# Factors Contributing to Kid's Mortality in Goat Kept under Desert Land Conditions

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**Abstract:** Pre-weaning death among kids in Pakistan is leading cause of economic loss to goat farmers. The study was conducted with an aim to identify the factors that contribute to kid mortality from birth to weaning. Data pertaining to various factors related to kids' mortality in five goat breeds (Beetal, Nachi, Dera Din Pannah, Teddy and Pak Angora) were obtained from Livestock Experiment Station, Rakh Kherewala, District Layyah, Punjab, Pakistan for the period from 1998 to 2007. The factors hypothesized to be associated with the kid mortality, were; breed, sex of kid, age of kid, birth weight, types of birth (single, twin, triplet), season of birth, fodder availability, flock size, breeding system, predators and diseases both infectious & non-infectious. Significance of difference among associations of various factors contributing to kid's mortality was statistically tested by Chi-square test. Maximum mortality (28.1%) and minimum (12.1%) mortality in beetal kids were noticed during 1998 and 1999, respectively. Maximum mortality (10.4%) in Teddy kids was found in 2006 against minimum (3.1%) in 2007. In Nachi maximum value was 16.4% (1998) whereas, no mortality recorded in 2007. In 2002, 7.7% mortality rate in Pak-Angora kids noticed as compared to no mortality in 1999 & 2003. Similarly, data showed 30.0% mortality in Dera Din Panah kids in 2005 as compared to in 4.1% in 2003. In conclusion, highest kid mortality was observed in teddy breed followed by Pak Angora. Pneumonia and Gastroenteritis were found as major cause of highest mortality in kids.

**Keywords:** mortality, Beetal, kids, Tedy, Pak-Angora.

## INTRODUCTION

Goats play a vital role in the social system and culture in countryside as well as provide a prospective of quick income [22]. Pakistan is blessed with 68.4 million heads of goats contributing over 70% and 12.71% of the total mutton and meat supplied in the country respectively [7]. The higher demand of meat and skin in the local as well as foreign markets, focused goat enterprise as extremely important to the vulnerable group of farmers in the existing socio-economics conditions of the country [22].

The traditional system of goat management is mainly characterized by low survivability and high kid mortality, which results in low weaning percentage. Any attempt made to ensure survival of kids is bound to increase productivity and economic returns [25]. Under extensive system in tropical areas, a pre-weaning mortality of 16-60% has been recorded, which is higher than intensive systems. This may be under estimated as deaths of newborns, which occur when goats are browsing, may go unnoticed [1]. Mortality of kids may be reduced by control of internal and external parasites, proper feeding of the dam, vaccination and improved housing [25]. But on the other hand, relatively low birth weight; slow growth rate and insufficient milk produced by the does were identified as the major constraints directly associated with higher kid mortality. Among the factors affecting kid mortality during the pre-weaning period, birth weight was the most important. Mortality rate decrease with increase of birth weight [13].

Low birth weight, insufficient milk production of does just after kidding, lack of proper care and overall faulty husbandry practices were also held responsible for higher kid mortality in the prevailing production system [13]. The present study, therefore, has been planned to identify the factors which contribute to kid mortality from birth to weaning and to use the identified factors for the development of extension messages to use by farmers.

## MATERIALS AND METHODS

Data pertaining to various factors related to kids' mortality in five goat breeds (Beetal, Nachi, Dera Din Pannah, Teddy and Pak Angora) were obtained from Livestock Experiment Station, Rakh Kherewala, District Layyah, Punjab, Pakistan for the period from 1998 to 2007. The records were analyzed to determine the possible cause of kids mortality from birth to weaning i.e. 120 days. The factors hypothesized to be associated with the kid mortality were; breed, sex of kid, age of kid, birth weight, types of birth (single, twin, triplet), season of birth, fodder availability, flock size, breeding system (controlled breeding, stray breeding/matting, predators (wolf, dogs, snake etc.), and diseases both infectious & non-infectious. The auctioned kids were not included in the data.

## DATA ANALYSIS

To find out relationship between mortality and various factors the data were analyzed using Chi-square test [29]. The data were compiled and statistical SPSS program was used to compare the results.

## RESULTS

Beetal: Maximum (28.1%) and minimum (12.1%) mortality in beetal kids were noticed during 1998 and 1999, respectively. (Table1). Mortality was more in case of male kids as compared to female kids (Tabl .2.). The death rate of male kids (8.4%) was higher as compared to female kids (3.2%). Mortality of kids was more dominated in case of triplets birth (25%) as compared to twins (7.5 %) and single (4.8 %) as in table .3. There were more deaths during hot dry summer and spring season in case of beetel kids with 37.5% and 35.4% respectively (Table.6.). Maximum mortality was observed in birth weight above 3 kg (6.2%) of kids whereas minimum in weight of 1.51 to 3.00 kg (5.5%) as in table 4. Higher mortality rate was revealed in kids in the age of 91 to 120 days (35.4%) where as low mortality in age of above 121 days (8.3%) as in table 6. Pneumonia was major cause of death with 43.8% followed by gastroenteritis with 33.3% (Table 4.1.7.). The kid mortality was more pronounced in large flock size (5.3 %) as compared to medium flock size as in table 4.1.8. The overall survivability in Beetal breed was 94.3% while mortality rate was 5.7%.

