ASSESSMENT OF CALF HEALTH CARE AND MANAGEMENT PRACTICES UNDER SMALLHOLDER PRODUCTION SYSTEM IN PUNJAB, PAKISTAN

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ABSTRACT

This study was conducted to evaluate health care and management practices for calves less than or equal to 12 months of age in smallholder production system. Data was collected using household survey technique in Lodhran district, Punjab, Pakistan. 14 villages were selected using stratified proportionate random sampling method and 10 calf keeping households from each village were interviewed using a semi-structured questionnaire. Calves were not allowed to free range therefore all farmers practiced stall feeding. Housing facilities were of poor quality in half of farms (50.7%). Farmers were not using modern technologies of milk replacer, urea treated wheat straw and urea molasses blocks. All farmers offered colostrum however timings of offering differed. 75.7% farmers performed navel cord cutting and disinfection. All farmers offered treatment but majority (87.1%) practiced self-medication first. Vaccination rate was good at 94.3%. Almost all farmers performed drenching and dipping on their calves but there were vast differences in when and on what conditions they will be performed. Calf mortality rate for the last 12 months was 18.78%. Weaning age was high from modern calf rearing perspective. These findings suggest that there have been marked improvements in some parameters but farmers are still following traditional methods and practices of calf rearing due to severe lack of training related to calf rearing. There is a need for improvement in various aspects related to calf rearing including feed, housing, weaning and training.

Keywords: *Bubalus bubalis*, buffalo, calf health care practices, calf management practices, livestock, smallholder production system, Pakistan

INTRODUCTION

Cattles and buffaloes are the most important of all livestock species reared in Pakistan from dairy farming perspective. The estimated livestock population of cattle and buffalo in Pakistan is 46.1 million and 38.8 million respectively. Pakistan is 4th largest milk producer country in the world (FAO, 2015). Pakistan's milk production from cows and buffaloes for the year 2017 to 2018 was 20,903 and 35,136 thousand tonnes respectively whereas beef production stood at 2,155 thousand tonnes (GOP, 2018).

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Calves are the most important by-product of dairy farming system from sustainability perspective. Future herd depend upon today's calves, therefore, proper care and management of young calves is needed to sustain and expand cattle (including buffaloes) production. Poor upbringing of young stock will lead to the degradation of cattle herd production performance and quality. Therefore, in order to improve the general situation of cattle farming priority has to be given to calf rearing.

Proper measures and specific interventions to improve and expand calf rearing cannot be planned and implemented without relevant, reliable and up to date data on aspects related to calf production and rearing. This research is aimed at describing current situation and analyzing calf and health care and management practices currently followed. This data and assessment will help policy makers in developing holistic strategy aimed at improving and expanding calf production in rural smallholder farms. An improvement in rural calf production performance will bring improvement in livelihood of majority of poor rural population and will help in meeting ever increasing demand for meat and dairy products. This will also help in achieving true cattle production potential.

MATERIALS AND METHODS

Lodhran is a district of Punjab province, Pakistan covering an area of 2778 square km. It is situated between 29°41'12.67"N latitude and 71°40'2.41"E longitude. It lies at an altitude of 116 meters from sea level. The district is well noted in Pakistan for its fertile land, irrigation network, crop production and livestock. Lodhran has a total population of 1,700,620 out of which 84.3% reside in rural areas (PBS, 2018). District Lodhran is composed of three tehsils i.e. Tehsil Lodhran, Tehsil Kahror Pacca and Tehsil Dunyapur. These tehsils are further divided into 73 union councils. Tehsil Lodhran, Tehsil Kahror Pacca and Tehsil Dunyapur are composed of 28, 23 and 22 union councils respectively. We employed stratified proportionate random sampling and selected 7 union councils out of a total of 73. Three union councils were selected randomly from Tehsil Lodhran and two union councils each from Tehsil Kahror Pacca and Tehsil Dunyapur respectively. From each union council 2 villages were selected and from each village 10 farmers were selected randomly based on the criteria of possession of at least 1 calf less than or equal to 12 months of age. Thus a total of 140 farmers were selected from 14 villages. 60 farmers in total were selected from Tehsil Lodhran and 40 each from Tehsil Kahror Pacca and Tehsil Dunyapur. The sample size was determined by the available financial, human and material means. For the purpose of our study we define smallholder production system as the one having a maximum of 30 large ruminants including, cattles, buffaloes and their calves. A semi-structured questionnaire was developed and pretested in two villages in order to further refine it. Data was collected through individual face to face interviews by the principal author himself from January 2018 to April 2018. Verbal consent was obtained prior to commencing the interview. Questionnaire was prepared in English but administered in Urdu, Saraiki and Punjabi languages. The author is fluent in all four languages. Data entry and statistical analysis were performed using IBM's Statistical Package for Social Sciences (SPSS) Version 23.

