

ORIGINAL ARTICLE

**Welfare Assessment of Dairy Cows in Commercial Farms in Chattogram, Bangladesh**

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**Abstract**

**Background:** Dairy farming is a major component of livestock in Bangladesh. However, a baseline study on the welfare of dairy cattle in Bangladesh is still new. Therefore, a cross-sectional study was performed to assess the present welfare status of dairy cows at the farm level.

**Method:** A total of 36 dairy farms of Chattogram having a total of 1,110 cross-bred multiparous lactating cows were studied to assess the health and welfare through farm investigation and animal-based measurements using a well-structured questionnaire. Data regarding farm management were collected by observation of the farm and interviewing the farmers. On the other hand, the cows were observed to identify the disorders with a special focus on the hock, claw, and hoof abnormalities. The data were then analyzed using Stata-14 and  $P < 0.05$  was taken as significant.

**Results:** The study showed that most of the farms used an intensive system (75%) while 47% and 17% of the farms had moderately dirty or dirty floors, respectively. Improper manure disposal led to heavy fly infestation (33%). Lameness and stereotypy behaviors were found in 12% and 14% of animals, respectively. Hock, claw, and hoof abnormalities were found in 30%, 37%, and 28% of the animals, respectively, whereas injuries were observed in 19% of the cows. About 25% of the injuries occurred in face-out rearing systems; 1.8 times more than the face-in systems. Moreover, cows on farms with bad drainage systems were 2.4 times more likely to have injuries compared with cows reared on farms with good drainage systems. It was also observed that hock and hoof abnormalities were significantly ( $P < 0.05$ ) associated with the quality and conditions of floor, and drainage systems.

**Conclusion:** These results suggest that the welfare of dairy cows in the commercial farms in Chattogram of Bangladesh is compromised and needs to be improved for better production and profitability.

**Keywords:** Dairy cows, animal welfare, injuries, farm conditions, hock health, Bangladesh

## Introduction

To meet the demand for milk and meat for the large population of Bangladesh, the number of dairy farms is rising gradually. Although farm animal welfare has been of considerable concern in most developed countries, concern for animal welfare in Bangladesh is just emerging. The drive to increase dairy cattle production is taking place while their well-being is being overlooked. However, consistent with the rising quality of life and education level among the Bangladeshi people, interest in dairy cattle welfare is slowly growing. Moreover, to gain access to global markets, satisfy consumer concerns, produce healthy foods, and ensure the good health of both people and animals, it is vital to ensure the optimum welfare of production animals.

Most welfare assessments include animal-related parameters such as behavior, body cleanliness, lameness, skin lesions, injuries, and on-farm conditions such as evaluating the housing systems and drainage facilities (Webster, 2005; De Vries *et al.*, 2015). Animal-based indicators are increasingly preferred over resource-based indicators because they are more closely related to the welfare of animals and help to measure the actual state of the animal (Webster *et al.*, 2004; Pugliese *et al.*, 2021). Skin injuries on any part of the animal's body are indicators that the welfare status of the animal may be compromised, particularly in relation to its environment. These lesions are associated with pain and suffering (Main *et al.*, 2003; Grandin, 2018).

Poor management practices related to housing, the attitude of staff, the surrounding environment, waste management systems, and so on, may affect the normal behavioral expression of the animals inducing physiological problems, reducing immunity, and increasing disease incidences (Hristov *et al.*, 2011). The holding of manure in cow housing units for long periods without cleaning exposes the claws to a continuous wet environment which softens the horny parts of the claws, predisposing them to the development of lesions within their hocks and ultimately leading to lameness (Nguhiu-Mwangi *et al.*, 2013). Accumulated wet manure also exposes udders to unhygienic conditions that predispose them to mastitis, particularly when the cows lie on such manure most of the time as has been previously observed (Whay *et al.*, 2003). The

subsequent development of lameness and mastitis will cause pain and inevitably lead to poor welfare.

