



## Research Article

# Ultrasonography: A Tool for Management of Reproductive Disorders in Dairy Cows

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**Abstract** | Ultrasonography is modern technique being utilized for management of reproductive efficiency of dairy cows all over the world. The ultrasound facility was not available in the study area due to which farmers were complaining about reproductive issues of their animals. Therefore, this study was conducted for assessment of reproductive health of cow genital tract using real time B mode Ultrasonography in order to improve the economics of the farmer through decreasing calving interval and improvement of fertility and conception rate. Out of total cows (n=261) observed, 79% of the cows were found positive for various reproductive disorders, whereas 21% of cows were found normal. Overall occurrence of reproductive disorders was higher (52%) in multiparous cows (4<sup>th</sup> calver and above) followed by multiparous cows (2<sup>nd</sup> and 3<sup>rd</sup> calver) (26%) and the incidence was lowest (22%) in 1<sup>st</sup> calvers. The incidence was higher in Friesian Cross bred cows (36%) followed by Sahiwal cows (25%), Jersey Cross bred (22%) and lowest in non-descript cows (17%). The incidence of acyclicity and repeat breeding was higher in Friesian Cross bred cows *viz*; 7.3 and 17% respectively whereas Cervicitis was higher in Sahiwal cows (10%). Endometritis, pyometra and cervicitis were treated with antibiotics like Co-Amoxiclav 4.8 gm and ceftriaxone 4gm Intravenous injections daily for three days along with (penicilin-streptomycin combination) 10 gram intrauterine. Pyometra and Hydrometra were first treated with Cyclomate to regress the Corpus luteum. In repeat breeding issues due to nymphomenia, follicular cysts, Luteal cysts, Buserelin 0.0105 mg/lecirelin 50µg and PGF2α Analogue 100µg Intramuscular (IM) were used. Further research on the efficacy of protocols that integrate ultrasonography with timed AI protocols for re-synchronization of ovulation, differential management strategies for cows carrying twin fetuses conducted.

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**Keywords** | Acyclicity, Cervicitis, Endometritis, Follicular cysts, Luteal cysts, Ultrasonography



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## Introduction

Reproductive management is a key to success in view of profitable dairy sector through calf a

year Slogan. After getting a calf from a dairy cow not only has an economic impact but also enhances the productive life of the dairy cow. Increased calving interval, low conception rates, early embryonic deaths,

due to various factors mainly management of nutrition, estrus and Artificial Insemination (AI) services has drastic impact on reproductive management (Dillon *et al.*, 2006).

Post breeding, an early identification of non-pregnant animals may reduce the interval between AI services and increases the AI service rates. It is indeed very crucial to incorporate the new technologies for early identification of pregnant and non-pregnant animals, which plays a vital role to enhance the reproductive efficiencies and devising the managerial strategies for establishing and sustaining a successful dairy business sector (Ashok *et al.*, 2013).

Rectal palpation has been employed as a rational method for pregnancy detection but its efficacy is being questioned regarding ovarian follicular distinction (Roberts, 1971). On the other hand, ultrasonography is a highly accurate and rapid method for assessing ovarian structures as well as detecting cyclicity. Hormonal assay is another method for detecting the cyclicity of the female animals which is not only costly but also time consuming and need a proper laboratory setup. In modern scenario portable ultrasound machines are commercially viable and are also established in commercial dairy setup. Currently ultrasonography has become an important diagnostic tool for evaluating female reproductive system, where it is possible to view entire reproductive tract in non-invasive way (Rahla *et al.*, 2019).

Ultrasonography has provided arena in diagnosing the reproductive disorders and as well as response of the treatment thereafter. The aim of the reproductive treatment is to alleviate the inflammatory response and bring back the cyclicity of the animal with fruitful conception (Quintela *et al.*, 2012).

Diagnostic ultrasound is a non-invasive diagnostic technique based on the pulse-echo principle used to image inside the body. It is portable, free of radiation risk, and relatively in expensive when compare with other imaging modalities, such as magnetic resonance and computed tomography (Ansari, 2011). Ultrasonography is best for distinguishing solid from cavities (fluid filled) structures and provides internal details not demonstrated radiographically. The non-invasive nature of ultrasonography makes it an excellent clinical and research tool in bovine reproduction (Jyoti *et al.*, 2019; Kumar and Purohit, 2009).

