Welfare assessment of udder health in intensively managed dairy cows

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Abstract

Udder abnormalities is considered as the most important health problem in dairy cattle with a major impact on welfare. The purpose of the present study is to assess the welfare of udder and predisposing factors associated with udder abnormalities in intensively managed dairy cow. A total of 106 dairy cows from 6 different dairy farms in Chattogram district were investigated. Prevalence of farm practices revealed that 83.3% farms floor made of concrete where 33.3% farms use floor mats as bedding material. In case of feces cleaning, 50% of the farms use scooping and 33.3% of the farms use water spray. The prevalence of different udder abnormalities and their association with different farm practices was evaluated in studied cows. The result revealed that 12.3%, 11.3%, 10.4% and 4.7% cows suffered from mastitis, hardened udder, blocked teats and ununiformed teats, respectively. Udder abnormalities was found to be significantly ($P<0.05$) associated with hand milking but relationship between post-dipping and udder abnormalities was not significant ($P>0.05$). This study concluded that udder abnormalities is the major problem for lactating cows. Dairy farming will be more beneficial if udder health welfare improved.

Chapter-I
Introduction

The employment of Bangladesh is largely depend on agriculture and livestock is an integral part of agricultural economy which contributes 2.79% GDP in agricultural share and enjoyed a growth rate of 5.85 percent during the last fiscal year (DLS-2019). Dairying is one of the key element of animal agriculture and part of mixed farming system in Bangladesh (Saadullah, 2001). Bangladesh is at 36th position in the world milk production ranking produces 9.4 million tons of milk in a year (DLS, 2018). Demand for milk and milk products is increasing because of fast growing population and growing nutrition awareness. But the milk availability of milk per capita is reported as 165.07 ml/day/capita against the minimal requirement of 250 ml/day/capita, the self-sufficiency according to DLS is 64% (DLS, 2019). Dairying is the leading source of income generation (Miyan., 1996), for sustainable dairy farming, welfare of the animal should be confirmed.

In Bangladesh, total livestock population is estimated in the year of 2020-2021 about 24.5 million cattle, 26.6 million goats, 1.5 million buffalos and 3.7 million sheep (Livestock economy 2020-2021). Among the total cattle population, about 6 million are dairy cattle of which about 85-90% are indigenous and 10-15% are crossbred. Indigenous cattle consisted of (a) Non-descript deshi, (b) Red chittagong cattle, (c) Pabna cattle, (d) North bengal gray and (e) Munshigonj white cows. On the other hand, crossbred cattle are the results of crossing between local with different exotic breeds like Holstein, Friesian, Sindhi, Sahiwal and Jersey at different level (Hamid et al., 2014).

Dairying is growing faster in Bangladesh, however, there are various issues hindering faster growth of dairy farming such as diseases, deficient management, and inadequate feeding practices—that compromise the welfare of cattle (Mdegela et al., 2009). Welfare assessment is common in large, intensive dairy farms in the developed world, but has been little explored in small dairy farms in developing countries (Islam et al., 2020). However, several studies emphasize the initial assessment and evaluation of health and welfare by an external person, implementation of farm-specific measures, and constant review and adaptation of measures as key aspects to improve dairy cattle health and welfare (Ivemeyer et al., 2012).

Animal health and welfare planning constitutes an approach to integrate farmers' participation and encouragement (Sibley et al., 2002). Previously, animal welfare was understood to relate just major concerns, such as serious hunger, thirst, injuries, or illness. For many years, welfare considerations have included discomfort, distress, fear, pain, and absence of normal behavior (Stull et al., 2005). It is now expanded to a multidimensional concept that includes physical and mental health, the absence of hunger, and provision for a manifestation of the typical behavior for that species (Webster et al., 2005).

