



Effects of flooring and rearing system on hoof health of dairy cows in some selected areas of Bangladesh

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Abstract

A survey was conducted to explore prevalence and risk factors of diverse hoof disorders on dairy cows at Chittagong and Patuakhali, Bangladesh from June 2012 to February 2013. About 2103 cows were examined from where 497 cases identified having fissure (37%), crack (19%), partially broken (19%), swollen hoof (16%) and multiple disorders (9%) in backyard dairy cows whereas 37%, 17%, 20%, 20% and 6% in commercial cows, respectively. Significantly higher prevalence ($p < 0.05$) was recorded in cows reared under concrete floor (68.4%) compared to brick (13.27%) and concrete with rubber bedding (18.3%). Other major conventional risk factors were season, age, milk yield and washing practiced on floor though the results were not significant ($p > 0.05$). The study has remarked frequency of hoof diseases in the survey areas along with factors causing risk to dairy cows.

Key words: flooring system, hoof health, prevalence and risk factors

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Introduction

Hoof is a hard and horny covering of the ends of digits. Diseases at hoof considered as an important health hazard having a negative effect on the welfare of dairy cows (Bergsten 2004). It has a tremendous impact directly on cattle and indirectly on economic profit in dairy production (Hernandez et al. 2005). Avulsion of hoof, sloughed-off, cracked, fissured, broken, luxated hooves are frequent disorders of hooves alarming the hoof health. Different localized and systemic diseases like Foot and Mouth Disease (FMD), foot rot, wound, arthritis, laminitis, bed sore, abscess, milk fever, downer's cow syndrome and physical trauma predispose cow towards abnormalities of hooves leading to lameness and recumbancy of animal (Cook et al. 2005). In addition, high yielding dairy cows, over-nourished and heavy weight cows which are reared intensively on concrete floor (Sogstad et al. 2005) are considered as risk factors.

Lameness due to hoof disorder has been identified as a major welfare determinant in cattle because of discomfort and pain (Offer et al. 2000). More than 60% lameness in cattle is caused by disorders such as sole ulcers, heel

erosion, sole bruising and white line separation and under run (double) soles. There are also some other intrinsic risks for lameness including season, gestation, stage of lactation (Green et al. 2002), previous disease and parity (Hirst et al. 2002). All these hoof disorders and lesions have a direct or indirect effect on the dermis (corium) of hoof and are associated with laminitis (Belge et al. 2005). Many sequestrations such as reduced conception rate, ovarian activity, premature culling, occasional mortality and increased calving interval are associated with lameness (Knight 2001). Lameness cows show more susceptibility to mastitis, the most significant economic disease of dairy animals leading to poor production.

There are indiscriminate researches on hoof health related welfare (Enting et al. 1997), production, reproduction and diseases in high yielding dairies (Green et al. 2002, Hirst et al. 2002, Hedges et al. 2001, Knight 2001, Vokey et al. 2001). However, a limited information is available on hoof disorders of cross-bred cattle in our country. The actual prevalence is controversial and management dependents rely on geography. Therefore, the present study was anticipated to explore prevalence of hoof

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disorders and to detect associated risk factors leading to hoof diseases of dairy cows at Chittagong and Patuakhali districts of Bangladesh.

Materials and methods

This study was conducted on commercial and backyard dairy cows of Chittagong metropolitan area (CMA), Patiya upazila of Chittagong and Bauphal upazila of Patuakhali district in Bangladesh. About 2103 dairy cows belonging to 87 farms (backyard farms) kept under consideration where farms were selected by random sampling technique. Among all cases, cross (1557 cows) and local (446 cows) breeds of dairy cows were examined. Cows, under commercial farming system cent-percent were cross of local with exotic and backyard system mostly of indigenous.

Questionnaire was designed to comprise mostly closed ended (categorical) questions according to (Thrusfield 2005). Repeated questioning was performed over farmers, observation of cows and taking records from register book. Survey was undertaken from March 2012 to February 2013. Animal level data were recorded including breed, age, sex, body condition, posture, physical status, parity, milk yield per day, major diseases, diseases relevant to hoof, type of floor, rearing system, washing system, housing pattern, floor (katcha/ dirt/ muddy/ brick/ concrete/ rubber bedded), rearing system (intensive/ semi-intensive/ free-range) as well as system of grazing or zero-grazing. Clinical examinations findings were noted down accordingly.

Diagnosis was made on the basis of clinical history, closed and careful examination of hooves scientifically. General attitude (alertness/ dullness/ depression), body condition (Cachectic/ poor/ fair/ good/ fat/ over fat) and posture gait (normal/ defective) were cautiously inspected by distant inspection (Radostits et al. 2000). Closed examinations of hooves were identified major disorders like fissure, crack, partially broken, avulsion, overgrowth and sole ulcer (Figure 1) as well as diseases i.e. foot and mouth disease, foot rot, laminitis, physical injury, wounds, abscess, myiasis, arthritis, bed sore.