The use of transrectal ultrasonography to evaluate reproduction in cows has enhanced our understanding of the ovarian and uterine process during the estrus cycle, different pathological states and pregnancy in order to improve reproductive performance and genetic phenomenon (Fricke and Lamb, 2002).

Therefore, current study was conducted to diagnose/ asses different pathological conditions of genital tract in dairy cows, treatment outcome for the improvement of their fertility in terms of conception rate using through real time B mode Ultrasonography.

## Materials and Methods

### Study area

Proposed study was carried out in District Haripur. As District Haripur is adjacent to the Punjab, there is no native cattle or buffalo breed found in this region. It is usually dependent on markets of Punjab especially Arif wala and Cheechawatni Gondal and Hassan Abdal for purchase of cross bred cattle for the farmers of this area.

### Identification of cows with reproductive disorders

Farmers were approached and animals with complaints of repeat breeding, A-cyclicity (did not show estrus by > 60 days postpartum), irregular estrus, nymphomania, abnormal vaginal discharge and presumably pregnant (wanted to know the pregnant status), animals showing sign of advance pregnancy while no parturition was identified and examined.

### Trans rectal ultrasonography

Ultrasonography was performed by using portable real time B-mode Trans rectal ultrasound scanners (Honda HS V1600, HLV-875M5.0/7.5/10MHz and KAIXIN 5600 digital B mode Scanner with 7.5 MHz multi frequency linear Probe). Detailed clinic-gynaecological examination was performed to sort out anatomical and pathological conditions. Thorough reproductive organs scan was performed including ovaries, fallopian tube, uterine horns, body of uterus and cervix. Ovaries of individual cows were scanned twice at an interval of ten days for cyclicity. Uteri were scanned (before and after advised treatment) and presence of CL, follicle or cysts in ovaries, and condition of uterus (tonus/Atonus). Pathophysiology of cervics was also observed during each scan (Reeves, 1984; Abd-El-Aty and Medana, 2010).

Treatment

Proper treatment strategy/regime was devised to the farmer against the problem diagnosed. In a scenario of poor heat detection by the farmer, proper signs of estrus and time of Artificial Insemination described. Pathological conditions like endometritis, metritis, pyometra, mucometra were addressed properly both by use of antibiotics and hormones. Effect of treatment on resumption of estrous cycle was noted. Anestrus was addressed through nutritional supplementation and management and also employing hormonal strategies keeping in view of the body conditioning score. Issues of follicular and luteal cysts were treated by Hormones. Repeat breeders given GnRH at time of insemination.

Analysis of data

The data was arranged in Microsoft excel sheets and was analyzed and tabulation was performed regarding proportions of reproductive disorders in cows.

Results and Discussion

Current study was conducted in the vicinity of District Haripur. Various cattle farms were visited and cow were checked randomly for their reproductive health. A total of 261 cows of various breeds available were examined. The findings of the study are elaborated in this chapter below.

Out of total cows (n=261) observed, 79% of the

cows were found positive for various reproductive disorders, whereas 21% of cows were found negative for any reproductive anomaly. The results are shown in Figure 1.

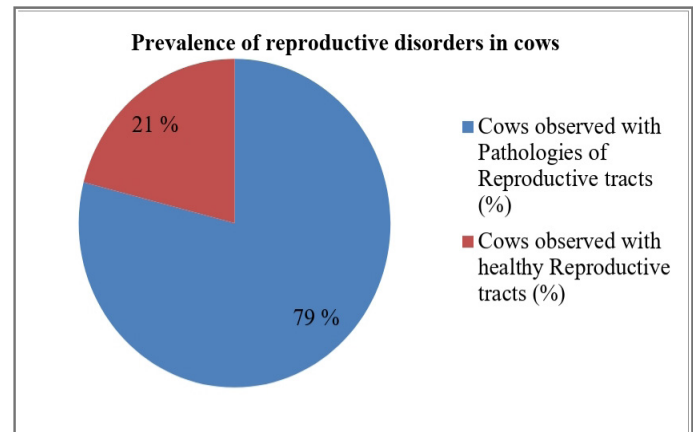


Figure 1: Graphical presentation of Overall prevalence of reproductive disorders in cows.

