The Pharma Innovation Journal 2022; SP-11(8): 1842-1846

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(8): 1842-1846

www.thepharmajournal.com
Received: 15-06-2022
Accepted: 18-07-2022

Swagat Mohapatra
Department of Veterinary Physiology, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

Smruti Smita Mohapatra
Department of Veterinary Physiology, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

Subhralaxmi Dwivedy
Department of Veterinary Physiology, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

Shivani Das
Department of Veterinary Physiology, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

Ritun Patra
Department of Veterinary Anatomy and Histology, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

Ambika Prasad Khadanga Mahapatra
Department of Veterinary Physiology, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

Lipika Priyadarsini
Department of Veterinary Physiology, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

Corresponding Author
Swagat Mohapatra
Department of Veterinary Physiology, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

Changes in electrocardiograms of black Bengal goats during pregnancy

Swagat Mohapatra, Smruti Smita Mohapatra, Subhralaxmi Dwivedy, Shivani Das, Ritun Patra, Ambika Prasad Khadanga Mahapatra and Lipika Priyadarsini

Abstract
ECG is a simple and fast diagnostic tool that records heart's electrical activity and helps to detect cardiac abnormalities, electrolyte imbalances etc. Pregnancy is a physiological phenomenon that affects all the systems of the maternal body. ECG can help to detect various physiological adaptations in the maternal cardiovascular system during pregnancy. Sometimes these changes mislead the diagnosis of cardiac diseases. This study highlights the changes in the electrocardiogram of Black Bengal goats during normal pregnancy and thus helps to differentiate physiological changes from the pathological conditions. In this study, pregnant Black Bengal goats (n=6) aged between 1 to 3 years with gestational age ranging from 75-100 days and non-pregnant Black Bengal goats (n=6) aged between 1 to 3 years were considered. A 12-lead standard ECG recorder (Cardiarts 108 T-MK VII-BPL) was used for recording electrocardiogram. The ECG machine was set with a paper speed of 25 mm/sec and sensitivity of 1 (1 cm = 1 mv). No significant changes were observed in P wave amplitude of pregnant and non-pregnant goats. However, in lead I, duration of P wave was significantly higher in pregnant goats. In lead III, P wave was found inverted in 1 out of 6 cases. Amplitude of R wave was significantly higher in non-pregnant goats in lead I. In pregnant goats, R wave was found inverted in 5 out of 6 cases in lead I. In lead II, R wave was found inverted in 5 out of 6 cases and in lead III, R wave was found inverted in 2 out of 6 cases. The RR interval was significantly higher in pregnant goats in lead I. The heart rate was significantly lower in pregnant goats in comparison to non-pregnant goats in lead I. This study enhances the understanding of normal physiological changes in the ECG during pregnancy which helps in better management of cardiovascular disorders.

Keywords: Electrocardiograms, black Bengal goats, pregnancy

1. Introduction
The heart is suspended in a conductive medium. Charges flow outside the heart during depolarization and repolarization which are conducted to the surface of the body by the fluids in other tissues surrounding the heart. The electrical activity of the heart can be recorded through electrocardiography (ECG) by attachment of electrodes to the surface of the body.

Goats are exposed to several biotic and abiotic stressors. One of the most pertinent abiotic stressors in Indian subcontinent is thermal stress. Thermal stress is defined as conditions of extreme environmental temperature leading to disturbance in homeostasis of animals (Parida *et al.*, 2020$_a$) [6]. Heat stress in cattle leads to alteration in ECG and injury to myocardial cells (Mohapatra *et al.*, 2021) [4]. Parida *et al.*, 2020b [7] demonstrated that thermal stress has detrimental effects on cardiac cells of goats. At least one type of cardiac arrhythmia among sinus tachycardia, respiratory sinus arrhythmia, sinoatrial block and ventricular premature complex was reported in more than 50 percent in Iranian Najdi goats (Pourjafar, 2012) [8]. Congenital cardiac defect in a pygmy goat has also been reported by Laus *et al.*, 2011 [2]. This warrants the use of ECG during routine clinical examination in goats.

The Black Bengal breed of goat is found throughout Bangladesh and other places of India such as West Bengal, Bihar, and Odisha. It's highly conducive for goat farming because of its high rate of reproduction, great adaptability to environmental conditions and high immunity (Pradhan *et al.*, 2017) [9]. Normal pregnancy brings about changes in ECG (Sunitha *et al.*, 2014) [12]. Fetal heart beat was observed in goats as early as day 21 of gestation (Suguna *et al.*, 2008) [11]. We hypothesized that pregnancy will alter the electrocardiograms of Black Bengal goats. The study was carried out to investigate the changes in ECG of Black Bengal goats during pregnancy. The results of the study might be taken into consideration while

interpretation of electrocardiogram in pregnant goats.

