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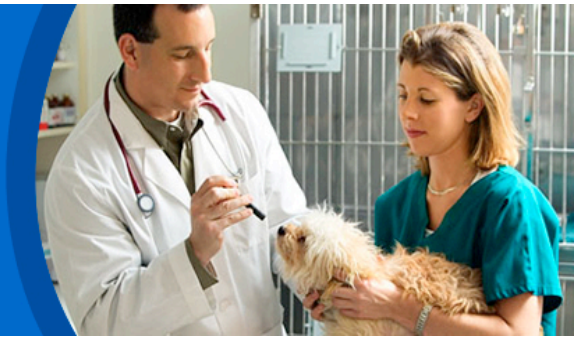

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Prediction of pregnant Bitches status to refer to C-Section based on Fetal heart rate by ultrasonography

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Abstract
The aim of this study is to determine the importance of the fetal heart rate as an indicator of fetal health. This study was conducted on 20 pregnant bitches 10 medium to large breeds (body wt. < 15kgs) and 10 small breeds (body wt. > 15kgs) and the fetal heart rate was recorded every day for a week before estimated date of whelping. The bitches with the fetal heartrate less than 200 bpm in case of small breeds and less than 180 bpm in case of large breeds were considered as indication for fetal distress and referred to caesarean section for decreasing incidents of fetal mortality. In this study under examination of 20 pregnant bitches, 7 bitches are referred to csection because of clinical signs of impending parturition, In these 3/10 in large breeds and 4/10 in small breeds are referred to c-section and saved fetuses on timely intervention.

Keywords: Ultrasonography, c-section, fetal heart rate, pregnant bitches

1. Introduction
Pet breeding has some risks that arise during pregnancy. Neonatal mortality in bitches represents a potential emotional and economic loss for pet owners and breeder, Parturition Constitute most anxious time for Canine breeder to allow better planning for labour assistance and potential caesarean section (C-section) so as to improve neonatal survival and minimize neonatal death. The most important and widely used parameter to monitor the fetal wellbeing is Fetal Heart Rate (FHR) (Gil *et al*., 2014) [4]. It's a safe and effective method for monitoring fetal development, viability and negative signs like fetal distress which is due to Hypoxia occurs during dystocia and manifests decreased Heart Rate of the foetus. Verstegen *et al*., (1993) [9] used the heart rate of dog and cat fetuses in utero studies by using realtime B and M mode ultrasonography. Zone and Wanke (2001) [10] detected fetal pathology as important for the care of puppies in the postnatal period to identify parameters of fetal distress by determining FHR. Ghaisas *et al.* (2015) [3] who studied the application of ultrasonography to assess fetal well-being during pregnancy in canines, fetal distress can be diagnosed by using fetal heart rate measurement. The pregnant bitches were scanned, and fetal heart rates were monitored and concluded that the fetal heart rate above 215 bpm is normal in an advanced stage of pregnancy.
Balaji *et al.* (2017) [1] reported that ultrasonography is one of the most promising techniques to assess pregnancy and related events in canines. The authors inferred that heart rates are important end points to assess fetal viability in bitches.
Transient acceleration and deceleration in normal fetal cardiac activity results from uterine contractions. Therefore, in present study these changes occur in relation with parturition and is utilised in predicting a suitable time to do caesarean section. Maternal cardiovascular adaptation during pregnancy provides interaction between maternal and fetal homeostasis, which is a useful screening tool for pregnancy complications and there is no information about these parameters throughout gestation, particularly early and mid-gestation (Lobo *et al*., 2021) [5].

2. Materials and Methods
The study was undertaken on 20 bitches (10 small breeds of <15kg Body weight and 10 medium to large breeds of >15kg Body weight) with 30 to 35 days crossing history aged

between 1-6 yrs were presented to Veterinary Clinical Complex, Veterinary Gynaecology and Obstetrics ward, College of Veterinary Science, Rajendranagar, Hyderabad. All these bitches were subjected to transabdominal ultrasonography to confirm the pregnancy the owners were asked to bring the pregnant bitches every day for a week before estimated date of whelping to record fetal heart rate by ultrasonography was analyzed by M-mode. The bitches with the fetuses having heartrate less than 200 bpm in case of small breeds and less than 180 bpm in case of large breeds were considered as indication for fetal distress and referred to caesarean section for decreasing incidents of fetal mortality.