The study animals were grouped in to three main groups viz; 1<sup>st</sup> calver, Multiparous cows (2<sup>nd</sup> and 3<sup>rd</sup> calver) and Multiparous cows (4<sup>th</sup> calver and above). The details are presented in Table 1.

It was observed that the overall occurrence of reproductive disorders was higher (52%) in Multiparous cows (4<sup>th</sup> calver and above) followed by Multiparous cows (2<sup>nd</sup> and 3<sup>rd</sup> calver) (26%) and the incidence was lowest (22%) in 1<sup>st</sup> calvers. The Incidence of acyclicity, repeat breeding, cervicitis, endometritis, pyometra, hydrometra, early embryonic

Table 1: Effect of parity on occurrence of reproductive disorders in cows.

Pathologic Conditions	Total animals positive for reproductive disorders (No.)	Parity of study animals					
		1 <sup>st</sup> calver		Multiparous cows (2 <sup>nd</sup> and 3 <sup>rd</sup> calver)		Multiparous cows (4 <sup>th</sup> calver and above)	
		No	%	No	%	No	%
Acyclic cows	34	2	1	7	3.4	25	12
Repeat Breeder Cows	75	25	12	20	9.7	30	15
Cervicitis	33	10	4.9	5	2.4	18	8.7
Endometritis	5	0	0	1	0.5	4	1.9
Pyometra	5	0	0	2	1	3	1.5
Hydrometra	3	1	0.5	2	1	0	0
Early Embryonic Death	7	2	1	3	1.5	2	1
Mummified Foetus	3	0	0	2	1	1	0.5
Anovulation/Static Ovaries	15	0	0	5	2.4	10	4.9
Anovulation-Follicle emergence	5	1	0.5	1	0.5	3	1.5
Anovulation -Follicle selective non-ovulatory size	4	1	0.5	1	0.5	2	1
anovulation -follicle ovulatory size	7	1	0.5	2	1	4	1.9
Mixed Patalogic conditions	10	2	1	3	1.5	5	2.4
Total	206	45	22	54	26	107	52

death, mummified foetus, an-ovulation and mixed pathologic conditions was 1%, 12%, 4.9%, 0%,0%, 0.5%, 1%, 0%, 0% and 1% in 1<sup>st</sup> calver cows, respectively while, in Multiparous cows (2<sup>nd</sup> and 3<sup>rd</sup> calver) the incidence was 3.4%, 9.7%, 2.4%, 0.5%, 1%, 1%, 1.5%, 1%, 2.4% and 2.4%, respectively, similarly the incidence in multiparous cows (4<sup>th</sup> calver and above) was 12%, 15%, 8.7%, 1.9%, 1.9%, 0%, 1%, 0.5%, 4.9% and 2.4%, respectively.

Effect of breed of animal on incidence of reproductive disorders was studied. Four different types of cow breeds (Sahiwal cows, non-descript cows, Friesian Cross bred and Jesry Cross bred) were observed in the study area. An overall affect of cow breed on occurrence of reproductive disease was observed and it was noticed that the incidence was higher in Friesian cross bred cows (36%) followed by Sahiwal cows (25%), Jesry cross bred (22%) and lowest in non-descript cows (17%). The incidence of acyclicity and repeat breeding was higher in Friesian cross bred cows viz; 7.3% and 17%, respectively whereas cervicitis was higher in Sahiwal cows (10%). The detail results are shown in [Table 2](#).

**Treatment**

Treatment was given to the animals with respect to identified pathological conditions. In pathologic conditions like endometritis, pyometra and cervicitis

were treated with antibiotics like Oxytetracycline, Co-Amoxiclav and ceftriaxone parental injections along with intrauterine pencillin and tetracycline. Pyometra and Hydrometra were first treated with cloprostenol sodium (0.263mcg) to regress the Corpus luteum. The endometritis and pyometra has been historically treated with intrauterine antimicrobials and systemically with PGF2 $\alpha$  and reported by many scientists from all over the world.

