Original Research Article

Effect of Different Risk Factors on Kid Mortality in Black Bengal Goats at Kanaighat Upazilla, Bangladesh

ABSTRACT

Aims: Goats contribute significantly to the rural economy by providing nutritional and food security as well as self-employment possibilities to small and marginal farmers. A study was conducted to determine the mortality rate of Black Bengal kids and to identify the influencing factors of kid mortality in Kanaighat Upazilla, Sylhet.

Place and Duration of Study: The study was conducted from May 2022 to October 2022 at farmers-level goats at Kanaighat Upazilla, Sylhet, Bangladesh.

Methodology: A detailed study was carried out on all the 13 kids died out of 53 live kids born from 36 dams during the study period of six months. The traits considered in the analysis were birth weights of kids (classified as < 1.5 kg, 1.5- 2.5kg, > 2.5 kg), Milk yield of Dam (classified as <200 ml, 200-350 ml, >350 ml), Litter size (single, twin and triplet), Sex and Parity.

Results: The results indicated that the kid's mortality was highest and lowest having milk yield of does found to be lower than 200 ml and 200-350 ml per day. On the contrary, it was also evident that the mortality of kids decreased from 44.0% to 4.76% with the increased birth weight from less than 1.5 kg groups to 1.5-2.5 kg groups respectively. Kids born as singly had the lowest mortality rate of 9.09%, followed by twins with 31.82% and triplets with 44.0% mortality. The study indicated that females had higher mortality than males kid. Male kids died at a rate of 14.26%, while female kids died at a rate of 36.0%. The first parity had the highest mortality rate (45.0%), followed by the third (20.0%), second (10.0%), and fourth (7.69%).

Conclusion: Greater emphasis should be put on improving kid birth weight, the milk-producing ability of does, and parity, which will reduce kid mortality to a greater extent and ultimately increase total productivity in Black Bengal goats.

Keywords*: Kid Mortality, Milk Yield, Birth Weight, Sex, Litter Size, Parity, Bangladesh*

1. INTRODUCTION

The Black Bengal Goat (BBG), popularly known as the "poor man's" cow, is one of the most important livestock species in Bangladesh which play a vital role in the rural economy and could be used to alleviate village poverty [1]. The importance of goats in human well-being should be emphasized because they rank second in terms of meat, milk, and skin production, accounting for around 28.0%, 23.0%, and 28% of total livestock contribution in Bangladesh, respectively [2]. The increased demand for meat and skin in both domestic and international markets has highlighted goat enterprise as extremely important to the country's disadvantaged populations under the present socioeconomic situations [2].

Black Bengal goats are renowned for their adaptability, resistance to disease, fertility, fecundity, early sexual maturation, larger litter size, tenderness of the meat, and superior skin quality [3]. Higher than 90% of the goat population consists of Black Bengal goats, which include a variety of coat colors and sizes. The Black Bengal goat's coat is mostly black, although it can also be white, brown, black and white, or white and brown [4]. It has short, silky, glossy hair. The legs are short, the back is straight, and both sexes have beards. Male horns are curved backward, whilst female horns are straight and thinner than male horns. Bucks weigh 25-30 kg at maturity, while does weigh 20-25 kg [4].

In 2015-16, the goat population was estimated to be around 25.77 million, with about 90% of which were Black Bengal goats reared by women and children in Bangladesh [5]. Out of 1.002 billion world goat population, Asia itself possesses about 556 million which is almost 60% of the total world population and Bangladesh has the fourth largest goat population in Asia, with approximately 26.38 million heads [6, 7]. The average household has 2.31 goats, which are primarily raised by small, landless and medium farmers [8]. More than 98% of Black Bengal goats are handled in the country's traditional village system [2], where villagers typically use an extensive management model, primarily with insufficient natural vegetation and crop stubbles, and with or without supplements. However, there are significant populations of goats in the country, their productivity is low due to genetic and environmental factors. High pre-weaning mortality of young kids is one of the most serious production issues that negatively affect goat productivity [3]. The mortality is higher in small breeds due to low birth weight, large litter size and less milk produced by does. Season and type of birth also have a significant effects on kid mortality [9].