The importance of udder health is enormous to build a sustainable dairy farm. Cow udder is the most important organ for dairy industry formed of four mammary glands on the female cattle (Rowen et al., 2013). Mastitis is the pathological condition of udder which is the most important issues for dairy farming can cause severe economic losses in dairy industry. Animal health and welfare planning can improve udder health of dairy animal (Lukas et al., 2015)

Assessment of dairy cow welfare is possible by a variety of methods. On-farm assessment of animal welfare can be based on an evaluation of the provision of resources and management, direct observation of the animals and examination of farm records (Whay et al., 2003). Acute welfare change can be indicated by a decrease in productivity, in particular milk yield, but may also be evidenced by development of illness or injury, and changes in behavior, for animals that are lethargic, unwilling to move, or unusually aggressive (Pawelek et al., 2003). Animal welfare can, therefore, be inferred by several methods: behavioral, physiological, psychopathological assessments, longevity, and productive performances. All the welfare indicators have, to a greater or lesser extent, constraints and are unreliable when used as sole assessment techniques. It is widely acknowledged that better results can be obtained by measuring animal welfare using a range of indicators instead of individual parameters (Winckler et al., 2003). With the background mentioned above this study was undertaken with the following specific objectives;

1) To evaluate the health and welfare of udder of intensively managed dairy cows
2) To assess the predisposing factors that are associated with any udder abnormalities

Chapter-II
METHODOLOGY

2.1 Study area and duration:

The field investigation was conducted in three different area under Chattogram district namely Chattogram metropolitan area, Fouzdarhat and Hathazari. The selection was made on the basis of suggestions made by random selection. Data were collected from 29th May to 11th September, 2021 in the study area.

2.2 Study population:

A total of 106 lactating cows from six different dairy farms were studied.

2.3 Selection of farm:

Six dairy farm were selected on the basis of random selection.

Table 1: Selected 6 dairy farms in different area of Chattogram district for the study.

Name of the dairy farm	Location	Code No
Pacific Agro	Salimpur,Rastarmatha	A1
Manoara Dairy Farm	Railway security agency	A2
Chowdhury Agro farm	silimpur,CDA	A3
Zarif Dairy Farm	West shikarpur ,Hathazari	A4
The Farmory	Mohora, chandgaon	A5
Well agro	Mohora, chandgaon	A6

2.4 Physical examination of Udder:

Physical examination of udder was carried out for each animal. During examination the animal was restrained properly and examined carefully by avoiding any discomfort of the animal. Physical examination includes close and distant inspection, palpation of udder and teats of animal. The abnormalities of udder and teats defined in table 2.

Table 2: Definition of different udder and teat abnormalities

Abnormalities	Definition
Mastitis	Mastitis is an infectious disease condition resulting in an inflammatory reaction in the mammary gland of the cow. Swelling, heat, hardness, redness, or pain can be seen in this condition.
Hardened udder	Udder become hard to touch.
Blocked teats	Teat block or obstructions are usually recognized when they interfere with milk flow.
Uniformity of teat length	Four teats remain similar in size. Any deviation from normal size can be considered as ununiformed teat.

2.5 Data collection:

A questionnaire was carefully developed on the basis of objectives to collect worker, animal and management linked data related to welfare. Face-to-face interviews and visual inspection were carried out to collect farmer information and farm husbandry information such as housing, feeding and cleanliness of the farm. Cow information with the milkers' like milk yield of the cow, frequency of milking, technique of milking, whether udder were washed before and after milking, application of antiseptics before and after milking, workers behavior with animal, udder conditions were collected through questioning, inspection and palpation. Worker information about their experience and facilities provided by farmer were asked by direct questioning. Questionnaire used for data collection has been presented in appendix-I.

2.6 Data processing and analysis:

Collected data were analyzed with mainly in tabular method. The collected data were calculated and analyzed in MS excel software. The frequency, percentages were calculated to explain data scientifically. Associations in different factors were done by Chi-square test in STATA-14 (Stata corps, Texas, USA). The probability level of significance was considered as $p < 0.05$.

Figures of udder and teat abnormalities in studied dairy farms

Figure 1: Swollen and hardened udder

Figure 2: Ununiformed teat

Figure 3: Blocked teat

Figure 4: Mastitis affected udder

Figure 5: Lacerated teat

Figure 6: Watery milk

Chapter-III

Results

The study was conducted on 106 milch cow from 6 different dairy farms of chattogram district to determine the prevalence of several farm practices and udder abnormalities.

