological and physiological variables of new-born calves and risk of diarrhoea during the neonatal period.

Gitau *et al.* (1994) reported Crude morbidity rate in the live born calves as 26.6 per cent in a study carried out at the dairy farms in the Kiambu district of Kenya.

Wittum *et al.* (1994) studied all calves born in ten participating herds during the 1990 and 1991 calving seasons. All 3666 calves born during the study period were individually identified at birth, and subsequent disease events were recorded by the producers. The disease outcomes of interest and their observed incidence rates were: perinatal (birth to 12 h) mortality, 2.5 per cent, general neonatal (12 h to 45 days) mortality 2.2 per cent, general neonatal morbidity 4.4 per cent, neonatal diarrhoea 1.1 per

cent, neonatal respiratory disease 1.0 per cent, mothering problems/weak calves, 1.2 per cent and neonatal enterotoxaemia/sudden death 1.4 per cent.

Virtala *et al.* (1996) concluded that the occurrence of pneumonia in calves during the first 3 months of life reduced average daily gain. The study involved 410 dairy calves from 18 commercial herds in NY over a 1-year period. Through the use of multiple linear regressions with seasonal effects in the model, it was concluded that each week of diagnosed pneumonia reduced body weight by 0.8 kg and height by 0.2 cm for the first 3 months of life. Whereas calf hood disease impacts average daily gain of calves, studies found no significant difference in milk production between cows that contracted diseases as calves and cows without calf hood disease.

Galyean *et al.* (1999) studied shipping stress, primarily bovine respiratory disease (BRD), and clouding weaning, commingling and shipment increase BRD morbidity in calves and yearlings (Loerch and Fluharty, 1999). Bovine respiratory disease impacts feed efficiency, veterinary costs, and death loss.

Bhattacharya (2002) reported that prevalence of mastitis on quarter basis was right fore 30 (16.85 %), left fore 38 (21.34 %), right hind 50 (28.08 %) and left hind 60 (33.70 %). It was also observed that single quarter involvement was more 55 (44 %) than double quarter 19 (15.20 %) and multiple quarter involvement 13 (10.40 %) in cows.

Jindal *et al.* (2002) estimated some epidemiological observations on haemorrhagic septicaemia in buffaloes and cattle in Haryana State of India.

Akhtar *et al.* (2003) examined 40 cross bred cows with clinical mastitis and found swelling of udder, reddishness and in some, milk was replaced by custard material and yellow or brown fluid with flakes or clots.

Lalrintluanga *et al.* (2003) examined a total of 987 udder quarters from 248 cows and screened for mastitis using a modified California mastitis test (MCMT) reagent in Aizawl, Mizoram, India from April to December 2001. Cows aged 4-6 years were the most commonly affected (51.10 %). Mastitis incidence was higher during the early stage of the third lactation (36.60 %), single quarter infection was recorded more frequently (63.44 %) and the left hind quarters were more frequently affected (30.25 %).

Svensson *et al.* (2003) studied the effects of season, breed, housing and type of colostrum feeding, and time, place and supervision of calving on the incidences of

diarrhoea, severe diarrhoea, respiratory disease, other infectious disease and moderately to severely increased respiratory sounds, were analysed by logistic-regression models (with herd as a random effect). The total morbidity rate was 0.081 cases per calf-month at risk.

Pinchak *et al.* (2004) studied effects of bovine respiratory disease (BRD) on stocker cattle systems are unknown under extensive rangeland environments. Three experiments were conducted to test the hypothesis that BRD-based morbidity is a major factor affecting the productive.

Mellor *et al.* (2004) noticed that main cause of neonatal morbidity and mortality were hypothermia, excessive heat loss, cold exposures, placental insufficiency, and immaturity at birth, starvation, infection, injuries and predation. Calf mortality observed was within the range of 15-51 per cent in India.

Shukla *et al.* (2005) reported that Sahiwal and crossbred cows were susceptible to mastitis especially during the third lactation.

Gupta *et al.* (2005) examined 40 cases of acute mastitis in Rajgarh and observed sudden onset of hard, red hot swelling of the udder that was painful to touch, increased body temperature (104-105°F), red coloured watery milk with flakes, lameness and anorexia.

Singh *et al.* (2005) conducted study at the organized farms situated in two different agro climatic conditions of Uttar Pradesh situated at Bareilly and Allahabad and found that the overall morbidity was 0.71 and 1.75 per cent per year respectively.

Khan *et al.* (2006) carried out data regarding buffalo calves rearing and calf mortality was collected from 111 buffalo farms in Peshawar city. Total number of buffaloes was 3092 in these farms having 27.85 buffaloes on average. 2492 calves born in one year of which 448 calves were died (17.98 % mortality rate). Colostrum feeding to newly born calves was practiced in all farms. In addition to suckling, solid feeding to calves was started during the second week of age. The weaning age ranged from 24 to 48 weeks. Calf mortality was influenced ( $P < 0.05$ ) by total number of animals but did not vary due to number of buffaloes, number of cows, total calves, age and season.