The treated animals which recovered after complete course of antibiotics and were either inseminated or naturally bred and after insemination/breeding pregnancy was confirmed with Ultrasonography at day 35.

Other issues like nymphomania, follicular cysts, Buserelin 0.021mg/ lecirelin 100 $\mu$ g (GnRH) were used. In some cases where cows were weak, energy contents were increased in feed and injectible Vitamin E and selenium were given to cows. It was also revealed that high contents of crude protein in the concentrate ration induced high mucus secretions in different stages of estrus cycle and pregnancy. In this context farmer was advised to balance the feeding ration in order to reduce blood urea nitrogen to permissible level. Moreover, in some cases heat stress was observed to affect the reproduction in cows.

**Table 2:** Effect of breed on occurrence of reproductive disorders in cows.

Reproductive Disorders	Total animals positive for reproductive disorders (No.)	Breed of study animals							
		Sahiwal		Non-descript		Friesian cross bred		Jesry cross bred	
		No	%	No	%	No	%	No	%
Acyclic cows	34	9	4.4	3	1.5	15	7.3	7	3.4
Repeat Breeder Cows	75	10	4.9	10	4.9	35	17	20	9.7
Cervicitis	33	21	10	1	0.5	5	2.4	6	2.9
Endometritics	5	2	1	1	0.5	1	0.5	1	0.5
Pyometra	5	2	1	1	0.5	1	0.5	1	0.5
Hydrometra	3	--	--	--	--	2	1	1	0.5
Early Embryonic Death	7	1	0.5	2	1	3	1.5	1	0.5
Mummified Foetus	3	--	--	2	1	1	0.5	--	--
Anovulation/Static Ovaries	15	1	0.5	5	2.4	5	2.4	4	1.9
Anovulation-Follicle emergence	5	1	0.5	2	1	1	0.5	1	0.5
Anovulation -Follicle selective non-ovulatory size	4	1	0.5	2	1	1	0.5	--	--
anovulation -follicle ovulatory size	7	2	1	3	1.5	1	0.5	1	0.5
Mixed Patalogic conditions	10	2	1	2	1	3	1.5	3	1.5
Total	206	52	25	34	17	74	36	46	22

Luteal cysts with varying sizes (24mm, 21mm) were observed in various cases in cows. Farmers were recommended with PGF2 $\alpha$  (cloprostenol sodium) treatment and treated cows got pregnant after insemination or natural breeding.

It was observed that when the farmers reduced the commercially formulated concentrate rations and increased the cotton seed cake and energy contents, most of the acyclicity was resolved without treatment.

Ultrasonography is an important non-invasive diagnostic tool for study of reproductive tract (Rahla *et al.*, 2019). Ultrasonography has provided arena in diagnosing the reproductive disorders and as well as response of the treatment thereafter (Quintela *et al.*, 2012). The results of current study are discussed in this chapter. Out of total cows (n=261) observed, 79% of the cows were found positive for various reproductive disorders, whereas 21% of cows were found negative for any reproductive anomaly. The effect of parity on occurrence of repeat breeding in cows was observed by Bonneville-Hebert *et al.* (2011) and reported that repeat breeding was significantly higher in multiparous cows (42%). Whereas the incidence was lower in second parity (18%) and third parity (24%) cows. Gilbert *et al.* (2005) has reported that the uterine diseases in dairy cows with a range of 3% to 40%, whereas in our study the prevalence rate of 79% has been observed which might be due to differences in managerial and rearing practices. Quintela *et al.* (2010) reported 45.7% of endometritis in cows in a study in northwest Spain which is much higher than the findings of our study. Similar findings have been observed in our study.

The treatment of clinical endometritis with intrauterine application of antibiotics or antimicrobials, as well as systemic administration of PGF2 $\alpha$ , has been described in the literature and is widespread in routine practice as a main therapy option (LeBlanc, 2002; Madoz, 2013). Similarly, LeBlanc (2008) has reported that the incidence of endometritis in cows is higher in second month postpartum and use of PGF2 $\alpha$  along with antibiotics has cleared the infection and improved the fertility rate. Similar findings have been observed in the current study.