Table 3: Prevalence of different husbandry practices in farms of study area (n=6)

Variable	Category	Number (n)	Prevalence (%)
Post-dipping	Perform	3	50%
	Not perform	3	50%
Floor	Concrete	5	83.3%
	Concrete & Sand	1	16.7%
Floor mat	Absent	4	66.7%
	Present	2	33.3%
Showering Times	Once daily	4	66.7%
	Twice daily	2	33.3%
Chronology of feeding	Concentrate-Water-Grass	5	83.3%
	Molasses straw-Silage-Concentrate	1	16.7%
Process of removing feces	Scooping	3	50%
	Water spray	2	33.3%
	Both	1	16.7%

In table 3, result shows that all farms had shelter for their cows with a corrugated iron roof and all have concrete floor in their farm from which 33.3% (n=2) of farms used floor mats as bedding material. A total of 16.7% (n=1) of farms had combined concrete and sand area for loafing. All farms make use of the 'cut and carry' system of feeding green grass with some straw and concentrate. A total of 66.7% (n=4) farms provide concentrate before milking and all farms serve green grass immediately after milking. Milking were performed twice a day in morning (4am-7am) and afternoon (3:30pm-4:30pm) by hand in 84% (n=89) cows and by machine in 16% (n=17) cows. Removal of feces and cleaning of floors performed at least twice a day before milking in all farms. 50% (n=3) farms done this by means of scooping, 33.3% (n=2) by means of water spraying and 16.7% (n=1) used both scooping and water spraying for feces removing and floor cleaning. A total of 66.7% (n=4) of farms bathe their animals at least once per day. Hind quarter or udder washing performed in all farms before milking and post milking teat disinfection was performed in 50% (n=3) of the farms but pre-milking teat disinfection of teats with antiseptics were not performed in all farms.

Table 4: Prevalence of teat or udder abnormalities of cows in study area (n=106)

Variable	Category	Number (n)	Prevalence (%)
Breed	HF cross	102	96.2%
	Jersey	1	0.9%
	Sahiwal	3	2.8%
Mastitis	Absent	93	87.7%
	Present	13	12.3%
Hardened udder	Absent	94	88.7%
	Present	12	11.3%
Blocked teats	Absent	95	89.6%
	Present	11	10.4%

| Uniformity of teat | Uniform | 101 | 95.3% |
| length | Ununiformed | 5 | 4.7% |

In table 4, result shows that about 96.2% (n=102) cows were of the Holstein-Friesian cross genotype, this being most common in the area. The udder and teats of majority cows (75.5%, n=80) were healthy and normal in shape, however, various abnormalities such as mastitis, blocked teats, hardened udder, ununiformed teat length were found in remaining 24.5% (n=26) of cows.

Table 5: Association of different variables with udder abnormalities (n=106)

Variable	Exposure group (n)	Udder abnormalities	P-Value
Post dipping	Yes (42)	19.1%	
	No (64)	28.1%	0.288
Milking type	Machine milking (17)	0.0%	
	Hand milking (89)	29.2%	0.01
Milking pattern in hand milking	Full hand (11)	36.4%	
	Two fingers (78)	28.2%	0.577

Table 5 shows the relationship of some variables with udder abnormalities. Results states that 29.2% udder abnormalities related to hand milking. Furthermore, it can be seen that 28.1% of udder abnormalities occur due to not performing post milking treatment of teats with antiseptic.

Chapter-IV

Discussion

This study is an effort to evaluate systems used for dairy farming and to assess the health and welfare of udder in dairy cows in farms of Chattogram. Farmers fed their dairy animals cut and carry grasses in addition with concentrate feeding (Khan et al., 2012). Feeding and milking performed twice a day (TNAU AGRITECH PORTAL) at the fixed time for getting maximum production from cows as feeding and milking at the same time enhance performance in the herd (Erickson et al., 2020).