Singh *et al.* (2006) conducted study on an outbreak of buffalo pox in buffalo dairy herds in November 2003 on the outskirts of the Aurangabad district of

Maharashtra in India. The outbreak occurred in ten herds containing buffaloes of mixed ages and of predominantly the Jafarabadi breed and the Jafarabadi-Surti crossbreed of domestic buffalo. The farms were individually owned with a total population of animals at risk of approximately 400. The overall morbidity reached 45% (total of 180 of the 400 buffaloes). Approximately 80 per cent of the affected buffaloes (which were aged between 6 and 12 years) were Jafarabadi and Jafarabadi-Surti dairy animals.

Rani (2007) studied sixteen graded Murrah buffaloes with clinical mastitis and observed that single quarter involvement was highest in right hind quarter (6) followed by left hind (3), right fore (2) and left fore (1) quarters.

Hassan *et al.* (2007) studied the prevalence of mastitis and black quarter in crossbred and local indigenous cattle and found that cross bred cows (58.33 %) were more susceptible to mastitis than local cows (41.67 %). Older cows (Age: 5-8 years) were more affected and the percentage of infection is higher in older cow (66.67 %) than the younger cow (33.33 %). Cross bred cattle were recorded higher (64.8 %) infection of black quarter than that of local cattle (35.72 %). Male animal affected more in black quarter than female animal and young (71.42 %) cattle were more susceptible than older (28.58 %) cattle.

Wudu *et al.* (2008) studied that the overall incidences of crude morbidity and crude mortality were 62 and 22 per cent, respectively. The most frequent disease syndrome was calf diarrhoea with the incidence of 39 per cent followed by joint ill 6 per cent. The other disease conditions/syndromes diagnosed include navel ill, pneumonia, septicemic conditions, congenital problems and miscellaneous cases. Age of the calves, age at first colostrum ingestion and cleanness of the calf barns significantly influenced morbidity.

Kumar *et al.* (2010) examined 305 animals and reported that the incidence of clinical mastitis in crossbred cows, indigenous cows and buffaloes was 9.28, 0.59, 4.10 per cent, respectively in Kolar districts of Karnataka.

Sundaramet *al* (2010) concluded that overall morbidity and mortality rate were 31.22 and 9.14 per cent in bovine population respectively. Major causes of morbidity were reproductive diseases followed by specific diseases and mortality were poor management problems followed by digestive and specific diseases. Adult bovine

showed high morbidity due to reproductive problems which are major challenges under village conditions in study area. Major emphases are laid to attend reproductive problems. The female were at higher risk of morbidity but males were at higher risk of mortality in bovine.

Belay Duguma (2012) conducted survey of major diseases affecting dairy cattle in Jimma town, Oromia, Ethiopia . He studied that mastitis, tick infestation, lumpy skin disease and heart water were the major diseases affecting dairy cattle production in the study area.

Poonia and Malik (2012) reported that incidence of pneumonia was highest (62.11 %) in 31-90 days and lowest (52.52 %) in 180 days age. The incidence of enteritis was highest (20.93 %) in 0-30 days and lowest (16.9 %) in 180 days. The incidence of spneumoenteritis was the highest (16.28 %) in age group of 0-30 days and lowest (8.5 %) in 90-180 days. Helminthosis was not observed in 0-30 days and 31-90 days age group.

Bangar *et al.* (2013) carried out to analysis Overall morbidity and mortality rates in cattle in village areas of Pune division in Maharashtra states. The data of total 1538 cattle were collected from 421 cattle owners by stratified two-stage random sampling design and analysed statistically by SAS 9.3 evaluation of chi- square analysis overall morbidity and mortality were 22.24% & 4.42%, respectively. Reproductive (7.09 %) and digestive (5.14 %) diseases were major causes of morbidity in the study area. Adult cattle showed high (28.97 %) morbidity due to reproductive problems which are major challenges under village conditions in study area. Digestive (1.43 %) and nutritional (0.85 %) diseases were major causes of mortality of cattle. Chi-square analysis revealed that the morbidity was significantly ( $p<0.01$ ) related with age groups while mortality was significantly ( $p<0.01$ ) related with age and sex. Highest mortality rate (16.81 %) were observed among calves and male were at higher (17.86 %) mortality risk than that of female.

Chaudhary *et al.* (2013) concluded that the overall analysis of morbidity rate in bovine was 31.22 per cent. Among the three age groups, adults' bovine showed highest morbidity rate 35.73 per cent, followed by calves 26.98 per cent and young stocks 23.17 per cent. Among the three age groups, calves had highest morbidity rate 16.09 per cent due to poor management problems followed by adults 12.15 per cent cases of

reproductive problems. The overall mortality rate in bovine was found 9.14 per cent. The overall analysis of mortality in bovine with respect to age revealed significance ( $p < 0.01$ ) difference between age and sex. Amongst the three age groups, calves showed highest mortality 21.53 per cent followed by young stocks 9.35 per cent and adults 4.73 per cent. Among the three age groups, calves had highest mortality (16.09 %) due to poor management problems followed by 2.48 per cent cases of digestive diseases. He also concluded that young and adult stocks showed high morbidity due to specific diseases as 84.68 and 68.42 per cent, respectively.