Figure 1. Hoof disorders: cracked hoof (A), partially broken hoof (B), avulsion of hoof (C) and sole ulcer (D)

Data were entered into MS excel (Microsoft office excel 2007, USA). Descriptive analysis was performed by STATA version 12.1 (STATA Corporation, USA) to estimate the association between a categorical explanatory variable with outcome, and then Chi square (χ^2) test was performed. An association was regarded as significant if $p < 0.05$.

Results

In the present study, 497 cases were identified from 2103 different examined cows where cows were recorded from Shikalbaha area of Patiya (472), Bauphal (22) and Chittagong Metropolitan Area (3). Among them 37%, 20%, 19%, 17% and 7% cows suffered from broken, swollen, cracks and multiple problems, respectively. Three age groups were categorized accordingly <5 years (81 cows), within 5 to 8 years (350 cows) and >8 years (66 cows). It was found that, only rearing system of cows was significantly associated ($p < 0.05$) with different hoof disorders. Details of the relationship with their p values are illustrated in Table 1.

The present study revealed that prevalence of hoof disorders was maximum in cows reared under intensive housing (98%) compared to semi-intensive (2%). Moreover, partially broken (60%) hooves were significantly ($p < 0.05$) higher in semi-intensive cows whereas fissured (37%) hooves were mostly prevalent in intensive cows.

Table 1. Hoof disorders with different explanatory variables (using χ^2 test)

Variables	Level	Number of hoof disorders					Total	p value
		Crack	Partially Broken	Fissure	Swollen	Multiple problems		
Farm type	Backyard	21 (19)	21 (19)	40 (37)	17 (16)	10 (9)	109 (21.93)	0.82
	Commercial	66 (17)	76 (20)	143 (37)	76 (20)	27 (6)	388 (78.06)	
Season	Autumn	37 (17)	41 (19)	79 (37)	40 (19)	16 (8)	213 (42.86)	0.99
	Rainy	18 (18)	19 (19)	38 (38)	19 (19)	6 (6)	100 (20.12)	
	Winter	32 (17)	37 (20)	66 (36)	34 (18)	15 (8)	184 (37.02)	
Rearing system	Intensive	85 (17)	91 (19)	182 (37)	92 (19)	37 (8)	487 (98)	0.01
	Semi-intensive	2 (20)	6 (60)	1 (10)	1 (10)	0	10 (2)	
Type of floor	Brick	13 (20)	13 (20)	26 (39)	12 (18)	2 (3)	66 (13.28)	0.29
	Concrete	53 (16)	72 (21)	129 (38)	60 (18)	26 (8)	340 (68.4)	
	Combined	21 (23)	12 (13)	28 (31)	21 (23)	9 (10)	91 (18.31)	
Floor washing	SID	8 (15)	10 (19)	19 (35)	13 (24)	4 (7)	54 (10.85)	0.86
	BID	55 (19)	54 (19)	111 (38)	50 (17)	19 (7)	289 (58.15)	
	TID	24 (16)	33 (21)	53 (34)	30 (19)	14 (9)	154 (31)	

*SID, single in a Day; BID, twice in a Day; TID, trice in a Day; figures in the parentheses indicate the percent values

It was found that diseases of hooves were mostly prevailed at 6-8 years aged cows. Fissured hooves were more regardless of the age where cracked hooves were mostly in older cows though the results were insignificant ($p > 0.05$) (Figure 2). On the other hand, the highest 72.5% hoof disorders were observed in cows having 10-14 liter milk yield per day ($p > 0.05$) (Figure 3).