### Teddy

Maximum mortality (10.4%) in Teddy kids was found in 2006 against minimum (3.1%) in 2007 (table 4.2.1). Mortality rate was more in case of male kids as compared to female kids (Table 4.2.2.). The mortality rate was higher in male (10.4%) while it was lower in female kids (6.4%). Mortality of kids was more dominated in case of triplets (16.7%) as compared to twins (9.6%) and single (7.3%; table 4.2.3). There were more death during hot dry summer in case of Teddy kids with 39.2% mortality rate where as it was minimum in summer humid hot (20.8%; table-4.2.4). Maximum mortality was observed in birth weight 1.00 to 1.50 kg (12.6%) of kids whereas minimum in weight groups of 1.51 to 3.00 kg (7.2%; table .5). Higher mortality rate revealed in kids in the age of 91 to 120 days (31.7%; table.6). pneumonia & gastroenteritis were major cause of death with 34.2% followed by heat stroke with 25.8% (Table .7.).

### Nachi

In Nachi maximum number of kids died in 1998 with mortality rate of 16.4% whereas in 2007 no mortality occurred (Table.1.). Mortality rate was more in case of male kids (11.3%) as compared to female kids (10.0%; table .2). Mortality of kids was more dominated in case of triplets births (33.3%) as compared to twins (10.8%) and single (9.7%) as shown in table 3. More mortality was observed in hot dry summer (50.0%) in case of Nachi kids whereas minimum in autumn (3.8%; table 4). Maximum mortality was observed in birth weight above 3kg (10.2%) of kids whereas minimum in weight group of 1.51 to 3.00 kg (11.2%; 4.3.5). Higher mortality rate was revealed in kids in the age of 91 to 120 days (46.2%) whereas low mortality in Nachi was gastroenteritis with 42.3% followed by pneumonia & heat stroke with (Table 4.3.7.). The ---- mortality was more pronounced in small flock size (10.7%).

### Pak–Angora

In Pak-Angora maximum number of kids died in 2002 with mortality rate 7.7% whereas there was no mortality in 1999 & 2003 (Table 4.4.1.). Mortality rate was more in case of male kids as compared to female kids (Table 4.4.2.). The higher mortality rate was observed in male sex with mortality rate of 5.3% while in female it was 4.4%. Mortality of kids was more dominated in case of triplets births (33.3%) as compared to twins (5.1%) and single (4.6%) as shown in table 4.4.3. The higher mortality was observed in spring (32.8%) in case of Pak-Angora kids while there was no mortality in autumn (Table 4.4.4.). Maximum mortality was observed in birth weight 1.0 to 1.50 kg (8.5%) of kids whereas minimum in weight group of 1.51 to 3.00 kg (3.5%) as in table 4.4.5. Higher mortality rate was revealed in kids in the age of 91 to 120 days (44.8%). Major cause of kids' mortality in Pak-Angora was pneumonia with 44.8% followed by gastroenteritis with 32.8% (Table 4.4.7.). The kids' mortality was more pronounced in large flock size (4.9%) as compared to medium flock size (table 4.4.8.).

**Dera Din Panah**

In Dera Din Panah maximum number of kids died in 2005 with mortality rate 30.0% whereas minimum in 2003 (4.1%; table 4.5.1).Mortality rate was more in case of female kids as compared to male kids (Table 4.5.2.). The mortality rate in female sex was 12.6% while in male it was 12.1%. Mortality of kids was observed in case of single births with 13.1% (Table 4.5.3.) The higher mortality rate was observed in hot dry summer with 43.5% whereas there was no mortality in winter & autumn (Table 4.5.4.). Birth weight had non-significant effect on kids' mortality in case of Nachi kids. Maximum mortality was observed in birth weight 1.00 to 1.50 kg (100%) of kids whereas minimum in weight group of above 3 kg (11.5%; table 4.5.5). Higher mortality rate was revealed in kids in the age of 91 to 120 days (52.2%) whereas low mortality in age of 1 to 30 & above 121 days (4.3%; table 4.5.6). Pneumonia was major cause of death with 34.8% followed by gastroenteritis & enteritis with 21.7% (Table 4.5.7.). The kids' mortality was more pronounced in medium flock size (10.2%) as compared to very small flock size as in table 4.5.8.