Chaudhary *et al.* (2013) studied the morbidity and mortality rates of specific diseases in bovine under the village condition in Himachal Pradesh state. The result showed that mastitis has highest morbidity rate 4.18 per cent followed by EBH 0.68 per cent, FMD 0.63 per cent and warts 0.57 per cent and Actinomycosis 0.26 per cent.

Hedge *et al.* (2014) analyzed data for epidemics of FMD between the years 1977-78 to 2012-13 and reported significant difference between the years for the annual incidence of FMD.

Babcock *et al.* (2014) collected data on individually treated cattle to determine whether cattle performance and health outcomes in feedlot cattle were associated with timing of treatment for bovine respiratory disease (BRD) during the feeding phase. Cattle that died at any point during the feeding phase were removed from the analysis. Bovine respiratory disease (BRD) is the most common and economically detrimental disease of cattle during the post weaning phase, causing approximately 75 per cent of morbidity and over 50 per cent of mortality in feedlots (Edwards, 1996 and Smith, 1998).

Bangar *et al.* (2014) estimated seasonal variation in morbidity pattern in cattle by log-linear model approach. The present study was carried out to understand the seasonal variations in pattern of various diseases in cattle of Pune division of Maharashtra state of India. Livestock diseases are essentially an economic problem as they reduce profitability to producers by causing direct losses (deaths, production losses, affecting body weight and fertility and changes in herd structure) and indirect losses (medicine costs, labour costs and reduction in market value).

Suneel Kumar *et al.* (2015) analyzed the morbidity and mortality due to various diseases in different species in Shivalik Hill Zone of Himachal Pradesh. They concluded that the overall morbidity pattern due to various diseases in cattle, buffalos, sheep and goats were 20.0, 24.98, 35.14 and 30.77 per cent, respectively. Chi-square test revealed a significant difference ( $p < 0.05$ ) in morbidity pattern among the diseases for cattle, buffalos and goats. The highest morbidity pattern in cattle, sheep and goats was due to specific diseases whereas in buffalo highest morbidity pattern was due to reproductive diseases (29.88 %). In cattle and buffalo highest mortality pattern was due to specific diseases (43.14 %) and reproductive diseases (27.78 %) respectively. In sheep and goat highest mortality pattern was due to specific diseases. The highest morbidity rate in cattle was due to specific diseases (5.74 %) while in buffalo was due to reproductive diseases (7.46 %).

Dhananjay *et al.* (2016) observed on overall morbidity rates of mastitis, HS and Surra in cattle and buffaloes were 15.5, 7.1 and 5.3 per cent, respectively. The mortality and case fatality due to HS was found higher in the young calves as compared to the adults in case of both buffaloes and cattle.

Anderson *et al.* (2017) reported that first longitudinal study that investigated the incidence of BRD in feedlot cattle from Brazil, and the results herein described indicate that BRD contributed significantly to the development of mortality and morbidity of cattle on feed.

### **3. MATERIAL AND METHODS**

#### **3.1 Source of data**

Present investigation on “Morbidity profile on Phule Triveni” was carried out by collecting the data from history and pedigree sheets maintained at Research-Cum-Development Project (RCDP) on Cattle, Mahatma Phule Krishi Vidyapeeth Rahuri, Dist. Ahmednagar (MS).

##### **3.1.1 Location and climate**

The Research-Cum-Development Project on Cattle, M.P.K.V., Rahuri is located at Ahmednagar - Manmad state highway No. 14, about 160 km North East of Pune and 30 km from Ahmednagar in Maharashtra. The area comes under scarcity zone of state and is situated at an elevation of 559 meters above the mean sea level on the 19°57' North latitude and 74 ° 19' East longitudes.

##### **3.1.2 History of herd and breeding programme**

The All India Co-ordinate Research Project (AICRP) on Cattle was started at Mahatma Phule Krishi Vidyapeeth, Rahuri on 1<sup>st</sup> December, 1970. The Indian Council of Agricultural Research (ICAR) terminated this project in year 1986. Later on Maharashtra state continued the project with same objectives as Research Cum Development Project (RCDP) on Cattle. Under All India Co-ordinate Research Project on Cattle at M.P.K.V., Rahuri, the foundation stock of 300 Gir cows were inseminated with frozen semen of progeny tested bulls of Holstein Friesian (HF) and Jersey (J).

The Jersey halfbreds were inseminated with frozen semen of proven sires of HF, where as FG females with Jersey sires and Brown-Swiss sires to generate FJG, JFG and BFG second generation triple crosses with 75 per cent two exotic inheritance and their interse.

The key task of this project was to evolve a commercially viable strain of crossbred cattle with a herd average of 3200 kg milk in a lactation of 300 days and fat per cent not less than 3.5, accordingly the Phule Triveni cow has been generated.

##### **3.1.3 Housing and management**

The animals were kept under loose housing system with loafing area and covered sheds. All calves irrespective of genetic groups were housed in calf pens up to

three months of age and thereafter reared separately in loose housing system according to age group and stage as under

1. 3 to 6 months
2. 6 months onwards
3. Breedable heifers
4. Cows in advance pregnancy
5. Milking cows and
6. Dry cows

Tattooing and dehorning of calves were carried out within 10 days of birth and subsequently ear tagging was done at maturity as identification marks. From six months onwards the calves were grouped according to their sex and age groups. Up to the age of six months, the body weights were recorded weekly and from six months to AFC the body weights recorded monthly and thereafter at every calving. The animals were culled on the basis of milk production, reproductive efficiency and health as per the recommendation of ICAR workshops.