RESULTS AND DISCUSSION

Socioeconomic characteristics

Farmer's socioeconomic characteristics are presented in Table 1. There is severe lack of formal training related to calf rearing with only 2.9% farmers reported getting formal training. Due to lack of training, farmers are using traditional calf rearing methods and practices resulting in lower productivity. Regarding education, 32.1% of farmers were found illiterate. Low education level of farmers involved in calf rearing is hindering the adoption of modern methods and practices of calf rearing. Our findings related to farmer's education levels are better than those reported by Mustafa *et al.* (2010) but worse than the findings reported by Ashraf *et al.* (2013).

Calf housing management

None of the farmers provided separate calf housing. This finding is in line with Ahmad *et al.* (2009); Mustafa *et al.* (2010). Normally, calves are tied in the corner of adult animal housing. Permanent pens were provided by 49.3% of the farmers while rest provided semi-permanent stall shed or pens (Table 2). Regarding permanent pens proper ventilation was not cared for in at least half of them. There were a wide variety of combinations of different varieties of shelter sidewalls and shelter roof construction in semi-permanent stall shed or pens. Most primitive of them was shelter construction with no sidewalls in 22.9% farms. Shelter construction with no sidewalls expose animals to cold winter, rain and high winds and may cause pneumonia. Semi-permanent shelter roof type in different combinations (51.4%) is also not suitable for different extreme weather conditions. Tiwari *et al.* (2007) reported similar findings in his study. One plausible explanation for poor housing structures in at least 40% farms is farmer's poor economic condition. Poor housing management of livestock seriously affect their health and productive performance, especially in calves which are more prone to diseases as their immunity level

Table 1. Farmer related variables across the three tehsils of district Lodhran.

Variables	Tehsil Lodhran	Tehsil Kahror Pacca	Tehsil Dunyapur	Overall District Lodhran	P-values
Age of famers (mean, SEM)	39.68±1.867	42.55±2.666	39.75±2.048	40.52±1.246	0.640
Size of household (mean, SEM)	7.92±0.417	7.95±0.741	7.75±0.549	7.88±0.316	0.785
Education level (%)					
No formal education	33.3	40	22.5	32.1	0.407
Elementary	15	27.5	17.5	19.3	
Primary	21.7	10	22.5	18.6	
Secondary	15	15	20	16.4	
Post–secondary	15	7.5	17.5	13.6	
Formal training related to calf rearing (%)	3.3	2.5	2.5	2.9	0.958

Table 2. Housing system of calves.