**Table-1: Year-wise kids mortality in Betal, Teady, Nachi, Pak Angora and Dira Din Pannah goats**

| Year | Beetal Alive | Beetal Dead | Beetal Total | Teady Alive | Teady Dead | Teady Total | Nachi Alive | Nachi Dead | Nachi Total | Pak Angora Alive | Pak Angora Dead | Pak Angora Total | Dira Din Pannah Alive | Dira Din Pannah Dead | Dira Din Pannah Total |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1998 | 23 (71.9) | 9 (28.1) | 32 (100) | 30 (-78.9) | 8 (-21.1) | 38 (100) | 46 (83.6) | 9 (16.4) | 55 (100) | 220 (96.1) | 9 (3.9) | 229 (100) | | | |
| 1999 | 51 (87.9) | 7 (12.1) | 58 (100) | 30 (-78.9) | 5 (-7) | 71 (100) | 11 (84.6) | 2 (15.4) | 13 (100) | 19 (100) | 0 (0.0) | 19 (100) | | | |
| 2000 | 142 (97.3) | 4 (2.7) | 146 (100) | 128 (-93.4) | 9 (-6.6) | 137 (100) | 37 (90.2) | 4 (9.8) | 41 (100) | 282 (95.3) | 14 (95.3) | 296 (100) | | | |
| 2001 | 76 (90.5) | 8 (9.5) | 84 (100) | 124 (-87.9) | 17 (-12.1) | 141 (100) | 18 (85.7) | 3 (14.3) | 21 (100) | 127 (94.1) | 8 (5.9) | 135 (100) | | | |
| 2002 | 126 (94.7) | 7 (5.3) | 133 (100) | 149 (-94.3) | 9 (-5.7) | 158 (100) | 16 (84.2) | 3 (15.8) | 19 (100) | 72 (92.3) | 6 (7.7) | 78 (100) | | | |
| 2003 | 32 (97.0) | 1 (3.0) | 33 (100) | 14 (-92.1) | 12 (-7.9) | 152 (100) | 23 (92.0) | 2 (8.0) | 25 (100) | 63 (100) | 0 (0.0) | 63 (100) | 70 (95.9) | 3 (4.1) | 73 (100) |
| 2004 | 81 (96.4) | 3 (3.6) | 84 (100) | 196 (-94.2) | 12 (-5.8) | 208 (100) | 18 (94.7) | 1 (5.3) | 19 (100) | 121 (92.4) | 10 (7.6) | 131 (100) | 44 (81.5) | 10 (18.5) | 54 (100) |
| 2005 | 37 (97.4) | 1 (2.6) | 38 (100) | 103 (-87.3) | 15 (-12.7) | 118 (100) | 12 (92.3) | 1 (7.7) | 13 (100) | 75 (96.2) | 3 (3.8) | 78 (100) | 14 (70.0) | 6 (30.0) | 20 (100) |
| 2006 | 135 (97.1) | 4 (2.9) | 139 (100) | 240 (-89.6) | 28 (-10.4) | 268 (100) | 19 (95.0) | 1 (5.0) | 20 (100) | 89 (95.7) | 4 (4.3) | 93 (100) | 22 (88.0) | 3 (12.0) | 25 (100) |
| 2007 | 86 (95.6) | 4 (4.4) | 90 (100) | 154 (-96.9) | 5 (-3.1) | 159 (100) | 18 (94.7) | 0 (0.0) | 18 (100) | 74 (94.9) | 4 (5.1) | 78 (100) | 13 (92.9) | 1 (7.1) | 14 (100) |
| Total | 789 (94.3) | 48 (5.7) | 837 | 1330 (-91.7) | 120 (-8.3) | 1450 | 218 (89.3) | 26 (10.7) | 244 | 1142 (95.2) | 58 (4.8) | 1200 | 163 (87.6) | 23 (12.4) | 186 |

Values in parentheses represent percentage

Chi-square (X2) = 42.915a

a = Highly significant (P<0.01)

**Table-2: Sex-wise mortality of kids in, Teady, Nachi, Pak Angora and Dira Din Pannah goats**

| | Beetal | | | Teady | | | Nachi | | | Pak Angora | | | Dira Din Pannah | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex | Alive | Dead | Total | Alive | Dead | Total | Alive | Dead | Total | Alive | Dead | Total | Alive | Dead | Total |
| Male | 369 (91.6) | 34 (8.4) | 403 (100) | 623 (89.6) | 72 (10.4) | 695 (100) | 110 (88.7) | 14 (11.3) | 124 (100) | 576 (94.7) | 32 (5.3) | 608 (100) | 80 (87.9) | 11 (12.1) | 91 (100) |
| Female | 420 (96.8) | 14 (3.2) | 434 (100) | 707 (93.6) | 48 (6.4) | 755 (100) | 108 (90.0) | 12 (10.0) | 120 (100) | 566 (95.6) | 26 (4.4) | 592 (100) | 83 (87.4) | 12 (12.6) | 95 (100) |
| Total | 789 (94.3) | 48 (5.7) | 837 | 1330 (91.7) | 120 (8.3) | 1450 | 218 (89.3) | 26 (10.7) | 244 | 1142 (95.2) | 58 (4.8) | 1200 | 163 (87.6) | 23 (12.4) | 186 |