Hand and machine milking was practiced at equal interval twice-a-day. Drying off of the pregnant cows two months prior to due date of calving was also followed. All the animals were maintained under normal level of sanitary conditions with adequate health cover. Sick animals were immediately spotted out, isolated and taken care off.

#### **3.1.4 Health management**

The animals were vaccinated against Foot and Mouth, Haemorrhagic-Septicaemia and Black Quarter disease regularly. Annual screening for Tuberculosis, Johne's disease, Brucellosis, Mastitis and protozoan diseases were also done. Deworming of animals at regular interval was also carried out. Animal sheds were sprayed regularly with insecticides to control ticks, lice, mosquitoes and flies.

#### **3.1.5 Feeding**

The feeding and management of the cattle was more or less uniform throughout the year. The calves were weaned immediately after birth and were fed with colostrums @  $1/10^{\text{th}}$  of the body weight for first four days. The level of whole milk feeding was as per the feeding schedule. The maintenance, growth, pregnancy and production ration was given as per feeding standards with roughages.

### 3.2 Collection of data

The observations regarding the morbidity of Phule Triveni cows were collected from the treatment records and history sheets maintained over a period of 16 years (2000 to 2016) at RCDP on Cattle, M.P.K.V., Rahuri.

The following observations were taken into consideration for collection of data.

#### Statement1. Details of data recorded for clinical efficacy in Phule Triveni

| Sr. No. | Particulars                   | Details |        |       |
|---------|-------------------------------|---------|--------|-------|
|         |                               | Male    | Female | Total |
| 1.      | Total number of cow available | 230     | 3411   | 3641  |
| 2.      | Total number of morbid cow    | 66      | 1721   | 1787  |

#### Statement 2. Details of data recorded for clinical efficacy in Phule Triveni

| Sr. No. | Particulars   | Details |
|---------|---|---------|
| 1.      | Total number of morbid cases                                | 1787    |
| 2.      | Total number of disease specific morbid cases               | 1787    |
| 3.      | Total number of animal days at risk                         | 14249   |
| 4.      | Total number of treated cases                               | 1787    |
| 5.      | Total number of treated cases that cured                    | 1537    |
| 6.      | Total number of treated cases that died                     | 54      |
| 7.      | Total number of treated cases that not recovered and culled | 196     |

### 3.3 Classification of Data

#### 3.3.1 Age group

The data maintained at RCDP on Cattle, MPKV ,Rahuri during 2000 to 2016 were classified according to age group classify the morbidity of Phule Triveni.

| Sr. No. | Age Group      | Code           |
|---------|----------------|----------------|
| 1.      | Up to 3 months | A <sub>1</sub> |
| 2.      | 3-6 month      | A <sub>2</sub> |
| 3.      | 6-7 month      | A <sub>3</sub> |
| 4.      | Above 12 month | A <sub>4</sub> |

#### 3.3.2 Birth weight

All the calf born were divided into following weight groups.

| Sr. No. | Birth weight group | Code           |
|---------|--------------------|----------------|
| 1.      | Below 20 kg        | B <sub>1</sub> |
| 2.      | 20 to 25 kg        | B <sub>2</sub> |
| 3.      | Above 25 kg        | B <sub>3</sub> |

### 3.3.3 Season

| Sr. No. | Season | Months          | Code           |
|---------|--------|-----------------|----------------|
| 1.      | Rainy  | June-September  | S <sub>1</sub> |
| 2.      | Winter | October-January | S <sub>2</sub> |
| 3.      | Summer | February-May    | S <sub>3</sub> |

#### 3.2.1 Causes of morbidity

Causes of morbidity were studied as per the standard nomenclature of veterinary diseases on the basis of treatment records maintained at R.C.D.P. on cattle.

#### 3.4 Statistical analysis

The data on morbidity of animal were presented according to age groups, birth weight groups, season and sex of calf and expressed as percentage to the total calf population in Phule Triveni. The differences due to age group, type, season, sex of calf, one birth weight groups etc. were tested for their significance by Chi-square test (Snedecor and Cochran, 1994). The formula used for estimation of the  $X^2$  values is as under :

$$X^2 = \sum_{i=1}^N \frac{(O_i - E_i)^2}{E_i} \sim X_{n-1}^2$$

Where,

$O_i$  = Observed frequency in the  $i^{th}$  cell

$E_i$  = The frequency expected in the  $i^t$

#### A. Formulae to analyze morbidity profile of Phule Triveni

Following formula was used to determine the morbidity profile of Phule Triveni (Schwabe *et al.*, 1977).

$$\text{Equivalent average morbidity rate (EAMR) at risk} = \frac{\text{Total no. of morbid cases}}{\text{Total no. of animal days}} \times 1000$$

$$\text{Disease specific EAMR} = \frac{\text{Total no. of disease specific morbid cases}}{\text{Total no. of animal days at risk}} \times 1000$$