Variables	Tehsil Lodhran (%)	Tehsil Kahror Pacca (%)	Tehsil Dunyapur (%)	Overall District Lodhran (%)	P-values
Separate calf house					
No	100	100	100	100	N/A
Calves kept in					
Open	0	0	0	0	0.284
Shelter	0	0	2.5	0.7	
Both	100	100	97.5	99.3	
Shelter provided during					
Summers only	0	0	0	0	0.284
Winters only	100	100	97.5	99.3	
Throughout the year	0	0	2.5	0.7	
Shelter provided					
During daytime only	0	0	0	0	0.284
During night only	100	100	97.5	99.3	
All day	0	0	2.5	0.7	
Shelter form					
Permanent pens	58.3	37.5	47.5	49.3	0.120
Semi-permanent stall sheds or pens	41.7	62.5	52.5	50.7	
Shelter floor made up of					
Prepared land	100	100	100	100	N/A
Shelter roof form					
Permanent arrangement	58.3	37.5	45	48.6	0.108
Semi-permanent arrangement	41.7	62.5	55	51.4	
Shelter sidewalls					
Open on all sides	21.7	30	17.5	22.9	0.210
Enclosed on some sides	25	15	37.5	25.7	
Fully enclosed	53.3	55	45	51.4	
Shelter sidewalls made up of					
Nothing (No sidewalls)	21.7	30	17.5	22.9	0.705
Mixture of mud and wheat straw	8.3	12.5	7.5	9.3	
Unbaked bricks	10	12.5	10	10.7	
Baked red bricks	60	45	65	57.1	
Daytime tethering of calves under tree	100	100	97.5	99.3	0.284
Hygiene of calf staying area					
Clean	86.7	87.5	77.5	84.3	0.375
Dirty	13.3	12.5	22.5	15.7	

is low (Tiwari *et al.*, 2007). According to Radostits *et al.* (1994), calf mortality was associated with the type of housing, feeding, management practices, weather conditions, external and internal parasitic infestation and bacterial infection especially those causing septicemia and enteritis. Farmers were cleaning animal housing area at least once a day but without the use of any disinfectant. More than 84% of the farms were found cleaned in our study. Similar cleaning practices were reported by Tiwari *et al.* (2007); Mustafa *et al.* (2010).

Calf feeding management

Land is not available for grazing purpose in district Lodhran because of its scarcity and high cost therefore all farmers practiced stall feeding. Our finding differs from Arif *et al.* (2013) who reported 43.3% farmers grazing their animals in summers and none in winters. 43.6% farmers were offering concentrate feeds to their calves (Table 3). Khan *et al.* (2007) in his study reported that farmers offered concentrate feeds to their calves only after weaning. In our study area, concentrate offering to calves was not dependent on weaning. This is beneficial for calf's health since concentrate feeds are energy rich and good for animal fattening purpose. Mustafa *et al.* (2010) observed that most of the poor farmers were not offering green fodder because of its unavailability and high cost. In contrast, we observed that green fodder was abundantly available at a reasonable cost in district Lodhran except during between seasons time periods and harsh weather conditions. No improvement was seen in milk replacer usage as compared to previous studies (Arif *et al.*, 2013; Saghir *et al.*, 2014). Only 9.3% farmers were using milk replacer in district Lodhran. Some farmers thought that milk replacer will be an extra expenditure ignoring savings in milk. Others, on the basis of previous experience of using milk replacer believe that calves don't like it. Not a single farmer was found using urea treated wheat straw and urea molasses blocks. Most of the farmers were even not aware about these two technologies. Farmers were aware of silage making but did not find any need for it in the presence of wheat straw. Our findings are completely in line with Bilal *et al.* (2008).

Neonatal care

All farmers fed colostrum to their calves. However, timing of colostrum feeding varies. 58.6% farmers fed colostrum to their calves within 2 to 3 h of their birth. 21.4% farmers fed within 4 to 6 h while the rest 20% fed colostrum to their calves only after the release of placenta by the animal (Table 4). It is very important to feed colostrum within 2 to 3 h of birth since it is a well-established fact that delay in feeding of colostrum leads to lowered effectiveness of the colostrum in terms of providing immunity to calves (Sharma and Mishra, 1987). Previous studies have reported farmer's misplaced perceptions about colostrum feeding. These include colostrum feeding immediately after birth is injurious and will cause worm infestation, obstruction of gastro-intestinal tract, diarrhea and will result in animal not releasing placenta (Kumar, 2002; Khan *et al.*, 2007; Bilal *et al.*, 2008; Ahmad *et al.*, 2009). As per our observation, these misperceptions have changed to some extent in our study area, therefore, our findings related to colostrum feeding differ from those reported by Bilal *et al.* (2008); Ahmad *et al.* (2009); Mustafa *et al.* (2010); Saghir *et al.* (2014). Both government and private veterinarians and para-veterinary staff have played their role in this regard. However, more efforts are needed in this regard since there is still a sizable proportion of farmers i.e. 41.4% who are either delaying colostrum feeding or are

Table 3. Variables related to calf feeding.