2. Material and Methods

Pregnant Black Bengal goats (n=6) aged between 1 to 3 years with gestational age ranging from 75 to 100 days and non-pregnant Black Bengal goats (n=6) aged between 1 to 3 years were considered for the present study. A 12-lead standard ECG recorder (Cardiart 108 T-MK VII-BPL) was used for recording electrocardiogram. The ECG machine was set with a paper speed of 25 mm sec-1 and sensitivity of 1 (1 cm = 1 mv) with the filter (50 Hz) in turned "on" mode. The anterolateral aspect, just below the elbow, and stifle joint were the preferred sites for the attachment of crocodile clips and the ECG tracings were taken in three bipolar standard leads (lead I, II and III). The ECG was recorded with animals in the standing position (Mohapatra *et al.*, 2018) [5]. All the data of the entire study was analyzed using Microsoft excel and processed using SPSS 11.00 for windows, adopting a significant level of 95 percent (p<0.05) in all cases.

3. Results and Discussion

The values of ECG variables and heart rate are shown for Lead I (Figure 1 and 2), Lead II (Figure 3 and 4), Lead III (Figure 5 and 6). P wave in ECG represents depolarization of atria.

No significant changes were observed in the P wave amplitude of pregnant and non-pregnant goats. This implies that there is no change in pattern of depolarization of atria between pregnant and non-pregnant goats. However, in lead I, duration of P wave was significantly higher in pregnant goats. In lead III, P wave was found inverted in 1 out of 6 cases. QRS complex represents ventricular depolarization. Amplitude of R wave was significantly higher in non-pregnant goats in lead I. However, in lead II and lead III, although R wave amplitude was higher in non-pregnant, but statistically it was insignificant. Our findings contradict with Samimi *et al.*, 2018 [10] who reported higher QRS amplitude in four months pregnant goats with respect to lactating non-pregnant goats. In pregnant goats, R wave was found inverted in 5 out of 6 cases in lead I. In lead II, R wave was found inverted in 5 out of 6 cases and in lead III, R wave was found inverted in 2 out of 6 cases. The change in mean electrical axis of the heart during pregnancy might be the reason behind such observation. Sunitha *et al.*, 2014 [12] reported axis deviation of the heart during pregnancy in human subjects. Duration of QRS complex represents the time taken for ventricular depolarization. There was no significant difference between the QRS complex duration of pregnant and non-pregnant goats.

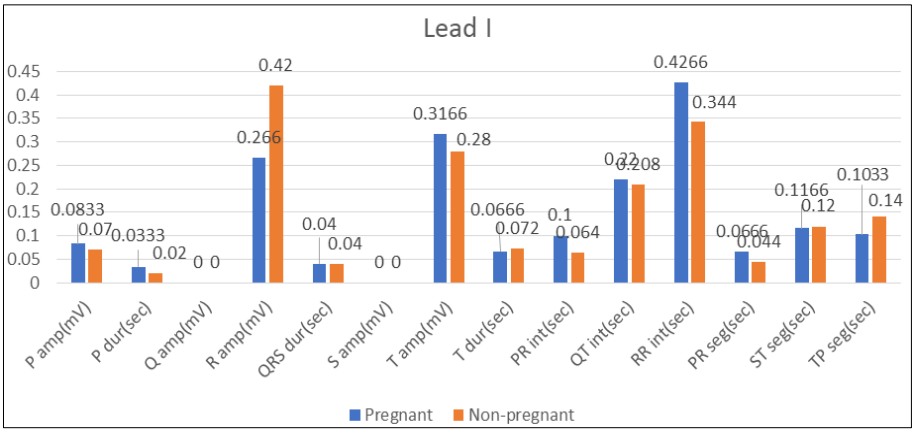

Fig 1: Graph showing ECG variables (Lead I) in pregnant and non-pregnant Black Bengal goats

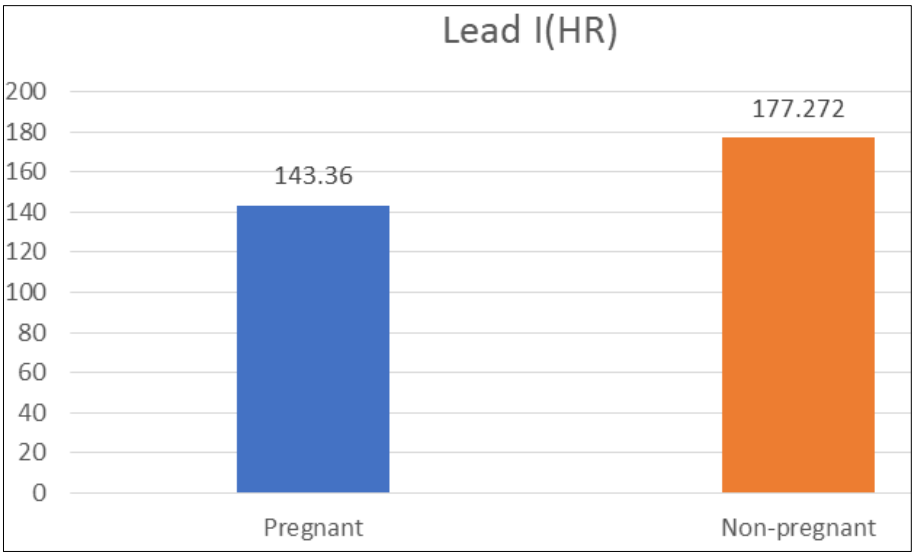

Fig 2: Graph showing Heart Rate (beats per minute) in Lead I of pregnant and non-pregnant Black Bengal goats