Researchers have used various approaches to study the welfare of dairy cows. Examples of such concepts include the Five Freedoms in the United Kingdom (FAWC, 1993), the concept of the Animal Need Index in Austria (Bartussek *et al.*, 2000), the concept of biological needs (Bracke *et al.*, 2002), the EU Welfare Quality® protocols (2009) for assessment of cattle welfare, among others. These approaches for assessing the welfare status differ. They all include direct observations of the animals, their housing systems, and surroundings; scrutinizing farm records, and asking questions of the farmers. Based on an integrative approach using animal-based measurements and farm records, this study was carried out to highlight the important welfare problems of dairy cows in Bangladesh.

## Materials and Methods

### Study design

The present investigation was conducted on commercial dairy farms in the urban and peri-urban areas of the Chattogram district. A cross-sectional study was done to assess the health and welfare of dairy cows using farm conditions and animal-based measurements. Information was collected during farm visits to 36 dairy farms located in Chattogram, Bangladesh. The farms were selected based on easy accessibility to the farm and the willing cooperation of the farm owners. A total of 1,110 cross-bred multiparous lactating cows with different ages and production statuses were considered for the present investigation.

### Data collection

The required information and data were collected through personal visits to the selected farms and direct interviews with the farmers with a preset questionnaire with multiple-choice and semi-closed questions. A preliminary questionnaire was prepared and trialed with some dairy farms before starting the actual data collection. The questionnaire was divided into several parts. The animal housing and the adjacent environment were inspected directly with a prepared sheet for recording the data. Structure, sloppiness, cleanliness of the floor, the provision of a rubber pad

or other bedding, and evaluation of the ventilation system were among the items that were checked. Other questions were asked along with the direct observation of the waste management system, distance of the waste pit from the barn, amount of fly nuisance, and the source of water supplied to the animals for drinking. The presence of any slurry on the walk alleys and in the barns was also noted.

### **Examination of the farm records**

Farm records were inspected along with farmer interviews to gather information about the average milk yield; the prevalence of mastitis, milk fever, lameness, sudden death, and other diseases; the number of animals sold for slaughter in the last year; their source of water and its quality; how cattle are dried off; their facilities for grazing; the number of dairy cattle in different categories; veterinary services received; animal welfare perceptions; and profitability.

### **Inspection of cows**

A sample of each cow herd was evaluated for a number of traits by both visual inspection and stockman information. The variables included lameness, ectoparasite infestation, dermatitis, dirtiness score, tick infestation level, number of injuries, claw lesions, and hock conformation. The presence or absence of the above parameters was coded on the datasheet. The body coat was also scored as glossy or not glossy.

### **Cleanliness scoring and fly infestation**

Cleanliness was evaluated at the hind leg, udder, and other body parts as a whole as per the protocol described by Welfare quality® (2009). Apparently, clean or negligible dirtiness was scored as 1, moderate dirtiness was scored as 2, and very dirty was scored as 3. If less than 10% of the area of the udder skin was covered with dirt, the udder was evaluated as clean. Dirt covering between 10% and 50% of the skin area was scored as dirty; more than 50% of the skin area covered with dirt was scored as very dirty. The cleanliness of floors, hind legs, and overall body were scored with the same system. Fly infestation was measured by visual estimation and a judgment as to how much the cows and stockmen seemed to be bothered using less, moderate, and heavy infestation scores.

### **Injuries and tick infestation**

Cows were examined systematically for the presence of injuries such as abrasions, lacerations, ulcerations, or fresh bleeding at different anatomical regions as defined and described by Alam *et al.* (2010a, b). Tick infestations were looked for in the most common sites such as the udder, groin, and axilla (Costa *et al.*, 2013). Cows were also examined for dermatitis for the present or absent and scored.

### **Hock, claw, and hoof health**

The hocks of each cow selected were observed for evidence of damage or swelling. Hock damage was noted when hair loss increased to the point of leaving the hock bare or when abrasions were found. Swelling was determined by visual inspection as it was not always feasible to touch and/or palpate the hock. All of the claws of each selected cow were observed for evidence of any abnormalities or disorders. The claw was categorized as normal, poor conformation, overgrown, lesion, or overgrown with a lesion as defined by Venogopalan (1997). Hoof health was also determined using the same procedure. Lameness was scored as either 0 when absent or 1 when present.

### **Data analysis**

The data were imported into STATA-14. Descriptive statistics were computed for cow-level and farm-level factors and to measure mean, SEM at 95% confidence interval. Risk factor analysis of skin injuries was calculated by univariate logistic regression model. Chi-square ( $\chi^2$ ) statistics were used to determine unconditional associations between all risk factors related to dairy welfare. A probability level of  $P < 0.05$  was considered to be significant.