All farms use tie stall housing system where 33.3% farms use floor mats and 16.7% uses sand as bedding material for loafing and remaining farm uses no bedding material. Cows lay on floors with an uneven and rough surface may increase the risk of teat or udder abrasion, lameness and limb injuries (Brochart., 1987). Westphal et al., (2011) shows in their study that using sand as bedding material reduces the occurrence of mastitis and enhance cow comfort, no mastitis cows were found in the farm of our study area which uses sand as bedding material which agrees with this statement. The cleanliness of cows and their housing depends on many factors such as floor type, bedding materials, stocking density etc. (NBC., 1990). Frequency of cleaning the floor has a direct relationship with cleanliness (Magnusson et al., 2008), in our study removal of feces and cleaning were done twice a day. Hind quarter or udder washing was performed in all farms of our study area.

The udder and teats of majority cows of our study area was healthy and normal in shape which are confirmed by clinical examination of udder, teat and milk of cows, though some cows had different kind of udder abnormalities like mastitis, which is considered as the most important health problems in dairy cattle with a major impact on welfare (Heringstad et al., 2005; Leslie et al., 2012), blocked teats, hardened udder etc. were found. Post-milking teat dip is an important way to reduce new udder infection. (Wesen et al., 1970) shows in his study that incidence of infected quarters reduces due to post-milking dipping of teats with antiseptics. In table-5 it was reported that 19.1% abnormalities of udder and teat were present where post-dipping performed and in 28.1% of udder and teat abnormalities present where post-dipping were not performed. These frequencies supporting the statement of Wesen et al., (1970), though the association between post-dipping and udder abnormalities was not statistically significant (p>0.05). Abnormalities

of udder and teats significantly associated with milking type ($p<0.05$) where no abnormalities found in machine milking but 29.2% of abnormalities found where hand milking performed, this result is supported by the study of Hovinen., (2011). Association between milking pattern in hand milking (Full hand or two finger) was not statistically significant ($P>0.05$), it may be due to lower population size.

Chapter-V

Conclusion

This study was done to assess the udder health and welfare practices of lactating cows. Mastitis is considered as the most important health problems in dairy cattle with a major impact on welfare. There are some other abnormalities like blocked teats, hardened udder, ununiformed teat length found in the study area which leads the farm to severe loss. Many management practices such as maximum frequency of feces removing, floor cleaning, udder or hind quarter washing before milking, pre & post milking dipping of teat with antiseptic may decrease the incidence of udder abnormalities which will generally lead to improved animal welfare and productivity in the farm. There is a need to expose dairy farmers to training in good animal welfare practices, including appropriate housing designs, cleanliness of the house, and emphasizing the relationship between good animal welfare and productivity.

Chapter-VI
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Appendix

Welfare assessment of udder health in intensively managed dairy cows

<u>Questionnaire</u>

Farmer Information

1.   Date:
2.   Farm name:
3.   Farmers Name and Mobile number:
4.   Address:
5.   Years of farming:
6.   Dairy farming is: Primary income source /Secondary income source/Hobby
7.   Training on farming: Yes/No. If yes, Duration and trainer:

Farm Husbandry

1.   Total number of milking cow:

2.   Floor: Kacha (Only soil)/ Brick/ Concrete/ Sand

3.   Presence of floor mat: Yes/No

4.   Showering times: Frequency-   times per day. Times-

5.   Milking time: ………am and …………pm

6.   Grass feeding time: During milking/ before milking/ after milking

7.   Concentrate feeding time: During milking/ before milking/ after milking

8.   Water supply: During milking/ before milking/ after milking

9.   Chronology of grass, conc and water:

10. Grazing of cows: Yes/No, If yes, when? ....

11. Removal of feces before milking: Yes/No

12. If yes, how: Scooping/ Water spraying/ Both

13. Movement of cow during feces cleaning? Yes/No

14. Slapping of the cows during removal of feces- No/
     …………………………………..of times

15. Shouting to the cows during removal of feces- No/
     …………………………………..of times

16. Beating the cows during removal of feces- No/
     …………………………………..of times

17. Beating agent…………

18. Tail movement………….. in two minutes…………by …………. cows

Cow information with the milkers':

