

## Epidemiological Measures of Association between Ketosis and Predisposing Factors in Bovines

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### Abstract

The epidemiological measures (Relative Risk, Odds Ratio, Attributable Rate and Attributable Fraction Percentage) of association between species, breed, stage of lactation, milk yield and order of lactation factors and the ketosis in dairy animals were studied in Namakkal and Karur districts of Tamil Nadu. For this study, 30 (18 Namakkal and 12 Karur) ketosis affected dairy animals (22 cows and 8 buffaloes) were selected randomly. RR indicated that the rate of ketosis in exotic / crossbred cows were 1.405 times greater than that of the rate of ketosis in native / non descriptive cows and the Odds Ratio of 1.419 also implied same. The calculated Attributable Rate for breed factor of 0.009 for cows and 0.0045 for buffaloes implied that the rate of ketosis in dairy animals that might be attributed to exotic / crossbred / upgraded germ plasm was 0.90 per cent and 0.45 per cent, respectively. The parity in cows was 3.16 per cent (AR) and 78.51 per cent (AFP) of ketosis in higher parity animals could be attributed to the higher parity factor.

**Key words:** Ketosis, Metabolic diseases and Relative Risk

### Introduction

In dairy farming, metabolic diseases such as ketosis, milk fever and downer cow syndrome are the most common expensive disease entities in such lactating dairy animals (Kaneene and

Scott, 1990). Ketosis is simply a condition marked by increased levels of circulating ketone bodies without the presence of the clinical signs of ketosis. Ketosis can cause economic losses through decreased milk production and may occur in association with pre parturient diseases (Ardvan Nowroozi *et al.*, 2011 and Rupasitwari *et al.*, 2013).

Epidemiology is the study of diseases in populations. This helps them discover what the high rate group is doing that the low rate group is not and vice versa. This allows factors influencing the risk of disease to be identified. Once identified, measures can be applied to reduce exposure to these risk factors and reducing the overall burden of disease in population. This allows disease to be controlled even if the precise pathogenic mechanism is not known. The epidemiological approach to disease management is conceptually different in that there is no dependency on being able to precisely define the aetiological agent. It is based on observing differences and similarities between diseased and non-diseased animals in order to try and understand what factors may be increasing

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or reducing the risk of disease. (Stevenson 2008). For the present study, the epidemiological measures viz., Relative Risk, Odds Ratio, Attributable Rate and Attributable Fraction Percentage of association between factors such as species, breed, stage of lactation, milk yield and order of lactation and ketosis in dairy animals were calculated.

### **Materials and Methods**

Namakkal and Karur districts of Tamil Nadu were purposively selected for the present study, as these districts are under different agro climatic zones. From these districts 30 (18 Namakkal and 12 Karur) ketosis affected dairy animals (22 cows and 8 buffaloes) were selected randomly. Data were collected from the respondent farmers by personal interview method, using pretested interview schedule. The data collected from the sample respondents included information on species, breed, stage of lactation, milk yield and order of lactation factors were also collected. The data so collected were calculated by epidemiological ratio measures as follows, i) Relative Risk/Risk Ratio (RR) can be determined by comparing the incidence or prevalence of an event in an exposed and unexposed group. ii). Odds Ratio (OR) is the measure of comparing the cross product of 2X2 contingent table and it gives the odd of getting disease in an unexposed group. iii) Attributable Risk / Ratio (AR) is the rate of events in the exposed group minus unexposed group. Risk of occurrence of an event to a specific cause is attributable ratio. iv) Attributable Factor Percentage

(AFP) is the estimate of quantum or amount of an event in an exposed group due to specifically to a factor.

### **Results and discussion**

The epidemiological measures (Relative Risk, Odds Ratio, Attributable Rate and Attributable Fraction Percentage) of association between species, breed, stage of lactation, milk yield and order of lactation factors and the ketosis in dairy animals were calculated and the results are displayed in table 1.