## **Results**

### **Dairy farms condition**

Table 1 depicts that most farms were intensive (75%) and used a face-in system (50%). Floor cleanliness, drainage systems, manure disposal, and ventilation status were not satisfactory but the provision of ceiling fan, cold protection; water frequency, trough cleanliness, and ectoparasite control were generally satisfactory. About 75% of the farm owners disposed

Table 1. General farm management ( $N = 36$ )

Variables	Category	Frequency (%)
Farm condition		
Farm type	Intensive	27 (75.00)
	Semi-intensive	9 (25.00)
Housing type	Face in	18 (50.00)
	Face out	6 (16.67)
	Both	6 (16.67)
	Haphazard	6 (16.67)
Floor-type	Bricked (with small pitted)	6 (16.67)
	Pacca (with cracked and slippery)	11 (30.56)
	Concrete (with bedding materials)	19 (2.785)
Sloppiness of the floor	Flat	16 (44.44)
	Slope	20 (55.56)
Cleanliness of floor	Clean	13 (36.11)
	Moderate dirty	17 (47.22)
	Dirty	6 (16.67)
Hygiene and comfort status		
Drainage system	Good	13 (36.11)
	Bad	23 (63.89)
Farm effluent disposal	Around farm premises	27 (75.00)
	Used in biogas plant	6 (16.67)
	Away from farm	3 (8.33)
Rubber pad	Used	22 (61.11)
	Not used	14 (38.89)
Fly infestation	Less infestation	19 (52.78)
	Moderate	5 (13.89)
	High infestation	12 (33.33)
Ventilation status	Good	12 (33.33)
	Bad	24 (66.67)
Provision of ceiling fan	Present	27 (75.00)
	Absent	9 (25.00)
Proper space allocation	Yes	22 (61.11)
	No	14 (38.89)
Water and feeding status		
Fodder land	Present	12 (33.33)
	Absent	24 (66.67)
Grazing facility	Yes	9 (25.00)
	No	27 (75.00)

## Welfare Assessment of Dairy Cows in Commercial Farms

of manure on their farms and 33% of the farms were highly fly infested. Minimum availability of fodder land (33%) and grazing land (25%) were observed. About 61% of farms used rubber pads for bedding. Feed was manually mixed on 75% of the farms and the water supply was also sufficient on 75% of the farms. Some farms (33%) reared cows mixing with other species and others did not provide sufficient space (39%) for individual animals. About 56% of the farmers did not maintain organized record-keeping systems.

### Individual animal measurements as indicators of welfare

According to the Table 2, the tick infestation, dermatitis, injuries, and lameness were at 15%, 27%, 20%, and 12%, respectively. Injuries were observed for 19% of the cows. Hock, claw, and hoof abnormalities were 30%, 37%, and 28%, respectively. On the other hand, stereotypy behavior and diseases were at 14% and 9%, respectively.

### Dirtiness and glossiness

The overall percentage of glossy coats was higher than dirty coats. In all the cows examined, all their limbs were soiled to various extents (Table 3).

### Body injuries as an indicator of welfare

Of the 1,110 animals examined, 216 had at least any type of body injury (Figure 1). The leg, udder, and back were the commonly affected parts. The highest proportion of injuries was found in the leg region (30%) followed by the udder, back, and neck region (Table 4).

It was observed that 25% of the injuries occurred in the face-out system of rearing which was 1.80 times riskier than the face-in system ( $OR = 1.80, P < 0.05$ ). Moreover, cows on farms reared with bad drainage systems were 2.37 times more likely to be injured than the cows reared in farms with good drainage systems ( $OR = 2.37, P < 0.05$ ). Dirty rubber pads, bad drainage systems, and the absence of the farmer's knowledge about farmhouse design had significant associations with injury ( $P < 0.05$ ) (Table 5).

In Table 6, the hock, claw, and hoof health were described. It was found that there was the presence of abnormal conditions in the hock, claw, and hoof in 29.5%, 36.6%, and 27.7% of animals, respectively (Figures 2-4).

