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Non-genetic factors affecting mortality in goat kids under intensive housing system

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Goats play an important role in the rural social system and culture, as well as being a source of quick income (Muhammad et al.2015). Goats contribute to food and economic security (Bhattarai et al. 2019), and they are commonly used as cash-generating animals in times of disaster. Goat farming is also excellent for landless marginal and small farmers (Uperti, 2008). Neonatal mortality is a crucial determinant of a herd's productivity and a sensitive indicator of management effectiveness. The key factor affecting goat production in the tropics and sub-tropics is kid mortality, which has been reported. A high rate of kid mortality is a significant impediment to enhanced goat rearing productivity. Non-genetic factors are expected to play a significant role in kid's mortality (Vostry and Milerski, 2013), as well as influence production potential (Gbangboche et al. 2006). Various non-genetic factors contributing to kid's mortality are discussed below:

1. Age of dam: Age of dam is one of the important factors affecting the kids' mortality. Kids born to nulliparous dams had a higher mortality rate than those born to multiparous dams, most likely due to low birth weight (Muhammad et al. 2018).
2. Age of kids: Kids especially those in the neonatal stage, are particularly vulnerable to health risks, resulting in the highest rate of mortality.The mortality rate of kid was highest during the early life and decreased with increase of age (Kamal and Nikhaila, 2009).
3. Birth weight of kid: Birth weight is the main determinant of kid survival (Bajhau and Kennedy, 1990). Birth weight of the kid had a significant influence on pre-weaning mortality rate. It has been reported that kids weighing less than a kg is

likely to be survived. Lower birth weight of kid reduces the chances of kids' survivality (Chauhan et al.2019). Kid's mortality tended to decrease with the increase in birth weight (Muhammad et al. 2018). As a result, a higher birth weight has a beneficial impact on total weaned kid output by lowering mortality and increasing growth rate.

4. Sex: The influence of sex on is a vital factor on kid's mortality. Males exhibited a considerably greater survival rate than females from 6 to 12 months of age, implying that females were more susceptible to diseases and unfavorable weather than males.
5. Type of birth: The effect of birth type was considered as one of the most important factors affecting the kids' survivality. Single kids born had a higher survival rate than twin kids (Synman, 2010 and Muhammad, 2018). The pattern of kid mortality-single<twins<triplet<quadruplet as per Miah et al.(2002).
6. Season of kidding: Birth season is the vital factor that determines the kid survivality. Season is generally characterized by the hot, wet and dry period.Mortality rate of kids is highest in rainy and winter season than summer (Miah et al. 2002). In winter, pneumonia and winter chilling are the main cause of kid mortality, whereas in rainy season, diarrhoea and high relative humidity are the leading cause for the kid mortality.
7. Parity order: Order of parity has been shown to influence neonatal mortality. It was reported that kid of first parity had a higher mortality rate than those kids born to second and third parity (Kamal and Nikhaila, 2009). Bhattarai (2021) also reported that kid mortality reduced with increasing dam parity up to the sixth parity, after which it increased at an increasing rate.
8. Teat disorders: With increasing in the age there is development of teat deformity or loss of the dam (Vostry and Milerski, 2013).
9. Litter size: Higher the litter size leads to competition among kids for the feed. This directly related with the growth f the kid, immunity development. Generally in the herd with improper management may leads to death of the weak kid due to affection of other concurrent diseases (Deribe et al. 2014).
10. Altitude: Prolificacy and pre-weaning kid mortality was also influenced with the variation in altitude. Prolificacy and pre-weaning kid mortality was high in animals staying in lower altitude. This might be associated with the occurrence/prevalence of higher parasitic loads in lower altitude.
11. Coat color: Pre-weaning kid mortality was influenced with the variation in their coat color. Higher rate of pre-weaning kid mortality was observed for the does of black & white and mixed colored does.
12. Mothering hood: Mis-mothering is one of the most frequently cause of mortality (26%) (Petros et al. 2014). It allows the new born kid to run with the rest of the flock, expose to the predators, increase the chances of starvation, injury (Mukasa-Mugerwa et al. 2000; Sharif et al. 2005).
13. Milk yield of dam: Milk yield had a highly significant influence on kid survivability (Subramaniyan et al., 2016).High mortality in kids been found in

animal with high and low yield of animals. this might be due to over feeding and starvation respectively.

14. Management practices: Keeping the newborn kid and the doe together for the first two week postpartum significantly reduces the pre weaning kid mortality (P <0.05). It also prevents injury, exposure to predators and insufficient ingestion of colostrums Separation of sick kid from the rest of kids significantly reduces the pre weaning kid mortality (Petros et al. 2014).
15. Diseases:
    Major percentage of pre-weaning kid mortality isoccurring due to infectious, non infectious and other miscellaneousreasons, respectively. The major causes of kid mortality were infectious (63%) followed by predators (10%), mechanical (4%) and congenital (1%) (Ershaduzzaman et al. 2007). Among the infectious causes kids were died due to diarrhea 30- 32.61%, pneumonia 27- 42.39%, bloat & enterotoxaemia 4.34- 23%, ecthyma 2- 20.65% and other causes (Chowdhury et al. 2002; Ershaduzzaman et al.2007). The morbidity was higher in female goats due to diarrhoea and pneumonia.

a) Pneumonia: Death in kids due to pneumonia and diarrhea were reported by earlier works (Donkin and Boyazoglu, 2004; Sharif et al. 2005; Ershaduzzaman et al. 2007). Highest mortality observed due to this disease condition 20%.
b) Diarrhea: One of the reasons of diarrhea is over suckling of milkresulted in neonatal scouring, indigestion, acidosis (Subramaniyan et al. 2016). Neonatal enterotoxaemia (Drunken kid disease) mainly caused by the *Clostridium perfringens* type D. Theclinical signs includes anorexia, dullness, abomasal distension and pain, ataxia and recumbency which looked like drunken stance in the early stage of the disease(Subramaniyan et al. 2016).
c) Parasitic infestation: High proportion of kid mortality (44.6%) due to diseases and parasites was reported from Botswana (Aganga et al. 2005). Even higher (63%) contribution of diseases to kid mortality was reported in Black Bengal Kids in Bangladesh (Ershaduzzaman et al. 2007).
d) Ecthyma or Orf: It is a viral skin and mucosae disease with symptoms of scabby mouth, contagious pustular dermatitis or sore mouth (Brahma et al. 2020). Morbidity of the disease can be as high as 100% and observed high mortality among young animals is due to the inability to intake feed.
e) Enzootic ataxia: It is occur due to deficiency of copper. It is occur in lambs and kids with high morbidity and mortality, in the Ethiopian Rift Valley, was described by Roeder (1980).
f) Miscellaneous causes: Unknown causes, goat's pox and predators like hyena also contributed to the mortality of kids.

Conclusion

High pre-weaning mortality of young goats is one of the most critical production issues that has a negative impact on goat production.Several factors had been reported in the literature to affect mortality rate in goat kids such as type of birth, sex of kid, birth

weight of kid, parity order, season of kidding, age of the kid and diseases. A high mortality and morbidity could indicate a problem with animal welfare, raising ethical concerns about animal production. The principal limits to goat production are high neonatal mortality and limited growth among those who survive.

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