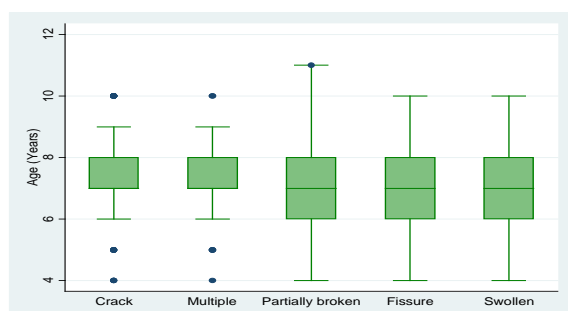


Figure 2. Age specific prevalence of hoof disorders

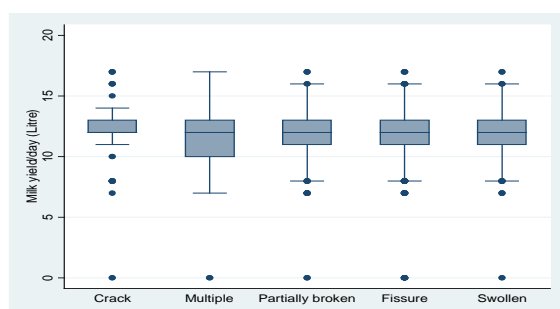


Figure 3: Prevalence of hoof disorders based on milk yield

Discussion

Our study revealed 497 various hoof diseases and disorders case from 2103 commercial and backyard dairy cows on which prevalence of cracks were 17% and 19%, respectively that were almost similar to the findings of Bielfeldt et al. (2004) who reported as 15.7% to 17.1% in Swiss dairy cows. A higher rate of 72% hoof abnormality was reported by Manske et al. (2002). Moreover, wide varieties of lower rates were published as 7.9% in Germany by Schopke et al. (2013), 3.5% in Ethiopia by Sulayeman and Fromsa (2012), 0.6% -39.9% in Netherland by van der Waaij et al. (2005). Intensively reared cows showed higher risk to suffer from different hoof disorders compared to grazing cows (Haskell et al. 2006; Hultgren and Bergsten 2001). Among the disorders, prevalence of fissure was higher (37%) than others i.e. van der Waaij et al. (2005) recorded 0.13-0.91% fissure in Denmark. In addition, prevalence of swollen hooves (16-20%) were inconsistent with the findings of other researcher (Bielfeldt et al. 2004; Sulayeman and Fromsa 2012; Hedges et al. 2001), whereas lower frequency of 5.5% and 5% swollen hooves were reported by Schopke et al. (2013) and Clarkson et al. (1996), respectively. Moreover, 19-20% cows had partially broken hooves which were agreed by Bielfeldt et al. 2004 in Switzerland. Higher rates were reported by Vanegas et al. (2006) (60%) in US and lower

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rates were analyzed by Clarkson et al. (1996) (8%) in UK and Schopke et al. (2013) (7.1%) in Germany. Finally, a range of 6-9% cows were found to have more than one hoof problem under this study. Variable sizes of the study population, climatic effect and floor type of the study farms and genetic make-up of different breeds might reflect the variations of results.

Present study noticed that commercial dairy cows reared in intensive housing showed significantly higher prevalence of hoof disorders compared to free-range or semi-intensive which is disagreed by Somers et al. (2003) where higher (63%) prevalence in pasture grazing than lower 37.4% in housed animals. On other hand, Amory et al. (2006) and van der Waaij et al. (2005) recorded 7.5% and 21.2% digital dermatitis as hoof lesions in Netherland. The type of floor and flooring materials used in different countries might have variable effects on creating hoof disorders. This study established 13.28% prevalence on cows housed on bricked floor and 68.4% on concrete though lower prevalence was reported by Somers et al. (2003) (20.1%) and Bergsten (2001) (10.21%). Additionally, 18.31% prevalence on concrete floor having rubber bedding was revealed by this study was much higher than the findings of Bergsten (2001).

The cows identified having hoof diseases all were cross of local whereas Sulayeman and Fromsa (2012) reported 3.8% prevalence in both local and Holstein Friesian cows with 1.6% in cross breeds. The study also showed a higher 70.4% prevalence in the cow of 5-8 years old with lower in the cows <5 years (16.3%) and >8 years (13.3%) while Sulayeman and Fromsa (2012) published a higher 4% prevalence in the cows of >2 years and a lower 2.2% in <2 years old cows. In addition, Talukdar et al. (2005) found 2.11% and 2.82% prevalence in calves and heifer cow, respectively in Bangladesh. Cows having 10-14 liter of milk production were found more prone to hoof disorders (72.5%) compared to 19.1% in <10 liter and 8.45% in >14 liter milk yielding cows and the findings were agreed by Hultgren et al. (2004). Moreover, Shearer and Amstel (2000) recorded 11.4%, 13.3% and 8.1% in the cows with 1st, 2nd and subsequent lactations. High yielding cows suffer from more disorders might be due to inadequate nutrient supply and management (Mulling et al. 2006).

Seasonal prevalence of the study showed 17% cracked, 19% partially broken, 37% fissured, 19% swollen and 8% having multiple disorders during autumn while Manske et al. (2002) and Hedges et al. (2001) reported overall prevalence of 5.1% in Sweden and 70% in UK respectively. In addition, hoof disorders were found as crack (18%), partially broken (19%), fissure (38%), swollen (19%) and multiple disorders (6%) whereas Clarkson et al. (1996) recorded 20% and 18.6% in US and UK accordingly. Furthermore, prevalence at winter was noticed as crack (17%), partially broken (20%), fissure (36%), swollen hooves (18%) and multiple problems (8%) though Clarkson et al. (1996) published 80% and 25% in US and UK consequently. Geographical distribution of animals might be adapted to a particular climate favorable to avoid unnecessary sufferings by seasonal variations. Further extensive studies are needed to confirm the present status of hooves, to investigate the specific causal agents responsible for alteration of hoof health and economic losses caused by hoof disorders.

Conclusion

The hoof disorders were mostly found in the cows reared commercially under intensive housing where autumn season, concrete floor, aging and high milk yield were found most probable risk factors contributing to do these. The study addresses the prevalence and factors causing hoof diseases to the farmers, attendants as well as the veterinarians of Bangladesh so that they can take necessary steps for better welfare and management of cows and profit of the farmers.

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