Table 2. Welfare conditions of individual animals ( $N = 1,110$ )

Variables	Category	Frequency (%)	95% CI
Tick infestation	Yes	161 (14.55)	11.45-17.45
	No	949 (85.45)	82.55-88.55
Dermatitis	Yes	300 (27.03)	23.93-29.29
	No	810 (72.97)	70.72-76.00
Injuries	Present	216 (19.46)	17.35-22.13
	Absent	894 (80.54)	77.93-82.78
Hock	Normal	782 (71.45)	67.8-73.14
	Disorder	328 (29.55)	27.56-32.43
Claw	Normal	704 (63.42)	60.58-66.26
	Disorder	406 (36.58)	24.60-29.85
Hoof	Normal	803 (72.34)	69.71-74.98
	Disorder	307 (27.66)	24.66-30.11
Lameness	Present	134 (12.07)	10.30-14.54
	Absent	976 (87.93)	85.82-89.73
Stereotypy	Present	153 (13.78)	11.83-16.00
	Absent	957 (86.22)	83.90-88.70

Table 3. Body coat glossiness and cleanliness (N = 1,110)

Variable	Category	Frequency (%)	95% CI
Body coat	Glossy	730 (65.8)	62.5-68.2
	Not glossy	380 (34.2)	31.8-37.5
Body dirtiness	Clean	559 (50.4)	47.3-53.2
	Moderate dirty	470 (42.4)	39.4-45.3
	Heavy dirty	81 (7.3)	5.8-8.9
Hindquarter Dirtiness	Clean	296 (26.7)	23.6-28.8
	Moderate dirty	667 (60.1)	57.4-63.2
	Heavy dirty	147 (13.4)	11.3-15.4
Udder dirtiness	Clean	337 (30.4)	27.3-32.7
	Moderate dirty	554 (49.9)	47.1-53.1
	Heavy dirty	219 (19.7)	17.6-22.3

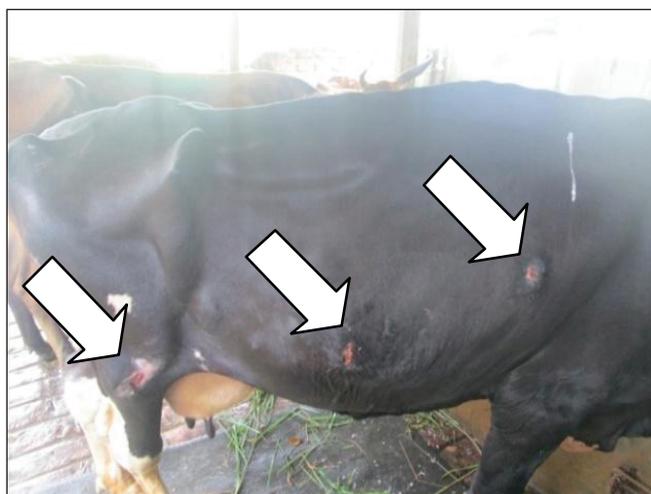


Figure 1. Injuries at various parts of the cow’s body (White arrow)

**Hock disorders as an indicator of welfare**

The association between hock disorders and management factors such as floor type, sloppiness, rubber pad condition, and drainage are shown in Table 7. Hock swelling was the most common hock disorder. Dirty floors were associated with more swelling than clean floors. Cows that were provided with rubber pads showed less hock swelling (18.5%) than those without rubber pads (24.9%). Normal hock was associated with good management practices such as concrete floors with bedding materials and good drainage. On

the other hand, hock abnormalities were significantly associated with management risk factors ( $P < 0.05$ ).