In addition following indices were also calculated to establish the clinical efficacy :

$$\text{Case recovery rate (\%)} = \frac{\text{Total no. of treated cases that cured}}{\text{Total no. of treated cases}} \times 100$$

$$\text{Case fatality rate (\%)} = \frac{\text{Total no. of treated cases that died}}{\text{Total no. of treated cases}} \times 100$$

$$\text{Case culling rate (\%)} = \frac{\text{Total no. of treated cases that not recovered and culled}}{\text{Total no. of treated cases}} \times 100$$

## 4. RESULTS AND DISCUSSION

The investigation entitled, “Morbidity profile of Phule Triveni” was undertaken by utilizing data generated at Research Cum development Project on cattle, Mahatma Phule Krishi Vidhyapeeth, Rahuri, Maharashtra. The results pertaining to various aspects of morbidity obtained in Phule Triveni are discussed in the following Table 1

### 4.1 Morbidity in Phule Triveni

**Table 1. Disease wise morbidity rates in Phule Triveni**

| Sr. No. | Disease category       | Number of disease | Morbidity rate |
|---------|------------------------|-------------------|----------------|
| 1.      | Digestive disorder     | 156               | 87.29          |
| 2.      | Reproductive disorder  | 198               | 110.80         |
| 3.      | Parasitic disorder     | 34                | 19.06          |
| 4.      | Specific disorder      | 149               | 83.37          |
| 5.      | Injury disorder        | 482               | 269.72         |
| 6.      | Mammary gland disorder | 728               | 407.38         |
| 7.      | Eye disorder           | 40                | 22.38          |
|         | Total                  | 1787              | 1000           |
|         | Available              | 3641              |                |

#### 4.1.1 The disease wise morbidity rates in Phule Triveni is shown in Table 1

Over the period of 16 years a total number of 1787 cases were treated for different ailments from that the highest morbidity rates occurred in mammary gland disorder (407.38) followed by injury disorder (269.72), reproductive disorder (110.80), digestive disorder (87.29), specific disorder (83.37), eye disorder (22.38) and parasitic disorder(19.06).

#### 4.1.2 Yearwise and causeswise morbidity in Phule Triveni is presented in Table 2

Over the period of 16 years a total of 1787 cases were treated for different ailments. The year exerted significant ( $P < 0.05$ ) effect on morbidity of Phule Triveni which may be due to changes in climate as well as feeding and management regims adapted.

The highest morbidity (10.36 %) in Phule Triveni was recorded during year 2013-14. In this year highest morbidity was due to mammary gland disorder (105)

followed by digestive disorder (41) and specific disorder (15) cases. Lowest morbidity (1.73 %) was recorded during the year 2002-03. In this year highest morbidity was due to mammary gland disorder (20) followed by injury disorder(10) cases.

The present result were in agreement with Patel *et al.* (2000) who reported highest morbidity due to prevalence of sub clinical mastitis (42.85 %) during 7<sup>th</sup> lactation and moderate during 3<sup>rd</sup> to 5<sup>th</sup> lactation(33 to 36 %) Over the period of 16 years cause wise highest morbidity occurred in mammary gland disorder (40.73 %) followed by injury (26.97 %) and lowest morbidity occurred due to parasitic disorder (1.84 %).

The present results were in the agreement of Khair *et al.* (2013) Reproductive and production disorders (PD) of crossbred dairy cattle significantly reduce their productivity which is of great concern of dairy producers worldwide because most reproductive disorders adversely affect the future fertility. The present study was conducted to determine the incidence of some reproductive diseases (RD) like abortion, anoestrus, metritis, repeat breeder, retained placenta and one production disease like clinical mastitis in cross-bred dairy cattle in Shahjadpurupazila of Sirajgonj district in Bangladesh.

Choudhary *et al.* (2013) studied on age, sex, season and cause wise morbidity and mortality collecting the data from all selected bovine owners in the state for period of one year (January 2011 to December 2011).The overall analysis of morbidity rate in bovine was (31.22 %). Among the three age groups, adults' bovine showed highest morbidity rate (35.73 %), followed by calves (26.98 %) and young stocks (23.17 %). Among the three age groups, calves had highest morbidity rate (16.09 %) due to poor management problems followed by adults (12.15 %) cases of reproductive problems. The overall mortality rate in bovine was found (9.14 %). The overall analysis of mortality in bovine with respect to age revealed significance ( $P < 0.01$ ) difference between age and sex. Amongst the three age groups, calves showed highest mortality (21.53 %) followed by young stocks (9.35 %) and adults(4.73 %). Among the three age groups, calves had highest mortality (16.09 %) due to poor management problems followed by (2.48 %) cases of digestive disease.

### 4.1.3 Age wise morbidity rates in Phule Triveni

The result obtained regarding morbidity according to age group are depicted in Table 3.