Variables	Tehsil Lodhran (%)	Tehsil Kahror Pacca (%)	Tehsil Dunyapur (%)	Overall District Lodhran (%)	P-values
Stall feed	100	100	100	100	N/A
Use of milk replacer	10	7.5	10	9.3	0.899
Offer concentrate feeds	53.3	35	37.5	43.6	0.127
Urea treated wheat straw usage	0	0	0	0	N/A
Urea molasses block usage	0	0	0	0	N/A
Silage making and usage	1.7	0	0	0.7	0.511

Table 4. Calf neonatal care practices.

Variables	Tehsil Lodhran (%)	Tehsil Kahror Pacca (%)	Tehsil Dunyapur (%)	Overall District Lodhran (%)	P-values
Colostrum feeding					
Colostrum feeding within 2-3 hours of birth	55	57.5	65	58.6	0.602
Colostrum feeding within 4-6 hours of birth	20	25	20	21.4	0.809
Colostrum feeding after release of placenta	25	17.5	15	20	0.423
Navel cord cutting and disinfection	73.3	75	80	75.7	0.742
Bedding provided	65	52.5	70	62.9	0.243

waiting for animals to release placenta which results in lower immunity levels for their calves.

It is imperative to take proper care of navel cord after the birth of calf since it is a channel through which infectious agents can enter into the blood or underlying tissues which can lead to certain serious diseases in newborn calf (Tiwari *et al.*, 2007). Previous studies have reported abysmal state of affairs regarding navel cord cutting and disinfection (Tiwari *et al.*, 2007; Bilal *et al.*, 2008; Ahmad *et al.*, 2009; Arif *et al.*, 2013; Saghir *et al.*, 2014). Our findings show marked improvement in this regard with more than 75% farmers practicing navel cord cutting and disinfection. However, we noted that farmers were diluting the disinfectant to a great extent. Again, there has been significant improvement in awareness among the farmers about the role of navel cord care in preventing serious diseases in newborn calves. There still is room for improvement in this regard since 25% farmers who are not practicing navel cord care are exposing their newborn calves to diseases. Contrary to Mustafa *et al*. (2010) who reported negligible proportion of farmers providing proper bedding, approximately 63% farmers were providing some form of bedding for the new born calves. The bedding material depended upon whatever was available and affordable at the time of calf birth.

Calf health care practices

All farmers offered treatment to their diseased calves. However, 87.1% farmers reported trying self-medication first since they believe that calling veterinarian every time a calf is sick is completely un-economical (Table 5). This finding is in line with Mustafa *et al.* (2010) who reported that 90% of small farmers were practicing self-medication. Farmers will skip self-medication only if the situation is critical. If self-medication has failed or the situation is critical almost all farmers would call veterinarian who in more than 50% cases would turn out to be a private para-veterinary staff and not a proper veterinarian. This is in sharp contrast to Ahmad *et al.* (2009) who reported that 60.4% farmers never called a veterinarian. There was statistically significant difference at $P<0.05$ in the willingness to eat diseased calf among the three tehsils.

There is heightened awareness among farmers about the importance of vaccination in preventing diseases due to previous losses, awareness generated by veterinary personnel and poor economic condition generally where the loss of even a single calf can put a dent in their economic condition. Due to interplay of these factors, we recorded exceptionally good vaccination rate of 94.3% in comparison to previous studies of Khan *et al.* (2007); Bilal *et al.* (2008); Mustafa *et al.* (2010). Our findings are more in line with Arif *et al.* (2013).