**Hoof health in dairy cows**

Table 8 shows the association between hoof health and management risk factors. The prevalence of overgrowth was the greatest hoof health problem (Figure 2). However, those farms that used rubber pads as bedding had less (12.2%) overgrowth than those without pads (25.9%). The lesion in interdigital spaces (Figure 3) was 9.6% with very dirty floors which was

Table 4. Distribution of injuries in various parts of the body (N = 216)

Body region	Frequency (%)	95% CI
Horn	7 (3.24)	0.86-5.62
Nose	5 (2.78)	0.57-4.94
Neck	21 (9.72)	5.74-13.70
Wither	1(0.46)	0.50-1.40
Hump	14 (6.48)	3.17-7.79
Back	23 (10.64)	6.60-14.79
Loin	19 (8.79)	4.98-12.60
Paralumber fossa	19 (8.79)	4.99-12.60
Udder and teat	23 (10.65)	6.50-14.79
Leg	65 (30.09)	23.93-36.26
Tail	19 (8.33)	4.62-12.05

Table 5. Injuries and associated management factors using univariate logistic regression model (N = 1,110)

Variables	Category	N	Injury		OR <sup>a</sup>	P-value
			Present (%)	Absent (%)		
Housing type	Face-in	570	88 (15)	482 (85)	1	0.005
	Face-out	240	60 (25)	180 (75)	1.82	
	Both	150	34 (23)	116 (77)	1.60	
	Haphazard	150	34 (23)	116 (77)	1.60	
Floor-type	Bricked (pitted)	573	120 (21)	453 (79)	1	0.0002
	Pacca (cracked)	240	60 (25)	180 (75)	1.25	
	Concrete (bedding)	297	36 (12)	261 (88)	0.52	
Rubber pad	Clean	720	122 (17)	598 (83)	1	0.01
	Dirty	89	25 (28)	64 (72)	1.91	
Drainage	Good	353	40 (11)	313 (89)	1	<0.0001
	Bad	757	176 (23)	581 (77)	2.37	
Floor cleanliness	Clean	353	40 (11)	313 (89)	1	<0.0001
	Moderate dirty	547	122 (22)	425 (78)	2.24	
	Very dirty	210	54 (26)	156 (74)	2.71	
Knowledge of on-farm design	Absent	300	68 (23)	232 (77)	1	<0.001
	Some extent	525	118 (22)	407 (78)	0.98	
	Educated	285	33 (11)	252 (89)	0.40	

<sup>a</sup>OR represents the Odds Ratio

Table 6. Evaluation of hock, claw, and hoof health (N = 1,110)

Variables	Category	Frequency (%)	95% CI
Hock health	Normal	782 (70.5)	67.8-73.2
	Swelling	225 (20.3)	17.9-22.6
	Lesion	53 (4.8)	3.5-6.0
	Swelling and lesion	50 (4.5)	3.3-5.7
Claw health	Normal	704 (63.4)	60.6-66.3
	Poor conformation	227 (20.5)	17.4-23.5
	Overgrowth	75 (6.8)	5.3-8.2
	Poor conformation with lesion	53 (4.8)	3.5-6.0
	Overgrowth with lesion	51 (4.6)	3.4-5.8
Hoof health	Normal	803 (72.3)	69.7-75.0
	Overgrowth	177 (16.0)	13.8-18.1
	Lesion	92 (8.3)	6.7-9.9
	Overgrowth and lesion	38 (3.4)	2.4-4.5



Figure 2. Hoof abnormality (Hoof overgrowth at the white arrow)



Figure 3. Hoof abnormality (Interdigital growth at the white arrow)

higher than for clean floors (7.4%). Hoof disorders were significantly minimized with the provision of rubber pads and floor cleanliness ( $P < 0.05$ ).

### Discussion

This study provides information on the assessment of dairy cattle welfare in the Chattogram regions of

Bangladesh. There is a scarcity of grazing land in Bangladesh which explains why farmers have chosen an intensive type of farming. Drainage systems, farm waste disposal, and ventilation were generally not satisfactory. Restricted water supplies and the absence of fodder land (66.7%) may lead to animals suffering from hunger and thirst. Lack of grazing land (75%) is the main hindrance



Figure 4. Claw overgrowth (White arrow)

to animals expressing normal behavior which was previously recognized by Nguhiu-Mwangi *et al.* (2013). Disposal of waste materials on the farm premises aids the propagation of various insects such as flies and mosquitoes. Although only about a third (31%) of the commercial units reared multiple species (sheep, goat, and so on) together which can create negative social interactions. Such interactions may in particular disrupt feeding by the more subordinate cattle.