Values in parentheses represent percentage

Chi-square (X2) = 42.915a

a = Highly significant (P<0.01)

**Table-3: Relationship of type of birth with kids mortality in Beetal , Teady, Nachi, Pak Angora and Dira Din Pannah goats**

| | Beetal | | | Teady | | | Nachi | | | Pak Angora | | | Dira Din Pannah | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Birth | Alive | Dead | Total | Alive | Dead | Total | Alive | Dead | Total | Alive | Dead | Total | Alive | Dead | Total |
| Single | 551 (95.2) | 28 (4.8) | 579 (100) | 837 (92.7) | 66 (7.3) | 903 (100) | 131 (90.3) | 14 (9.7) | 145 (100) | 953 (95.4) | 46 (4.6) | 999 (100) | 153 (86.9) | 23 (13.1) | 176 (100) |
| Twin | 235 (92.5) | 19 (7.5) | 254 (100) | 478 (90.4) | 51 (9.6) | 529 (100) | 83 (89.2) | 10 (10.8) | 93 (100) | 185 (94.9) | 10 (5.1) | 195 (100) | 10 (100) | 0 (0.0) | 10 (100) |
| Triplet | 3 (75.0) | 1 (25.0) | 4 (100) | 15 (83.3) | 3 (16.7) | 18 (100) | 4 (66.7) | 2 (33.3) | 6 (100) | 4 (66.7) | 2 (33.3) | 6 (100) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Total | 789 (94.3) | 48 (5.7) | 837 | 1330 (91.7) | 120 (8.3) | 1450 (100) | 218 (89.3) | 26 (10.7) | 244 | 1142 (95.2) | 58 (4.8) | 1200 | 163 (87.6) | 23 (12.4) | 186 |

**Table-4: Relationship of birth weight with kids mortality in Beetal , Teady, Nachi, Pak Angora and Dira Din Pannah goats**

| | Beetal | | | | Teady | | | | Nachi | | | | Pak Angora | | | | Dira Din Pannah | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Weight of kids at birth (kg) | | | | | | | | | | | | | | | | | | | | |
| Type of Birth | 1.00-1.50 | 1.51-3.00 | Above 3.00 | Total | 1.00-1.50 | 1.51-3.00 | Above 3.00 | Total | 1.00-1.50 | 1.51-3.00 | Above 3.00 | Total | 1.00-1.50 | 1.51-3.00 | Above 3.00 | Total | 1.00-1.50 | 1.51-3.00 | Above 3.00 | Total |
| Alive | 6 (100) | 451 (94.5) | 332 (93.8) | 789 (94.3) | 222 (87.4) | 1016 (92.8) | 92 (91.1) | 1330 (91.7) | | 95 (88.8) | 123 (89.8) | 218 (89.3) | 270 (91.5) | 658 (96.5) | 214 (96.0) | 1142 (95.2) | 0 (0.0) | 47 (87.0) | 116 (88.5) | 163 (87.6) |
| Dead | 0 (0) | 26 (5.5) | 22 (6.2) | 48 (5.7) | 32 (12.6) | 79 (7.2) | 9 (8.9) | 120 (8.3) | | 12 (11.2) | 14 (10.2) | 26 (10.7) | 25 (8.5) | 24 (3.5) | 9 (4.0) | 58 (4.8) | 1 (100) | 7 (13.0) | 15 (11.5) | 23 (12.4) |
| Total | 6 (100) | 477 (100) | 354 (100) | 837 | 254 (100) | 1095 (100) | 101 (100) | 1450 | | 107 (100) | 137 (100) | 244 | 295 (100) | 682 (100) | 223 (100) | 1200 | 1 (100) | 54 (100) | 131 (100) | 186 |

**Table-5: Effect of Flock size on kids mortality in Beetal , Teady,  Nachi, Pak Angora and Dira Din Pannah goats**

| | Beetal | | | | Teady | | | | Nachi | | | | Pak Angora | | | | Dira Din Pannah | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Flock size | | | | | | | | | | | |
| Flock Size | Small | Medium | Large | Total | Small | Medium | Large | Total | Small | Medium | Large | Total | Small | Medium | Large | Total | Small | Medium | Large | Total |
| Alive | | 202 (93.1) | 587 (94.7) | 789 (94.3) | 224 (91.1) | 516 (90.7) | 590 (92.9) | 1330 (91.7) | 218 (89.3) | 0 (0.0) | 0 (0.0) | 218 (89.3) | 0 (0.0) | 89 (95.7) | 1053 (95.1) | 1142 (95.2) | 49 (83.1) | 114 (89.8) | 0 (0.0) | 163 (87.6) |
| Dead | | 15 (6.9) | 33 (5.3) | 48 (5.7) | 22 (8.9) | 53 (9.3) | 45 (7.1) | 120 (8.3) | 26 (10.7) | 0 (0.0) | 0 (0.0) | 26 (10.7) | 0 (0.0) | 4 (4.3) | 54 (4.9) | 58 (4.8) | 10 (16.9) | 13 (10.2) | 0 (0.0) | 23 (12.4) |
| Total | | 217 (100) | 620 (100) | 837 (100) | 246 (100) | 569 (100) | 635 (100) | 1450 | 244 (100) | 0 (0.0) | 0 (0.0) | 244 | 0 (0.0) | 93 (100) | 1107 (100) | 1200 | 59 (100) | 127 (100) | 0 (0.0) | 186 |