Indiscriminate use of the oxytocin leads to reproductive anomalies. It is believed that prolonged use of oxytocin also hinder fertility disorder leads to

poor heat, decrease conception rate, reduced lactation period, increase incidence of embryonic mortality in local herds of buffalo and cattle (Siddiqui and Saeed, 2000). Same was observed during the course of study.

Early embryonic deaths and anovulation due to improper growth of follicles was also observed in various cases and it was probed that feeding management was the key issue in this regard. Dietary proteins play an important role in reproduction and increase dietary Crude Protein, increased degradability of dietary proteins and elevated milk and blood urea have been associated with decreased conception and pregnancy (Dawuda *et al.*, 2002). In short, rations enriched in dietary protein may influence the reproductive efficiency through increased Negative Energy Balance (NEB), potential toxicity for the oocyte and the embryo through by products of protein catabolism, changes in biochemistry and pH of uterine fluid after ovulation, PGF2 $\alpha$  hormonal changes secreted by endometrium, changes in spermatozoa motility (Melendez *et al.*, 2003; Leroy *et al.*, 2008).

All the animals which failed to conceive after three or more consecutive AI were considered as Repeat breeding (RB) and those animals with oestrous period longer than 36 hours were considered as RB with prolonged oestrus (Dadarwal *et al.*, 2005). Multifactorial causes of repeat breeding including anatomical infertility and functional infertility (fertilization failure, Early Embryonic Death, hormonal imbalances, improper heat detection, nutritional imbalance). For anatomical infertility cattle facing cervical fibrosis semen concentration was increased, or recommended natural breeding (Jaureguiberry *et al.*, 2017). Functional infertility of repeat breeding were addressed according to the nature of cause by employing double insemination an interval of 24 hours while keeping in view the size of graffian follicle (14.5mm to 16mm), along with administration of Buserelin 0.0105 mg/lecirelin 50 $\mu$ g. Cystic ovaries with follicular cysts with more than 30 mm diameter were observed by Takagi *et al.* (2005). These were also treated with GnRH with similar findings as in our study.

Takagi *et al.* (2005) diagnosed pyometra and endometritis with varying sizes of *Corpus luteum* (CL) on the ovary. The diagnosed conditions were treated with PGF2 $\alpha$  dinoprost 25 mg IM for regression of CL and release of fluids from the uterus. The results

of this study are inline our findings. On the other hand, in the same study the luteal cyst was treated with PGF2 $\alpha$  Analogue 100  $\mu$ g IM. The acyclic cows came into estrous after treatment. The findings of this study are same as our findings.

## Conclusion and Recommendations

As a research tool, transrectal ultrasound has revolutionized our understanding of reproductive biology. As a management tool, transrectal ultrasound may provide a diagnostic tool for improving reproductive management in dairy operations. Although there are many potential applications of ultrasound for use in reproductive management of dairy cattle, combining ultrasound for early pregnancy diagnosis with timed AI along with early detection of twin pregnancies will likely result in the most widespread uses of this technology. Development of integrated reproductive management systems that combine ultrasound with new and existing reproductive technologies will further enhance the practical applications of ultrasonography. Further research on the efficacy of protocols that integrate ultrasonography with timed AI protocols for re-synchronization of ovulation, differential management strategies for cows carrying twin fetuses, and thorough economic analyses on the use of ultrasound for reproductive management of dairy cattle must be conducted before widespread integration of ultrasound occurs in the dairy industry.

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## Novelty Statement

Ultrasonography being a moderanized and versatile diagnostic tool was introduced very first time in the study area. No baseline data was available regarding ultrasonography of reproductive system of cows in the study area, rather; ultrasonography was not even practiced for diagnosis in animals. It was very first attempt to introduce it for diagnosis of reproductive disorders and the obtained data will be helpful in future for diagnostic reference and treatment of reproductive disorders in cows.

## Author's Contribution

ZA and MS conceived the idea of the study and performed the field work. YA, IA and MM helped in various activities during the course of study. H did overall supervision of the study. MS analysed the data and did writeup along with ZA.

## Conflict of interest

The authors have declared no conflict of interest.

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