The absence of a positive welfare perception (50%) by workers and the lack of trained labor (67%) negatively impact animal welfare. Many farmers and stockmen were found to have poor human-animal interactions, as exemplified by shouting and whipping of the cows, particularly during milking times. Such interactions made the cattle aggressive making them difficult to handle contrary to good animal welfare recommendations (DEFRA, 2003; Andreasen *et al.*, 2020). Although some farmers supported the need to alleviate animal pain and suffering as well as to provide provisions for animal comfort, others seemed to believe that alleviation of animal suffering was not important. The idea that better animal welfare and comfort contribute to improved production did not seem to be part of their viewpoint.

The prevalence of dermatitis was 26% which was similar to previous studies conducted by Roche *et al.* (2009). It is likely that the irregular control of

ectoparasites and the dirtiness of animals and their resting floor predispose them to dermatitis. Stereotypes (14%) were observed while cows were idle, such as pushing the bars with their noses, grasping the bars with their mouths, moving their heads left and right, tongue rolling, and so on, similar that of to the result of Komlosi (2013). Stereotypes shown by the animals may be due to a lack of nutrition, frustration, and restricted movements (Komlosi, 2013; Binev, 2022).

The current study showed that 50%, 26%, and 30% of cows were clean overall, hind quarter, and udder, respectively (Table 3), which is similar to Cook (2002) and Whay *et al.* (2003) who reported that there were on average 27%, 50%, and 25% of lactating cows with dirty flanks, hind limbs, and udders, respectively. The cleanliness depends on many factors including how clean and dry the resting area, drainage, how often and where cows lay down, and how frequently the floor is scraped (Magnusson *et al.*, 2008; Kathambi *et al.*, 2019). It is suggested that the slurry be removed at least once per day to promote good animal welfare (DEFRA, 2003). Bad drainage and a lower frequency of manure removal may increase the dirtiness in animals as well as lying floors. Body cleanliness provides information about the comfort and hygiene in animal houses provided by stockmen. Cleanliness has been used in the dairy industry as a possible indicator of cow welfare and dirty sleeping floors affect the incidence of mastitis (Ward *et al.*, 2002; Aytekin *et al.*, 2021).

Any skin injury suggests a negative interaction with the environment. These lesions are associated with pain and suffering (Main *et al.*, 2003; Knock and Carroll, 2019). The skin injuries observed in the current study were a reflection of the housing type, size, and construction as previously described by Whay *et al.* (2003). The external injuries were mainly located on body protuberances such as the wither, paralumbar fossa, leg, udder, back, neck, and hock. Bad drainage creates a slippery floor that leads to injury. Structures that limit a cow's natural behavioral patterns (Kiellard *et al.*, 2009; Palacio *et al.*, 2022) can also lead to excess injury. The restricted sizes of many of these animal units reflect the smallness of the land holding and the financial limitations of these farmers (Webster, 2005; Marshall *et al.*, 2020) making change in this area

Table 7. Risk factors associated with hock health ( $N = 1,110$ )

Risk factor	Category	N	Hock health (Frequency %)				P
			Normal	Swelling	Lesion	Swelling and lesion	
Floor-type	Bricked (pitted)	150	99 (66)	42 (28)	6 (4)	3(2)	0.01
	Pacca (cracked)	406	286 (70.4)	76 (18.7)	24(5.9)	20 (4.9)	
	Concrete (bedding)	554	397 (71.7)	107 (19.3)	23(4.2)	27 (4.9)	
Floor cleanliness	Clean	353	270 (76.5)	58 (16.4)	10 (2.8)	15 (4.3)	0.00
	Moderate dirty	547	383 (70.0)	119 (21.8)	28 (5.1)	17 (3.1)	
	Very dirty	210	129 (61.4)	48 (22.9)	15 (7.1)	18 (8.6)	
Rubber pad	Used	809	598 (73.9)	150 (18.5)	32 (4.0)	29 (3.6)	0.01
	Not used	301	184 (61.1)	75 (24.9)	21 (7.0)	21 (7.0)	
Drainage	Good	353	270 (76.5)	58 (16.4)	10 (2.8)	15 (4.3)	0.01
	Bad	757	512 (67.6)	167 (22.1)	43 (5.7)	35 (4.6)	

Table 8. Risk factors associated with hoof health ( $N = 1,110$ )