**Table-6: Effect of season on kids mortality in Beetal , Teady,  Nachi, Pak Angora and Dira Din Pannah goats**

| Season | Beetal | | Teddy | | Nachi | | Pak Angora | | Dira Din Pannah | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Dead | Total mortality | Dead | Total mortality | Dead | Total mortality | Dead | Total mortality | Dead | Total mortality |
| Winter | 7 (14.6) | 7 | 13 (10.9) | 13 (100) | 3 (11.5) | 3 | 12 (20.7) | 12 | 0 (0.0) | 0 |
| Spring | 17 (35.4) | 17 | 22 (18.3) | 22 (100) | 6 (23.1) | 6 | 19 (32.8) | 19 | 8 (34.8) | 8 |
| Summer: hot dry | 18 (37.5) | 18 | 47 (39.2) | 47 (100) | 13 (50.0) | 13 | 15 (25.9) | 15 | 10 (43.5) | 10 |
| Summer: Humid dry | 5 (10.4) | 5 | 25 (20.8) | 25 (100) | 3 (11.5) | 3 | 12 (20.7) | 12 | 5 (21.7) | 5 |
| Autumn | 1 (2.1) | 1 | 13 (10.8) | 13 (100) | 1 (3.8) | 1 | 0 (0.0) | 0 | 0 (0.0) | 0 |
| Total | 48 (100) | 48 | 120 (100) | 120 (100) | 26 (10.7) | 26 | 58 (4.8) | 58 | 23 (12.4) | 23 |

**Table-7:  Effect of age of kid on kids mortality in Beetal, Teady,  Nachi, Pak Angora and Dira Din Pannah goats**

| Age of Kid | Beetal | | Teady | | Nachi | | Pak Angora | | Dira Din Pannah | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Dead | Total | Dead | Total | Dead | Total | Dead | Total | Dead | Total |
| 1-30 days | 6 (12.5) | 6 | 14 (11.7) | 14 | 2 (7.7) | 2 | 16 (27.6) | 16 | 1 (4.3) | 1 |
| 31-60 days | 10 (20.8) | 10 | 34 (28.3) | 34 | 5 (19.2) | 5 | 7 (12.1) | 7 | 4 (17.4) | 4 |
| 61-90 days | 11 (22.9) | 11 | 23 (19.2) | 23 | 7 (26.9) | 7 | 8 (13.8) | 8 | 5 (21.7) | 5 |
| 91-120 days | 17 (35.4) | 17 | 38 (31.7) | 38 | 12 (46.2) | 12 | 26 (44.8) | 26 | 12 (52.2) | 12 |
| 121 days and above | 4 (8.3) | 4 | 11 (9.2) | 11 | - | - | 1 (1.7) | 1 | 1 (4.3) | 1 |
| Total | 48 (5.7) | 48 | 120 (8.3) | 120 | 26 (10.7) | 26 | 58 (4.8) | 58 | 23 (12.4) | 23 |

**Table-8: Diseases causing death in Beetal, Teady,  Nachi, Pak Angora and Dira Din Pannah goats kida**

| Disease | Beetal | | Teady | | Nachi | | Pak Angora | | Dira Din Pannah | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Dead | Total | Dead | Total | Dead | Total | Dead | Total | Dead | Total |
| Pneumonia | 21 (43.8) | 21 | 41 (34.2) | 41 | 7 (26.9) | 7 | 26 (44.8) | 26 | 8 (34.8) | 8 |
| Gastro-entritis | 16 (33.3) | 16 | 41 (34.2) | 41 | 11 (42.3) | 11 | 19 (32.8) | 19 | 5 (21.7) | 5 |
| Heat stroke | 6 (12.5) | 6 | 31 (25.8) | 31 | 7 (26.9) | 7 | 5 (8.6) | 5 | 4 (17.4) | 4 |
| Enteritis | 4 (8.3) | 4 | 4 (3.3) | 4 | 1 (3.8) | 1 | 8 (13.8) | 8 | 5 (21.7) | 5 |
| Coccidiosis | 1 (2.1) | 1 | 3 (2.5) | 3 | - | - | 00 (0) | 00 | 1 (4.3) | 1 |
| Total | 48 (5.7) | 48 | 120 (100) | 120 | 26 (10.7) | 26 | 58 (4.8) | 58 | 23 (12.4) | 23 |