**Table 3. Agewise morbidity rates in Phule Triveni**

| Causes of morbidity    | Age (month)     |      |      |                | Total |
|------------------------|-----------------|------|------|----------------|-------|
|                        | 0-3             | 3-6  | 6-12 | 12 month above |       |
| Digestive disorder     | 16              | 20   | 44   | 76             | 156   |
| Reproductive disorder  | 0               | 0    | 0    | 198            | 198   |
| Parasitic disorder     | 4               | 1    | 2    | 27             | 34    |
| Specific disorder      | 18              | 14   | 31   | 86             | 149   |
| Injury disorder        | 64              | 48   | 70   | 300            | 482   |
| Mammary gland disorder | 0               | 0    | 0    | 728            | 728   |
| Eye disorder           | 6               | 6    | 7    | 21             | 40    |
| Total                  | 108             | 89   | 154  | 1436           | 1787  |
| Per cent morbidity     | 6.04            | 4.98 | 8.62 | 80.36          | 100   |
| Chi-square test        | <b>102.953*</b> |      |      |                |       |

\*= $P < 0.05$

#### Effect of age on morbidity in Phule Triveni

The results obtained indicated significant ( $P < 0.05$ ). The Table clearly indicated the highest morbidity (80.36 %) in the age group of above 12 month and lowest in 3-6 month age group (4.98 %). It indicated that calves of age group 3-6 months were more susceptible to disease as compared to calves of 0-3 month age group and 6-12 month and adult group.

The Table 3 clearly indicated that the morbidity in calves gradually increased with advancement in age from 3-6 months which coincides with the result reported by Bangar *et al.*, (2013) who carried out the morbidity and mortality rate in cattle in village areas of Pune division in the Maharashtra state.

Morbidity obtained regarding age group was coincided with the result obtained by Chaudhary *et al.* (2013). They concluded that among the three age groups, adults' bovine showed highest morbidity rate (35.73 %), followed by calves (26.98 %) and young stocks (23.17 %). Similar result was obtained by Sundaram *et al.* (2010). Wudu *et al.* (2008) reported that age of the calves, age at first colostrum ingestion and cleanness of the calf barn significantly influenced morbidity

Britney *et al.* (1984) conducted a study on 460 calves from two institutional herds over a 7-years time frame. Cumulative disease incidences of calves having respiratory, gastro-intestinal, navel-joint, and other diseases prior to 4 no. of age were 5.8, 3.3, 2.9, and 16.7 per cent, respectively.

#### 4.1.4 Sex wise morbidity rates in Phule Triveni

The result obtained regarding effect of sex on morbidity in Phule Triveni is depicted in Table 4.

**Table 4. Sex wise morbidity in Phule Triveni**

| Causes of morbidity    | Sex          |               |              |               | Total |
|------------------------|--------------|---------------|--------------|---------------|-------|
|                        | Female       |               | Male         |               |       |
|                        | No. of cases | Morbidity (%) | No. of cases | Morbidity (%) |       |
| Digestive disorder     | 141          | 8.19          | 15           | 22.73         | 156   |
| Reproductive disorder  | 198          | 11.90         | 0            | 0             | 198   |
| Parasitic disorder     | 27           | 1.57          | 7            | 10.61         | 34    |
| Specific disorder      | 143          | 8.31          | 6            | 9.09          | 149   |
| Injury disorder        | 450          | 26.15         | 32           | 48.48         | 482   |
| Mammary gland disorder | 728          | 42.30         | 0            | 0             | 728   |
| Eye disorder           | 34           | 1.90          | 6            | 9.09          | 40    |
| Total                  | 1721         | 100           | 66           | 100           | 1787  |
| Per cent morbidity     | 96.31        |               | 3.69         |               | 100   |
| Chi-square test        | 79.379*      |               |              |               |       |

\*= $P < 0.05$

The overall morbidity in females was higher (96.31 %) than the males (3.69 %). In female highest morbidity was occurred in mammary gland disorder (42.30 %) and lowest morbidity was occurred in eye disorder (1.98 %). In males highest morbidity was observed in injury (48.48 %) and lowest in reproductive disorder (0.0 %).

#### 4.1.5 Effect of season on morbidity

The results obtained regarding morbidity according to season of birth in Phule Triveni are depicted in Table 5.

**Table 5. Season wise morbidity rates in Phule Triveni**

| Causes of Morbidity    | Season code  |               |              |               |              |               | Total |
|------------------------|--------------|---------------|--------------|---------------|--------------|---------------|-------|
|                        | Rainy        |               | Winter       |               | Summer       |               |       |
|                        | No. of cases | Morbidity (%) | No. of cases | Morbidity (%) | No. of cases | Morbidity (%) |       |
| Digestive disorder     | 66           | 9.48          | 34           | 5.48          | 54           | 11.48         | 156   |
| Reproductive disorder  | 75           | 8.19          | 63           | 10.15         | 60           | 12.77         | 198   |
| Parasitic disorder     | 16           | 2.30          | 10           | 1.61          | 8            | 1.17          | 34    |
| Specific disorder      | 59           | 8.48          | 45           | 7.24          | 45           | 9.58          | 149   |
| Injury disorder        | 187          | 26.87         | 182          | 29.30         | 113          | 24.04         | 482   |
| Mammary gland disorder | 280          | 40.23         | 270          | 44.44         | 178          | 37.48         | 728   |
| Eye disorder           | 13           | 1.87          | 15           | 22.42         | 12           | 2.55          | 40    |
| Total                  | 696          | 100           | 621          | 100           | 470          | 100           | 1787  |
| Per cent morbidity     | 38.95        | 34.75         | 26.30        | 100           |              |               |       |
| Chi-square test        | 20.754*      |               |              |               |              |               |       |

\*= $P < 0.05$

#### **Effect of season on morbidity of Phule Triveni**

The results obtained indicated significant ( $P < 0.05$ ). It was clearly indicated from Table 5 that, in overall morbidity was highest in calf born during rainy season (38.95 %) followed by winter season (34.75 %) and the lowest in summer season (26.30 %).