3. Results

In this study, in small breeds, foetuses delivered normally had antepartum FHR of above 200 bpm and in large breeds, fetuses delivered normally had antepartum FHR of above 180 bpm foetuses delivered by c-section had decreased heart rate of less than 200 bpm in case of small breeds and 180 bpm in case of large breeds as mentioned in table 1 and 2.

Table 1: Characteristics of the bitches and their type of delivery, and Numbers of foetuses and fetal heart rate in large breeds.

Bitch	Age (In years)	FHR (bpm)	Parturition	Number of foetuses
1	2	241	Normal delivery	5
2	1	238	Normal delivery	8
3	1	243	Normal delivery	6
4	5	240	Normal delivery	5
5	1	226	Normal delivery	8
6	2	220	Normal delivery	4
7	4	234	Normal delivery	3
8	3	170	Caesarean section	2
9	2	180	Caesarean section	1
10	2	172	Caesarean section	4

Table 2: Characteristics of the bitches and their type of delivery, and numbers of foetuses and fetal heart rate in small breeds

Bitch	Age	FHR (bpm)	Parturition	Numbers of foetuses
1	6	232.5	Normal delivery	5
2	2	246	Normal delivery	4
3	2	248	Normal delivery	4
4	2	260	Normal delivery	4
5	2	250	Normal delivery	4
6	4	238	Normal delivery	6
7	1	180	Caesarean section	4
8	1	185	Caesarean section	5
9	3	190	Caesarean section	5
10	3	178	Caesarean section	3

4. Discussion

In the present study bitches with the fetuses having heartrate less than 200 bpm in case of small breeds and less than 180 bpm in case of large breeds were considered as indication for fetal distress and referred to caesarean section for decreasing incidents of fetal mortality. Simoes *et al.* (2016) [7] concluded that the prepartum increase in heart rate in bitches with eutocia or dystocia was correlated with fetal and maternal stress. Smith (2007) [8] summarized that properly timed cesarean section is an appropriate therapeutic modality to be used in small animal reproduction.

The fetal heart rate was evaluated for assessing fetal viability and found excellent indicator of fetal distress. FHRs are 2 to 3 times greater than maternal heart rate (MHR) and found to corroborate with those of (Barr *et al*., 1988 and Lopate, 2008) [2, 6] which is 220 to 240 bpm, Heart rates between 180 and 220 bpm were considered indicative of slight fetal stress and rates consistently less than 180 bpm were considered indicative of severe fetal distress owing to hypoxia.

The FHR variability was measured and found to be consistent with accelerations and decelerations. These changes occurred during the study period from 72 hrs. Until 6-1 hr. antepartum. Initially, variation in heart rate occurred only in select fetuses, but as the bitch was nearing the time of parturition, all fetuses presented these variations. Heart rate acceleration and deceleration variations alternated and became extreme as parturition approached. As parturition approached, the fetal HR decelerations reached 180 bpm as minimum and sustained maximum values above 200 bpm. The FHR should be greater than 200 beats per minute in small breeds and 180 bpm in large breeds, otherwise it is indicative of fetal distress.

A low fetal Heart Rate in all fetuses could be mistaken as evidence of fetal distress. Instead, low FHR should be considered physiological and normal when associated with subsequent heart rate elevations. This is evidenced by the positive outcome for the puppies; all were born alive and healthy. Intermittent uterine contractions over a fetus can temporarily reduce the fetus heart rate significantly, but it should return to a normal rate within 1 to 2 minutes and remain within the normal range when there is no fetal stress. In general, the FHR declines as parturition approaches and bitch with fetuses having deceleration and then acceleration, showing signs of delivery and then stops having FHR deceleration and has diminished signs of delivery, may be in uterine inertia and cesarean delivery should be considered. This finding was confirmed in this study and quantitative analysis was possible.

In this study under examination of 20 pregnant bitches, 7 bitches are referred to csection because of clinical signs of impending parturition, in these 3/10 in large breeds and 4/10 in small breeds are referred to c-section and saved fetuses on timely intervention.

5. Conclusion

Ultrasonography has greatly improved knowledge regarding pregnancy diagnosis and fetal viability. It is interpreted that

heart rate was important end point to assess fetal viability in bitches, as the decreased heart rate correlates with conceptus viability. Reproductive history and risk factors should also be considered and, finally, serial ultrasound assessment were more predictive than a single examination for assessing pregnancy diagnosis and fetal viability.

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