**Table-9: Year-wise kids mortality in Beetal kids**

| | Year of data | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | |
| Alive | 23 (71.9) | 51 (87.9) | 142 (97.3) | 76 (90.5) | 126 (94.7) | 32 (97.0) | 81 (96.4) | 37 (97.4) | 135 (97.1) | 86 (95.6) | 789 (94.3) |
| Dead | 9 (28.1) | 7 (12.1) | 4 (2.7) | 8 (9.5) | 7 (5.3) | 1 (3.0) | 3 (3.6) | 1 (2.6) | 4 (2.9) | 4 (4.4) | 48 (5.7) |
| Total kids | 32 (100) | 58 (100) | 146 (100) | 84 (100) | 133 (100) | 33 (100) | 84 (100) | 38 (100) | 139 (100) | 90 (100) | 837 |

Values in parentheses represent percentage
Chi-square (X2) = 42.915a
a = Highly significant (P<0.01)

**Table-10: Sex-wise mortality in Beetal kids**

| | Sex of kids | | Total |
|---|---|---|---|
| | Male | Female | |
| Alive | 369 (91.6) | 420 (96.8) | 789 (94.3) |
| Dead | 34 (8.4) | 14 (3.2) | 48 (5.7) |
| Total kids | 403 (100) | 434 (100) | 837 |

Values in parentheses represent percentage
Chi-square (X2) = 10.496a
a = Highly significant (P<0.01)

**Table-11: Relationship of type of birth with kids mortality in beetal**

| | Type of birth | | | Total |
|---|---|---|---|---|
| | Single | Twin | Triplet | |
| Alive | 551 (95.2) | 235 (92.5) | 3 (75.0) | 789 (94.3) |
| Dead | 28 (4.8) | 19 (7.5) | 1 (25.0) | 48 (5.7) |
| Total kids | 579 (100) | 254 (100) | 4 (100) | 837 |

Values in parentheses represent percentage
Chi-square (X2) = 5.043a
a = Highly significant (P>0.05)

**Table-12: Relationship of type of season with kids mortality in Beetal**

| | Season of death of kid | | | | | |
|---|---|---|---|---|---|---|
| | Winter | Spring | Summer: Hot dry | Summer Humid dry | Autumn | Total |
| Dead | 7 (14.6) | 17 (35.4) | 18 (37.5) | 5 (10.4) | 1 (2.1) | 48 (100) |
| Total mortality | 7 | 17 | 18 | 5 | 1 | 48 |

Values in parentheses represent percentage

**Table-13: Relationship of birth weight with kids mortality in beetal**

| | Weight of kids at birth | | | Total |
|---|---|---|---|---|
| | 1.00-1.50 | 1.51-3.00 | Above 3 | |
| Alive | 6 (100) | 451 (94.5) | 332 (93.8) | 789 (94.3) |
| Dead | 0 (0) | 26 (5.5) | 22 (6.2) | 48 (5.7) |
| Total | 6 (100) | 477 (100) | 354 (100) | 837 |

Values in parentheses represent percentage

Chi-square (X2) = 0.587a

a = Non significant (P>0.05)

**Table-14: Age of kids at death in beetal**

| | Age of kids at death (Days) | | | | | Total |
|---|---|---|---|---|---|---|
| | 1-30 | 31-60 | 61-90 | 91-120 | 121 & above | |
| Dead | 6 (12.5) | 10 (20.8) | 11 (22.9) | 17 (35.4) | 4 (8.3) | 48 (5.7) |
| Total | 6 | 10 | 11 | 17 | 4 | 48 |

Values in parentheses represent percentage

**Table-15: Year-wise kids mortality in Teddy**

| | Year of data | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | |
| Alive | 30 (78.9) | 30 (78.9) | 128 (93.4) | 124 (87.9) | 149 (94.3) | 14 (92.1) | 196 (94.2) | 103 (87.3) | 240 (89.6) | 154 (96.9) | 1330 (91.7) |
| Dead | 8 (21.1) | 5 (7.0) | 9 (6.6) | 17 (12.1) | 9 (5.7) | 12 (7.9) | 12 (5.8) | 15 (12.7) | 28 (10.4) | 5 (3.1) | 120 (8.3) |
| Total | 38 (100) | 71 (100) | 137 (100) | 141 (100) | 158 (100) | 152 (100) | 208 (100) | 118 (100) | 268 (100) | 159 (100) | 1450 |

Values in parentheses represent percentage

Chi-square ($X^2$) = 24.870[a],

a = significant (P> 0.05)