Almost all farmers i.e. 98.6% were performing drenching and dipping on their calves. A major reason of calf mortality is the parasitic load in the calves due to which their health deteriorates and the calf often dies (Sharma and Mishra, 1987). Widespread adoption of drenching and dipping practice in district Lodhran demonstrate farmer's awareness and seriousness about the importance of deworming practices in controlling endo and ecto-parasites to keep their calves healthy. However, more awareness need to be generated about the importance and benefits of scheduled and routine deworming practices since at least half of the farmers were performing deworming only when needed depending upon visual cues. As per our observation, the lesser the number of calves a farmer had, the more serious he was about adopting practices to keep his calves healthy and to avoid

losses due to diseases.

Due to improved adoption rates of practices like vaccination, deworming, colostrum feeding and navel cord care we recorded much lower calf mortality rate (18.78%) than those reported by Tiwari *et al.* (2007); Bilal *et al.* (2008); Ahmad *et al.* (2009). Our finding regarding calf mortality rate is completely in line with Khan *et al.* (2007) who reported calf mortality rate of 17.98%.

Weaning and selling age

In modern dairy farming early weaning of calves is necessary in order to save milk for marketing purpose. However, we noted fairly high weaning age in our study where farmers were not weaning their calves at age less than 6 months. Similar findings have been reported previously (Khan *et al.*, 2007; Arif *et al.*, 2014). This situation is unlikely to change unless farmers are convinced for the use of milk replacer which would enhance farmer's profitability. Mustafa *et al.* (2010) noted that most farmers prefer to sell their calves at very young age. Farmers considered male calves as an economic burden and a loss in milk production. Therefore, 90% farmers in his study sold male calves before the age of 6 months, whereas female

Table 5. Variables related to calf health care.

Variables	Tehsil Lodhran (%)	Tehsil Kahror Pacca (%)	Tehsil Dunyapur (%)	Overall District Lodhran (%)	P-values
Treatment offered	100	100	100	100	N/A
Self-medication first	86.7	90	85	87.1	0.792
Consult veterinarian	100	97.5	100	99.3	0.284
Type/types of medicines offered					
Veterinary medicines	100	97.5	100	99.3	0.284
Traditional, desi or ethno-veterinary medicines	96.7	85	90	91.4	0.116
Human medicines	0	0	0	0	N/A
Eat diseased calf if edible	93.3[a,b]	100[b]	85[a]	92.9	0.033
Vaccination	96.7	92.5	92.5	94.3	0.576
Drenching performed					
Routinely	48.3	55	45	49.3	0.738
Only when needed	50	42.5	55	49.3	
Never	1.7	2.5	0	1.4	
Dipping performed					
Routinely	38.3	25	30	32.2	0.558
Only when needed	60	72.5	70	66.4	
Never	1.7	2.5	0	1.4	
Calf mortality rate of last 12 months	20.261	16.494	18.75	18.784	N/A

calves were sold with buffaloes. Contrary to his findings, in our study overwhelming majority of farmers i.e. 90% indicated their willingness to sell calves whether they are male or female between 24 to 36 months of age provided there are no pressing needs. Farmers were not willing to sell calves at a very young age because of unfavorable prices. Secondly, calves aged between 2 to 3 years normally are getting a good price at the occasion of Eid-ul-Adha. Therefore, there is a tendency among farmers to keep calves till the age of 24 months. Due to recent trend of getting good prices at Eid-ul-Adha calf rearing is considered profitable by the farmers and instead of being considered as an economic burden calves have become valuable assets in farmer's eyes.

CONCLUSION

Our findings shows that there have been marked improvements in some parameters like vaccination, colostrum feeding, navel cord care and deworming practices culminating in a lower calf mortality rate. However farmers are still following traditional methods and practices in many aspects of calf rearing especially in feeding, housing and weaning due to severe lack of training. Calf productivity and farmers profitability will not improve without the adoption of modern and scientific methods and practices of calf rearing. Smallholder calf rearing is labor intensive and can provide employment opportunities to the unemployed rural youth. The need of the hour are proper policy interventions and appropriately designed training programs to promote calf rearing on modern and scientific methods keeping in mind the local conditions. This if done properly, can become an engine of growth in rural areas thus providing employment opportunities in rural areas and checking population shift from rural to urban areas. Furthermore, this will help in meeting ever increasing demand of milk and meat products and may also contribute to foreign exchange earnings through exports.

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