During rainy season highest morbidity was occurred due to mammary gland disorder (40.23 %) and lowest due to eye disorder (1.86 %) And during winter season highest morbidity was occurred due to mammary gland disorder (44.44 %) and lowest due to parasitic disorder (1.61 %) and during the summer season the highest morbidity was occurred due mammary gland disorder (37.48 %) and lowest morbidity occurred due to parasitic disorder (1.17 %).

Calves morbidity obtained is coincides with the result of Shaikh *et al.* (2009) reported that morbidity rate in cattle in summer, rainy and winter season was 23.51, 47.59, 28.89 per cent, respectively

#### **4.1.6 Effect of birth weight group on morbidity**

The data on calf morbidity was analyzed according to birth weight groups and results obtained are presented in Table 6.

The results indicated that the overall morbidity was highest in birth weight group below 20 kg (37.04 %), followed by 25 above (34.36 %) and 20kg-25kg birth weight group (28.60 %).

The effect of birth weight on calf morbidity of Phule Triveni clearly indicated that having higher birth weight (20-25kg) had less morbidity than animals with lower birth weights (less than 20 kg). The resistance against various diseases is also low in weak calf as a natural phenomenon. Hence, attempt should be made to have the higher birth weight calves by providing better feeding, management and health cover practices to advance pregnant and lactating cows.

### **Birth weight group wise morbidity in Phule Triveni**

The result obtained regarding morbidity according birth weight group are depicted in Table 6.

**Table 6. Birth weight group wise morbidity**

| Causes of Morbidity    | Birth weight group (kg) |               |              |               |              |               | Total |
|------------------------|-------------------------|---------------|--------------|---------------|--------------|---------------|-------|
|                        | Below 20                |               | 20-25        |               | Above 25     |               |       |
|                        | No. of cases            | Morbidity (%) | No. of cases | Morbidity (%) | No. of cases | Morbidity (%) |       |
| Digestive disorder     | 53                      | 9.50          | 58           | 11.35         | 45           | 4.07          | 156   |
| Reproductive disorder  | 86                      | 12.99         | 52           | 10.18         | 62           | 7.34          | 198   |
| Parasitic disorder     | 16                      | 2.42          | 10           | 1.96          | 8            | 10.62         | 34    |
| Specific disorder      | 62                      | 9.37          | 34           | 6.65          | 53           | 1.31          | 149   |
| Injury disorder        | 168                     | 25.38         | 150          | 29.35         | 164          | 8.63          | 482   |
| Mammary gland disorder | 246                     | 37.17         | 190          | 37.18         | 274          | 44.63         | 728   |
| Eye disorder           | 13                      | 2.42          | 17           | 3.33          | 10           | 1.89          | 40    |
| Total                  | 662                     | 100           | 511          | 100           | 614          | 100           | 1787  |
| Per cent morbidity     | 37.04                   | 28.60         | 34.36        | 100           |              |               |       |
| Chi-square test        | 23.679*                 |               |              |               |              |               |       |

\***P<0.05**

## **4.2 Estimation of clinical efficacy**

### **4.2.1 EAMR**

Equivalent average morbidity rate in Phule Triveni was 125.41. It was calculated by counting all morbid cases out of total number of days at which animal was in risk which is always measured out of thousand.

**Table 7. Causes of morbidity**

| <b>Sr. No.</b> | <b>Causes of morbidity</b> | <b>Total number of morbid cases</b> | <b>Total number of days at risk</b> | <b>Disease specific EAMR (out of 1000)</b> |
|----------------|----------------------------|-------------------------------------|-------------------------------------|--|
| 1              | Digestive disorder         | 156                                 | 1544                                | 101.33                                     |
| 2              | Eye disorder               | 40                                  | 340                                 | 116.64                                     |
| 3              | Injury disorder            | 482                                 | 3251                                | 148.26                                     |
| 4              | Mammary gland disorder     | 728                                 | 6802                                | 107.02                                     |
| 5              | Parasitic disorder         | 34                                  | 312                                 | 108.97                                     |
| 6              | Reproductive disorder      | 198                                 | 1544                                | 101.03                                     |
| 7              | Specific disorder          | 149                                 | 455                                 | 327.47                                     |
| 8              | Total                      | 1787                                | 14249                               | 125.41                                     |

The results obtained from Table 7 revealed that the highest disease specific equivalent average morbidity was observed in Specific disorder (327.47) followed by injury disorder (148.26), eye disorder (116.64), Parasitic disorder (108.97), Mammary gland disorder (107.02) and lowest in reproductive disorder (101.03).