**Table-16: Relationship of type of birth with kids mortality in beetal**

| | Type of birth | | | Total |
|---|---|---|---|---|
| | Single | Twin | Triplet | |
| Alive | 551 (95.2) | 235 (92.5) | 3 (75.0) | 789 (94.3) |
| Dead | 28 (4.8) | 19 (7.5) | 1 (25.0) | 48 (5.7) |
| Total kids | 579 (100) | 254 (100) | 4 (100) | 837 |

Values in parentheses represent percentage

Chi-square (X2) = 5.043a        a = Highly significant (P>0.05)

**Table-16: Relationship of type of season with kids mortality in Beetal**

| | Season of death of kid | | | | | Total |
|---|---|---|---|---|---|---|
| | Winter | Spring | Summer: Hot dry | Summer Humid dry | Autumn | |
| Dead | 7 (14.6) | 17 (35.4) | 18 (37.5) | 5 (10.4) | 1 (2.1) | 48 (100) |
| Total mortality | 7 | 17 | 18 | 5 | 1 | 48 |

Values in parentheses represent percentage

**Table-17: Relationship of birth weight with kids mortality in beetal**

| | Weight of kids at birth | | | Total |
|---|---|---|---|---|
| | 1.00-1.50 | 1.51-3.00 | Above 3 | |
| Alive | 6 (100) | 451 (94.5) | 332 (93.8) | 789 (94.3) |
| Dead | 0 (0) | 26 (5.5) | 22 (6.2) | 48 (5.7) |
| Total | 6 (100) | 477 (100) | 354 (100) | 837 |

Values in parentheses represent percentage

Chi-square $(X^2) = 0.587a$

a = Non significant $(P>0.05)$

**Table-18: Age of kids at death in beetal**

| | Age of kids at death (Days) | | | | | Total |
|---|---|---|---|---|---|---|
| | 1-30 | 31-60 | 61-90 | 91-120 | 121 & above | |
| Dead | 6 (12.5) | 10 (20.8) | 11 (22.9) | 17 (35.4) | 4 (8.3) | 48 (5.7) |
| Total | 6 | 10 | 11 | 17 | 4 | 48 |

Values in parentheses represent percentage

## DISCUSSION

Effect of Year: The breed-wise distribution of kids' mortality as observed in this study was 10.7, 5.7, 12.4, 8.3 and 4.8 percent among Nachi, Beetal, Dera Din Panah, Teddy and Pak-Angora breeds for the period from years 1998-2007 (Table 4.6.1.). Breed share in total mortality rate was maximum (43.6%) among Teddy kids followed by Pak-Angora with (21.1%). This study is in line with the finding of [8], who reported that kid mortality in Beetal and Nachi goats which revealed values of 12.74 and 14.9 percent. This possible reason for higher mortality in Teddy kids could be the multiple births as a result of which kids of low birth weight are born. The chances of survival of young ones having low birth weight[23,24]. The mortality, however, was the highest in all breeds during the year 1998 with 9.9%.

These results conform to those reported by [27] and [17] reported that the kid mortality was lower in crossbred than in purebred kids (Beetal x Sirohi vs Beetal or Sirohi kids), whereas in the present study the mortality in purebred was higher than in crossbred (43.6% vs 21.1%). This must be the result of higher resistant of crossbred than purebred against the diseases. While these result did not confirm to those [17] which observed that purebred and crossbred kids showed mortality rate of 59.23 and 64.58 percent in Osmanabad and Jamnapari (Purebreds) and their crosses with Sannen and Alpine breeds (crossbred), respectively.

### Effect of Sex

The sex-wise kids' mortality among different breeds averaged 4.16 and 2.86 percent in male and female sucklers, respectively (Table 4.6.3.). The sex-wise mortality share was 59.3 and 40.7 percent of the total mortality in male and female, the difference being negligible. These differences might be due to better care and protective measure. However, when different breeds involved in this study were considered, no set pattern of mortality was apparent. The results also showed the higher mortality in female in DDP breed as in table 4.5.2 because of low birth weight of female kids as compared to male. This study in line with the finding of [8] were reported significantly higher percentage (56.52%) of death cases observed in males than in females (43.48%) in Beetal goats. These results also agreed with the findings of [15, 24, 20, 17, 31] reported that male kids suffered higher mortality than female kids. While this study is not accordance with the findings of [28], reported females had higher mortality rate 56.85% than the males 43.15% kids [17,30] reported total of 33.9% of the females left the flock either due to death or culling and sales before first kidding.