Traits	1	2	3	4	5	6	7	8	9	10
Breed HF Cross(1)/Jersey cross(2)/Shahiwal(3)/Deshi(4)										
Current Parity (No)										
Calf birth date										
Before milking showering(1)/ Only udder washing(2)/Hind quarter Washing(3)/Nothing(4)										
Pre dipping of teat No(1)/agent name										
Milking with Calf suckling stimulation(1)/ Calf visual stimulation(2)/ Hand stimulation(3)/ Oxytocin(4)										
Duration of stimulation (Seconds)										
Agent used in stimulation or milking										
Trait	1	2	3	4	5	6	7	8	9	10
Tying of calf in front of mother yes(1)/No(2)										
Tying of rear legs of cow: yes(1)/No(2)										
Milking type: Milking parlour(1)/Milking machine(2)/ Hand milking(3)										
Milking pattern in hand milking: full hand(1)/ 2 fingers(2)/Knuckling(3)										

Trait	1	2	3	4	5	6	7	8	9	10
Changing of milking pattern at the later stage? If yes then changed to what type? 2 fingers/Knuckling										
Slapping of calf (No/ Number)										
Shouting to calf (No/ Number)										
Beating to calf (No/ Number)										
Slapping of cow (No/ Number)										
Shouting to cow (No/ Number)										
Beating to cow (No/ Number)										
Stepping of cow (No/Number)										
Trait	1	2	3	4	5	6	7	8	9	10
Urination during milking(No/Number)										
If urinate then when? During stimulation/During milking										
Total milking time (Min & sec)										
Milk production										
Which milking (Morn/afternoon)										
Post milking dipping: No(1)/agent(2)										
Calf is weaned (1)/can drink milk from udder (2)										
Head butt by the calf to udder (No/Number)										
Stepping of the cow during head butt (No/Number)										
Lying down of cow after …… min of milking										
Udder condition										
Length of teats										
Width of teats										

Trait		1	2	3	4	5	6	7	8	9	10
Hardened udder (which quarter)											
Blocked teats											
Supernumery teat (No/ on which side)											
Udder edema (absent/Present)											
Blood in milk											
Mastitis (No/ affected teats)											
Color of milk											
Increased temperature (No/Temp)											
Blister on teats (Yes/No)											
Ulceration on teats (Yes/No)											
Uniform teat length of all 4 teats (yes/No)											
Which teat is not similar in length											
Is it smaller or longer?											
Worker Info											
Age											
Experience in farming (Years)											
Experience in milking(Years)											
Trait	1	2	3	4	5	6	7	8	9	10
Experience in milking (years)											
Married(1)/Not married(2)											
Wife is here with him(1)/Not with him(2)											
Last night sleep (Hours)											
Milking before(1)/after(2) breakfast											
Cut grass in field: yes(1)/No(2)/sporadically(3)											
Give treatment to cow: yes(1)/No(2)/sporadically(3)											
Have to sale milk: yes(1)/No(2)/sporadically(3)											
Last day off (..........days ago)											
Last pay rise (..........Month ago)											
Income............Tk											

Food cost (Farmer/Worker)											
Housing cost (Farmer/Worker)											
Mobile bill (Farmer/Worker)											
Gas (Farmer/Worker)											
Electricity (Farmer/Worker)											

Biography

Md. Hasanul Karim, son of **Nur Ahmed** and **Rohima Begum** passed his Secondary School Certificate (Dakhil) examination from Baitush Sharf Ideal Kamil Madrasha, Chattogram in 2012 and Higher School Certificate (HSC) examination from Government City College, Chattogram in 2014. Thereafter he enrolled for Doctor of Veterinary Medicine (DVM) degree in Chattrogram Veterinary and Animal Sciences University (CVASU), Bangladesh and now he is an intern student in this university.