In order to reduce the high rate of kid mortality it is very important to know the causes of kid mortality. Knowledge of the causes of mortality would be helpful in designing strategies that would minimize the loss of kids due to the identified problems. However, there is no systematic observation or monitoring type of study conducted on the incidence of different diseases or other factors related to kid mortality in extensively reared Black Bengal Goat in Kanaighat. The present study was, therefore, undertaken to determine the mortality rate of Black Bengal kids and to identify the influencing factors of kid mortality in Kanaighat Upazilla.

2. MATERIAL AND METHODS

2.1. Study Area

The study was conducted from May 2022 to October 2022 at farmers level goats from three unions namely Jingabari Union, Rajagonj Union, and Banigram Union of Kanaighat Upazilla, Sylhet, Bangladesh.

2.2. Data Collection

For collection of data, farmer's houses in the study areas was visited door to door. Direct interview method was used for collection of information. Information given by the goat owners was recorded on a pre-structured questionnaire. The questionnaire was prepared considering the objectives of the study and was designed in such a way that the farmers can understand easily. The collected data were classified according to sex, type of kidding and parity of dam, birth weight of kids, and dams milk yield as a source of variation.

2.3. Animal management

Goats were maintained under an extensive management system at farmers' houses. The majority of the farmers kept their goats in separate goat houses, where some of them keep beside the living room. Farmers also kept their goats at night in the corridor, kitchen, and cowshed. Farmers did not take special care with bedding or feeding. They only used bedding materials (such as rice straw, rice bran, and dry tree leaves) during the winter season. During the day, goats are generally allowed to graze on naturally available grassland around the village. Farmers did not usually vaccinate or medicate their goats due to financial constraints and unawareness.

2.4. Parameters Recorded

The traits considered in the analysis were birth weights of kids (classified as < 1.5 kg, 1.5-2.5kg, > 2.5 kg), Milk yield of Dam (classified as <200 ml, 200-350 ml, >350 ml), Litter size (single, twin and triplet), Sex and Parity.

2.5. Data analysis

The data was thoroughly examined for obvious inconsistencies, misspellings and missing data. Potential errors were identified and corrected. The collected data were loaded into a Microsoft Excel spreadsheet and the mortality rate was calculated as the number of animals that died by different causes divided by the total number of animals born during that specific period. Data pertaining to mortality rate were analyzed by standard statistical analysis namely Chi-square analysis.

3. RESULTS AND DISCUSSION

The total number of births recorded was 53 kids from 36 Dams during the study period starting from May 2022 to October 2022. Among them 22 were single, 11 were twin, and 3 were triplet birth type.

3.1 Influence of birth weight of kids on their Mortality

One of the most significant factors that affect kid's mortality is their birth weight. The findings **(Table-1**) revealed that birth weight had a significant influence (**χ 2** =9.95**) on kids' mortality. From the table, the birth weight range lower than 1.5 kg had a higher mortality rate (44.0%) than the other birth weight groups. Kids born weighing 1.5–2.5 kg had the lowest mortality rate (4.76%), followed by kids weighing more than 2.5 kg (14.28%). Among the 53 kids, a total of 40 kids survived, and the net survivability was 75.47%, whereas the mortality rate was 24.52% based on birth weight of kid respectively. It could be due to an insufficient supply of dam's milk in relation to the newborn's requirements. This study also found that by improving kid's birth weight, the mortality rate could be reduced. The current findings are consistent with those of Malik et al. [10]. He found that the birth weight of kids had a significant effect on the mortality of black Bengal goats and their crossbreds. As birth weight increased, the mortality rate in kid decreased. According to Gupta and Senger [11], kids with a low birth weight have a higher mortality rate than those with a higher birth weight.