### Age of Kids

Age-wise kids' mortality up to the weaning age (120 days) was studied. The frequency of kids' mortality 0-1, 1-2, 2-3, 3-4 and above 4 months of age averaged 1.0, 1.5, 2.7 and 0.4 percent respectively (Table 4.6.8.). The analysis showed that the incidence of overall mortality increased with the increase in age and maximum in 4 months (91 to 120 days). This is due to the fact that kids mostly at the neonatal stage are much prone to health hazards leading to the highest rate of mortality [4]. Comparatively high mortality in 3-4 months of age group could partly be attributed to the lack of supplementary concentrate feeding, exposure to parasitic infestation and seasonal stress. The results were in agreement with the findings of [2, 20, 27, 17, 30, 7]. The work of [12] supported this present study and studied that there was higher mortality rate of 25% for kids at the age of 3 to 8 months in Gabra goats as compared to 13% in Redille goat kids. While [31]

studied that pre-weaning mortalities were 10% while the overall mortalities from birth up to 12 months of age was 30.8%.

## Birth weight

The kids; mortality averaged 0, 1.5, 3.8 and 1.8 percent among kids having birth weights from 0-1.0, 1.01-1.50, 1.51-3.00 and above 3 kg respectively (Table 4.6.4.). Kids; mortality tended to increase with the increase in birth weight are unable to withstand inclement weather as well as the difficulties faced by them in suckling of milk from their dams, resulting in low nutrient intake and consequent high mortality [23]. The breed-wise analysis showed that kids' mortality decreased with the increase in birth weight up to 3 kg and above. These results were supported by [16,19, 24, 23]. They observed that kids' mortality tended to decrease with the increase in birth weight. While Ramirez-Bribiesca *et al.* reported that weights of the animals at death were extremely low, group (i) 0-7 days, 2.3 kg; (ii) 7-30 days, 2.8 kg and (iii) 30-90 days, 4 kg.

## Types of Birth

The mortality rate among single, twins and triplet born kids averaged 4.5, 2.3 and 0.2 percent of total mortality respectively (Table 4.6.5.). Decreased trends in mortality with the multiplicity in births were noted. The breed-wise analysis showed that there was increased rate of mortality in twins and triplet compared with the mortality in single except in Dera Din Panah which showed less kid losses in twins and triplet than in single births. This might be due to the fact that single born kids from nulliparous females had lower birth weight than twins-born kids from multiparous females [23]. The breed-wise analysis showed higher mortality rate with increase in multiple types of births. The effect of birth type was considered as one of the highly significant factors affecting the kids' mortality (2, 24, 26). This study also with in line of [31], reported that a higher proportion of the dead were twins.

## Season of Birth

Of total kids dead (275), 12.7 percent died in winter, 26.2 percent in spring, 37.5 percent in summer (dry hot), 18.2 percent in summer (humid hot) and 5.5 percent in autumn. In view of the collectively small number of deaths (15) taken place in autumn as well as winter, summer (humid hot), the overall mortality appeared to be the highest in summer dry hot season (Table 4.6.6.). This season tended to be highly stressful because of high temperature relatively humidity but also due to the scarcity off fodder in May and June which could adversely affected the milk yield of dams and ultimately the kids. The study is in line with the finding of [28] reported maximum mortality was observed in summer (36.10 percent) followed by winter (33.20 percent) and monsoon months (30.71 percent).

## Age of Dam

Age of dam is one of the important factors affecting the kids' mortality. However, information concerning this aspect was not adequately available at the farm; therefore, pertinent data could not be collected. Some of the workers, however, reported that kids born to nulliparous dams suffered greater mortality (17.0%) probably due to low birth weight than those out of multiparous dams (7.2%) [23, 17].

## Breeding System

From the data given (Table 4.6.9.), it appeared that controlled breeding system was mostly in vogue at the farm for maximum survival among kids of goat. Under this system, breeding was carried out twice a year (March to April and September to October). Consequent to the use of controlled system, kidding predominantly took place in such season that was considered best for the survival of kids. [16, 27] reported a specific effect of breeding system on kids' mortality among kids of Jamnapari goats. Kids born in winter (September-November) showed higher mortality than those born in summer (March-May) as a result of breeding in the months of April-June and October-December, respectively.

## Diseases

The highest rate of mortality among kids of different breeds was due to pneumonia (37.45%), followed by gastroenteritis (33.45%), enteritis (19.27%), heat stroke (8.0%) and coccidiosis (1.81%) as in table 4.6.7. The total mortality rate was 2.6, 2.3, 1.4, 0.6 and 0.1 for pneumonia, gastroenteritis, heat stroke, enteritis and coccidiosis. High incidence of pneumonia might be due to the more number of kids born in severe winter.

Significant losses due to kids' mortality as assessed from this study were supported by [4, 24, 25 17]. As they reported pneumonia as major cause of death in kids followed by gastroenteritis, enteritis, heat stroke and coccidiosis.

This study is also in line with the work of following scientists [18] reported that pneumonia was the major cause of death in kids. While [28] reported that enteritis (50.68 percent) was the major problem followed by pneumonia (36.99 percent) [30, 17] studied that maximum deaths occurred due to pneumonia (15.7%) followed by enteritis (12.1%) and stomatitis (11.4%) [3] Accounted disease for 44.6% of the overall pre-weaning mortality.

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