#### **4.2.2 Annual morbidity rate and its clinical efficacy**

The result obtained regarding CRR, CFR, CCR in Phule Triveni during the years 2000-01 to 2015-16 is depicted in Table 8

The overall CRR in Phule Triveni was 86.01 per cent. The effect of year on CRR was significant ( $p < 0.05$ ). The highest CRR was observed in the year 2006-07 (94.30 %) and the lowest in year 2012-13 (70.53 %). The year wise variation in CRR was inconsistent in Phule Triveni.

The overall CFR in Phule Triveni was 3.02 per cent and yearwise variation in CFR was inconsistent. The effect of year on CFR was significant ( $P < 0.05$ ). The lowest CFR (1.98 %) was observed during year 2004-05 and the highest (8.03 %) in 2011-12. The results indicated that relatively higher prolificacy had lower resistant to disease. The yearly variation in CFR could be attributed to nature of aliment treated.

The overall CCR was 10.96 per cent. The influence of year was non-significant influence on CCR and it was highest in year 2010-11 (9.05 %) and lowest in year 2014-15 (3.36 %).

## 5. SUMMARY AND CONCLUSIONS

The investigation entitled, “Morbidity profile of Phule Triveni” was undertaken by utilizing data generated at Research cum development Project on Cattle, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, from 2000-2016. The entire data were analyzed for its significance and the results are summarized as below.

### A. Summary

#### 5.1 Morbidity in cattle

Overall morbidity in Phule Triveni was is summarized as follows

##### 5.1.1 Year wise and causes wise morbidity

The highest morbidity (10.36 %) in Phule Triveni was observed during year 2013-14. The highest morbid cases were due to of Mammary gland disorder, followed by Injury disorder and reproductive disorder cases. Lowest morbidity was recorded during the year 2002-03(1.73 %).

And causes wise highest morbidity rate was occurred due the mammary gland disorder (407.38), while lowest morbidity was occurred due to parasitic disorder (19.06).

##### 5.1.2 Effect of age

The age group wise morbidity studied in Phule Triveni indicated highest morbidity in 12 months above age group (80.36 %) and lowest in 3-6 month age group (4.98 %). The morbidity in calves gradually increases with advancement age from 3-6 month. The differences in the calf morbidity between the age groups studied were found to be significant

##### 5.1.3 Effect on sex

The higher morbidity was observed in females (96.31 %) than males (3.69 %). Sex had significant effect on the morbidity.

##### 5.1.4 Effect of season on morbidity

The effect of season on morbidity of Phule Triveni was higher in the rainy season born calf (38.95 %) followed by winter (34.75 %) and summer season born calf(26.30 %). Significant differences were observed in calf morbidity between the seasons

### **5.1.5 Effect of birth weight on morbidity**

It is indicated that the overall morbidity was significantly highest in weight group below 20 kg (37.04 %) followed by above 25 kg (34.36 %) and the lowest in weight group above 20-25 kg (28.60 %).

Significant ( $P < 0.05$ ) differences were found in morbidity between the birth weight groups of Phule Triveni.

### **5.1.6 Disease/ disorder wise morbidity**

The overall morbidity in Phule Triveni due to various diseases and disorders was higher in females than males. According to diseases and disorders, mammary gland disorders contributed higher morbidity followed by injury disorders and lowest in parasitic disorder. In mammary gland disorders, mastitis and postules on udder, swelling of udder were major causes of morbidity, while in injury disorder, wound accounted for higher morbidity.

## **5.2 Estimation of clinical efficacy**

The highest disease specific EAMR in Phule Triveni was observed in mammary gland disorder followed by injury disorder, reproductive disorder, digestive disorders, specific disorder, eye disorder and lowest in parasitic disorders.

The effect of year on CRR was significant ( $p < 0.05$ ). The highest CRR was observed in the year 2006-07 and the lowest in year 2003-04.

The effect of year on CFR was significant. The highest and lowest CFR was observed in the year 2011-12 and year 2006-07 respectively.

The overall CCR was highest in the year 2008-09 and lowest in 2014-15. The effect of year on CCR was non-significant. The results revealed that the year wise variation in morbidity, CRR, CFR, CCR were inconsistent in Phule Triveni.

## **B. Conclusions**

1. The highest morbidity was found in adult above 12 months age group and calf born during rainy season shows highest morbidity and it was observed in year 2013-14 while the lowest during the year 2002-03 in Phule Triveni.
2. The overall highest morbidity in Phule Triveni was found in mammary gland disorder and lowest morbidity occurs in parasitic disorder especially highest morbidity rate occurs in female than the male.

3. The CRR, CFR, CCR was recorded highest in year 2006-07,2011-12,2008-09 respectively and lowest in year 2003-04, 2006-07, and in 2014-15 respectively. The CRR, CFR, CCR was highest in mammary gland disorder and lowest in case of parasitic disorder.

From the results of the present study, it is concluded that attention should be given on above 12 months of age and having birth weight less than 20 kg. Care should also be taken specially for female in particular those related to mammary gland disorder. The hygienic management particularly in feeding and watering should be adopted to cover the morbidity due to mammary gland disorder and care should be taken at the time of milking and regular diagnosis of udder condition should be checked.

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## 8. VITAE

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