Table-1: Influence of kid's birth weight on Mortality

Birth weight	Survived	Kids died	Total	Chi Square (χ 2)
<1.5 kg	14 (56.0)[a] (35.0)[b]	11 (44.0)[a] (84.62)b	25 (100.0)[a] (47.17)[b]	
1.5-2.5 kg	20 (95.23)[a] (50.0)[b]	1 (4.76)[a] (7.69)[b]	21 (100.0)[a] (39.62)[b]	9.95**
>2.5 kg	6 (85.71)[a] (15.0)[b]	1 (14.28)[a] (7.69)[b]	7 (100.0)[a] (53.84)[b]	
Total	40 (75.47)[a] (100.0)[b]	13 (24.52)[a] (100.0)[b]	53 (100.0)[a] (100.0)[b]	

a- Figures in parenthesis represent a percentage of the row total.

b- Figures in parenthesis represent a percentage of the column total

** - Significant (*P* =.01)

3.2 Influence of dam's milk yield on kid Mortality

Table -2 shows the decrease in kid mortality as the dam's milk yield increases. The study's findings revealed that milk yield had a highly significant influence on kid mortality ($\chi 2$ =7.73**). Kid mortality was highest in dams producing less than 200 ml of milk per day (42.86%), followed by dams producing more than 300 ml (33.33%), and dams producing between 200-350 ml of milk per day (4.76%). The present findings are in agreement with the findings of Husain et al [2], Chowdhury et al. [11] who reported that mortality of kids was negatively corelated to the increased milk yield of dams. Milk production is mainly influenced by the size of doe and availability of natural feed resources. Acute shortage of feed few weeks before and after parturition severely affects the milk production ability of does and it finally affects kids' mortality. The differences in relation with milk yield and kids' mortality reported by various authors could be due to the management and environment variation in different studies.

Table-2: Influence of dam's milk yield on kid Mortality

Milk yield	Survived	Kids died	Total	Chi Square (χ 2)
<200 ml	8 (57.14)[a] (20.0)[b]	6 (42.86)[a] (46.15)[b]	14 (100.0)[a] (26.41)[b]	
200-350 ml	20 (95.24)[a] (50.0)[b]	1 (4.76)[a] (7.69)[b]	21 (100.0)[a] (39.62)[b]	7.73**
>350 ml	12 (66.67)[a] (30.0)[b]	6 (33.33)[a] (46.15)[b]	18 (100.0)[a] (33.96)[b]	
Total	40 (75.47)[a] (100.0)[b]	13 (24.53)[a] (100.0)[b]	53 (100.0)[a] (100.0)[b]	

a- Figures in parenthesis represent a percentage of the row total.

b- Figures in parenthesis represent a percentage of the column total

** - Significant (*P* =.05)

3.3 Influence of litter size on kids Mortality

In accordance with the findings **Table-3**, litter size at birth had a significant (**χ 2** = 5.392**) influence on kid mortality. Kids born singly had the lowest mortality rate of 9.09 percent, followed by twins with a 31.82 percent mortality rate and triplets with a 44.44 percent mortality rate. It indicates that singles had a lower mortality rate than multiples.This result was consistent with the findings of Awemu et al. [13], Hailu et al. [14], Ershaduzzaman et al. [15], as well as Muthkumar et al. [16]. According to Srivastava et al. [17], single-born children have the highest mortality rate, followed by twins and triplets at 20.80%, 13.65%, and 11.28%, respectively, which is not aligned with our study. The increased survivability among single-birth kids could be attributed to higher birth weights, better nursing from does, and better maternal care. Decreased survivability among triplet kids could be attributed to lower birth weight, littermate milk sharing, and less maternal care, which resulted in mismothering and maternal rejection.

Table -3: Influence of litter size on kid Mortality

Litter size	Survived	Kids died	Total	Chi Square (χ 2)
Single	20 (90.90)[a] (50.0)[b]	2 (9.09)[a] (15.38)[b]	22 (100.0)[a] (41.50)[b]	
Twin	15 (68.18)[a] (37.5)[b]	7 (31.82)[a] (53.85)[b]	22 (100.0)[a] (41.50)[b]	5.392**
Triplet	5 (55.56)[a] (12.5)[b]	4 (44.44)[a] (30.77)[b]	9 (100.0)[a] (16.98)[b]	
Total	40 (75.47)[a] (100.0)[b]	13 (24.52)[a] (100.0)[b]	53 (100.0)[a] (100.0)[b]	

a- Figures in parenthesis represent a percentage of the row total.