Risk factors	Category	N	Hoof health (Frequency %)				P
			Normal	Overgrowth	Lesion	Overgrowth and lesion	
Floor-type	Bricked (pitted)	150	99(66)	33 (22)	9 (6)	9 (6)	0.01
	Pacca (cracked)	406	288 (71.0)	66 (16.3)	44 (10.8)	8 (2.0)	
	Concrete (bedding)	554	416 (75.1)	78 (14.1)	39 (7.0)	21 (3.8)	
Floor cleanliness	Clean	373	297 (78.5)	35 (9.9)	26 (7.4)	15 (4.3)	0.00
	moderate dirty	527	382 (69.8)	103 (18.8)	48 (8.8)	14 (2.6)	
	Very dirty	210	140 (66.6)	43 (20.6)	18 (9.6)	9 (3.3)	
Rubber pad	Used	805	635 (78.4)	99 (12.2)	65 (8.0)	10 (1.3)	0.01
	Not used	305	193 (63.1)	78 (25.9)	27 (9.0)	7 (2.1)	
Drainage	Good	353	277 (78.5)	35 (9.9)	26 (7.4)	15 (4.3)	0.01
	Bad	757	526 (69.5)	142 (18.8)	66 (8.7)	23 (3.0)	

difficult. Overcrowding and mixed animal farming may also be responsible for some injuries.

Hock injuries are very common in dairy herds, ranging in incidence from 14% in Germany to 70% in Canada (Manske *et al.*, 2002; Freigang *et al.*, 2023). The most common hock injury (30%) in this study was swelling, damage, or both similar to the results of Nguhiu-Mwangi *et al.* (2013). The association between hock injury was statistically related ( $P < 0.05$ ) to such risk factors as floor condition, sloppiness of the floor, provision of rubber pad, cleanliness of the floor, and drainage.

Claw disorders are common in dairy herds and the incidence varies widely from herd to herd, but up to 80% of cows can have some kind of abnormality at claw trimming (Somers *et al.*, 2003; Capion *et al.*, 2021). In this study, 37% of dairy cows had poor conformation, overgrowth, lesions, and so on, which is supported by the results of Bergsten (2001). Claw lesions can be prevented by softer flooring such as the use of rubber pads. Meanwhile, it has to be noted that un-slatted rubber floors may cause more claw lesions in cows than concrete floors (Bergsten, 2009; Kulualp *et al.*, 2021). Slippery, dirty, and pitted floors might cause claw lesions because of the wet condition they support.

The prevalence of hoof lesions and lameness in the current study was 30% and 12%, respectively, which is similar to the work of Webster (2005). Recent research by Nguhiu-Mwangi *et al.* (2013) indicated that 31% of dairy cows were clinically lame in peri-urban and urban dairies in Nairobi which is higher than the present result. The present study showed that floor type, floor condition, bedding materials cleanliness of the floor, and drainage are strongly associated risk factors ( $P < 0.05$ ) for hoof health which is similar to the results of Rutherford *et al.* (2008) and Sadiq *et al.* (2021). Andreasen and Forkman (2012) showed that sand as a bedding material has been shown to result in a lower frequency of hock lesions and claw disorders and thus a reduced rate of lameness which is consistent with the use of rubber pads.

## **Conclusion**

The overall impression from the study is that some management factors were not satisfactory for good

animal welfare. Skin injuries such as hock, claw, and hoof lesions were the major welfare problems. Significant associations between injury and various management risk factors were shown. Hock and hoof disorders were also associated with floor type, drainage, and the provision of rubber pads. The findings suggest that poor dairy welfare exists on many dairy farms in Bangladesh. Some of the factors resulting in the poor welfare of dairy cows include substandard housing designs, poor cattle housing, suboptimal feeding, and poor husbandry practices. Moreover, thought needs to be given to reducing the risk of all these injuries. The farmer's perceptions and ignorance of animal welfare issues compound the problem. Proper management and consciousness of the stockmen for their animals are important in assuring good health and welfare.

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## **Conflict of interest**

The authors have declared no conflict of interest.

## **Authorship contribution**

MR Alam designed the experiment, supervised the study, and revised the final draft of the manuscript. Al-Amin and MJ Islam collected data and prepared the manuscript. AH Shaikat co-supervised the study. MR Pasha and RE Doyle analyzed the data and edited the manuscript.

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