### **Species Factor**

Relative Risk (RR) with respect to species factor was found to be 1.485. If there was no association between the factor and the ketosis, the RR will be 1. The greater departure of RR was (either larger or smaller), the stronger association between the factor and disease. Since, the RR was 1.485, it can be concluded that the rate of ketosis in cows was 1.485 times greater than that of rate of ketosis in buffaloes. Odds Ratio (OR) calculated to be 1.502 can also be interpreted in the same way. The larger the Attributable Rate (AR), the greater the effect of factors i.e. cow / buffalo in causing ketosis. The calculated AR for the species factor was 0.0109, which implied that the rate of ketosis in dairy animals that might be attributed to cow or buffalo species was 1.09 per cent only. Attributable Fraction Percentage (AFP) calculated of 0.3268, indicated that 32.68 per cent of ketosis in dairy animals could be attributable to species factor.

**Breed Factor**

Relative Risk with respect to breed factor for ketosis was 1.405 for cows and 1.238 for buffaloes, respectively. The results indicated that the rate of ketosis in exotic pure breed / crossbred cows was 1.405 times greater than that of the rate of ketosis in native / non descriptive cows. Similarly, the rate of ketosis in Murrah graded buffaloes was 1.238 times greater than that of rate of ketosis in non descript buffaloes. The calculated Attributable Rate for breed factor of 0.009 for cows and 0.0045 for buffaloes implied that the rate of ketosis in dairy animals that might be attributed to exotic / crossbred / upgraded germ plasm was 0.90 per cent and 0.45 per cent, respectively. Attributable Fraction was calculated 0.2883 for cows and 0.1923 for buffaloes which indicated that 28.83 per cent of ketosis in cows and 19.23 per cent of ketosis in buffaloes could be attributable to the exotic / cross bred / graded breed factor.

**Stages of Lactation Factor**

The measures of association for the stage of lactation for ketosis implied that the rate of ketosis in dairy animals at mid and late stage of lactation was 1.104 times (Relative Risk) more than the rate of ketosis in milch cows at early stage of lactation. Similarly, the rate of ketosis in buffaloes at mid and late stage of lactation was 1.68 times greater than the rate of ketosis in milch buffaloes at early stage of lactation. The Attributable Rate for the stage of lactation factor was calculated to be 0.0036 and 0.0135 for cows and buffaloes, respectively. The 19.23 per cent

and 9.43 per cent of ketosis in cows and buffaloes (Attributable Fraction Percentage) could be attributed to their stages of lactation.

**Milk Yield Factor**

The measures of association for the milk yield factor for ketosis implied that the rate of ketosis in milch animals yielding more than 5 lites per day was 2.22 (Relative Risk) times more than the rate of ketosis in milch animals yielding less than 5 liters per day. The rate of ketosis in milch animals that might be attributed to high yielding was 2.08 per cent (Attributable Rate) and 55.00 per cent (Attributable Fraction Percentage) of ketosis in high yielding dairy animals could be attributed to their high yielding capacity.

**Parity (Order of Lactation) Factor**

The measures of association for the parity factor for ketosis imply that the rate of ketosis in dairy animals of more than second parity was 4.655 (Relative Risk) times more than rate of ketosis in milch animals within second parity. The rate of ketosis in milch animals that might be attributed to higher parity factor was 3.16 per cent (Attributable Rate) and 78.51 per cent (Attributable Fraction Percentage) of ketosis in higher parity dairy animals could be attributed to the higher parity factor.

**Table 1: Epidemiological Measures of Association between Ketosis and Predisposing Factors in Bovines**

Measures of association	Factors						
	Species	Breed		Stage of lactation		Milk yield	Order of lactation
		Cow	Buffalo	Cow	Buffalo		
<b>Strength</b>							
Relative Risk (RR)	1.485	1.405	1.238	1.104	1.6833	2.222	4.655
Odds Ratio (OR)	1.502	1.419	1.2439	1.1085	1.7068	2.27	4.808
<b>Effect</b>							
Attributable Rate (AR)	0.0109	0.009	0.0045	0.0036	0.0135	0.0208	0.0316
Attributable Fraction Percentage (AFP)	0.3268	0.2883	0.1923	0.094497	0.4059	0.55	0.7851

### Conclusion

Ketosis is mainly because of a marginal relationship between energy metabolism and milk production in dairy animals. Regarding breed concerned, prevalence of metabolic diseases is more in crossbred / exotic breeds rather than native breeds. This is due to high throughput of milk production among crossbred / exotic breeds. Disseminating knowledge about the clinical signs of this disease to take early measures to avoid heavy economic loss during and after the course of the disease.

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