b- Figures in parenthesis represent a percentage of the column total

** - Significant *(P* =.01)

3.4 Influence of Sex on kid Mortality

The results revealed a significant influence ($\chi 2=3.364$) of sex on kid mortality **(Table-4)**. From 53 kids a total of 13 died from where 4 male kids and 9 female kids. Male kids died at a rate of 14.26%, while female kids died at a rate of 36.0%. This could be due to male kids having higher birth weights than female kids. This finding agreed with the findings of Alexander et al. [18], who reported that female kids died at a higher rate than male kids. But this was not in agreement with the findings of Kumar et al. [19] and Thiruvenkadam et al. [20]. They observed a similar level of mortality rate between the male and female kids. Differences in sex chromosomes, probably in the position of genes related to growth and physiological characteristics, differences in the individual system, and the measure of hormone secretion, especially sex hormone, lead to differences in animal growth. That could be one of the reasons in which females have smaller body and lighter weight against males.

Table -4: Influence of kid sex on Mortality

Sex	Survived	Kids died	Total	Chi Square (χ 2)
Male	24 (85.71)[a] (60.0)[b]	4 (14.26)[a] (30.77)[b]	28 (100.0)[a] (52.83)[b]	
Female	16 (64.0)[a] (40.0)[b]	9 (36.0)[a] (69.23)[b]	25 (100.0)[a] (47.16)[b]	3.364**
Total	40 (75.47)[a] (100.0)[b]	13 (24.52)[a] (100.0)[b]	53 (100.0)[a] (100.0)[b]	

a- Figures in parenthesis represent a percentage of the row total.

b- Figures in parenthesis represent a percentage of the column total

** - Significant (*P* =.10)

3.5 Influence of parity on kid Mortality

A total of 20, 10, 10, and 13 birth records were recorded for the first, second, third, and fourth parities, respectively from where survived kids were 11, 9, 8, and 12. Parity had a significant influence on kid mortality (χ **2** =7.769**). The first parity had the highest mortality rate (45.0%), followed by the third (20.0%), second (10.0%), and fourth (7.69%), according to **Table -5**. These findings were in accordance with the findings of Awemu et al. [13], Chowdhary et al. [12], and Ershaduzzaman et al. [15]. On the contrary, Butswat et al. [21] observed that increased kid mortality is associated with increasing parity due to the increase

in litter size as the parity advances. Due to insufficient milk production and the delivery of a small and weak kid, does suffered significant kid loss when she gave birth for the first time. The general trend of decreasing kid mortality rates with increasing parity up to a specific parity number may be due to the doe achieving mature body weight and thus producing a large quantity of milk with increased parity.

Table 5: Influence of parity on kids Mortality

Parity	Survived	Kids died	Total	Chi Square (χ 2)
First	11 (55.0)[a] (27.5)[b]	9 (45.0)[a] (69.23)[b]	20 (100.0)[a] (37.73)[b]	
Second	9 (90.0)[a] (22.50)[b]	1 (10.0)[a] (7.69)[b]	10 (100.0)[a] (18.86)[b]	
Third	8 (80.0)[a] (20.0)[b]	2 (20.0)[a] (15.38)[b]	10 (100.0)[a] (18.86)[b]	7.769**
Fourth	12 (92.30)[a] (30.0)[b]	1 (7.69)[a] (7.69)[b]	13 (100.0)[a] (24.52)[b]	
Total	40 (75.47)[a] (100.0)[b]	13 (24.52)[a] (100.0)[b]	53 (100.0)[a] (100.0)[b]	

a- Figures in parenthesis represent a percentage of the row total.

b- Figures in parenthesis represent a percentage of the column total

** - Significant (*P* = .10)

4. CONCLUSION

In accordance with the findings of this study, kid mortality in Black Bengal goats is extremely high in Bangladesh due to both genetic and non-genetic factors. These factors should be considered in the selection program to reduce kids' mortality. Higher death rates were recorded in kids born at kidding with less than 200 ml of milk yield per day and less than 1.5 kg birth weight, kids born as triplets, female kids, and first parity, so while selecting the goats, the above areas were found to be of importance to have a better kid survival rate. So, greater emphasis should be put on improving kid birth weight, the milk producing ability of does, and parity, which will reduce kid mortality to a greater extent and ultimately increase total productivity in Black Bengal goats in this region.

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