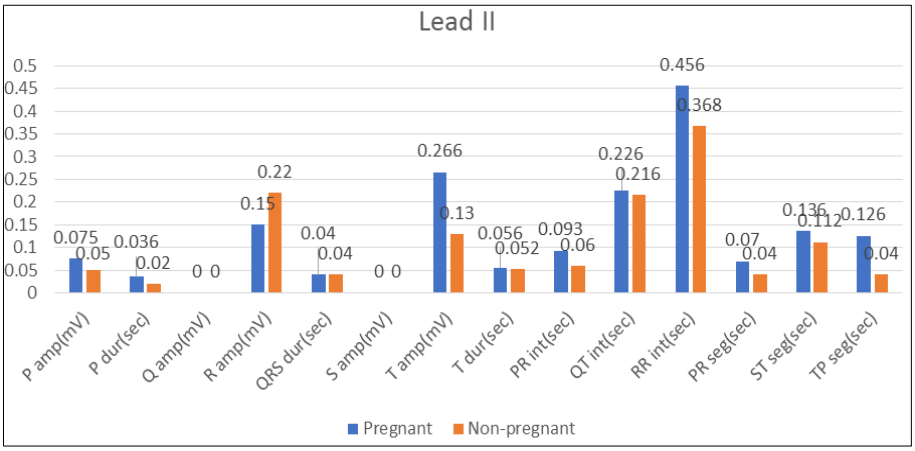

Fig 3: Graph showing ECG variables (Lead II) in pregnant and non-pregnant Black Bengal goats

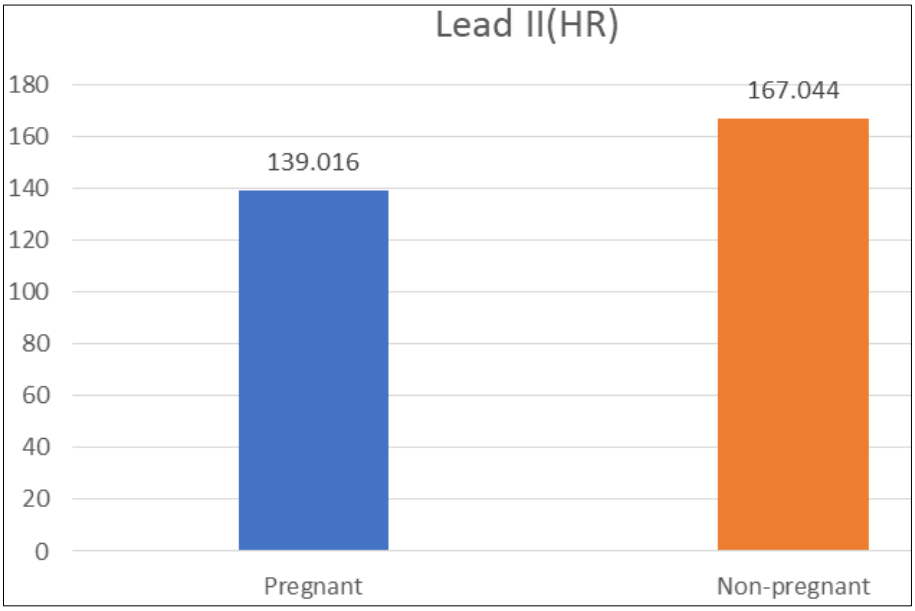

Fig 4: Graph showing Heart Rate (beats per minute) in Lead II of pregnant and non-pregnant Black Bengal goats

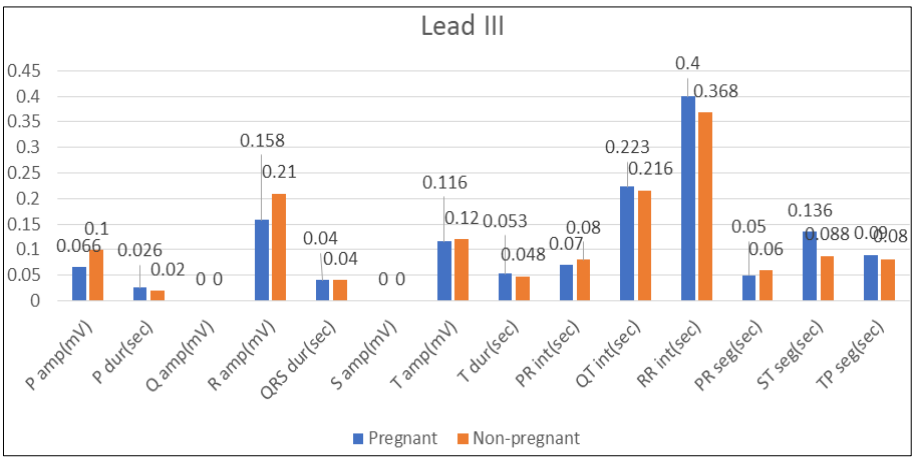

Fig 5: Graph showing ECG variables (Lead III) in pregnant and non-pregnant Black Bengal goats

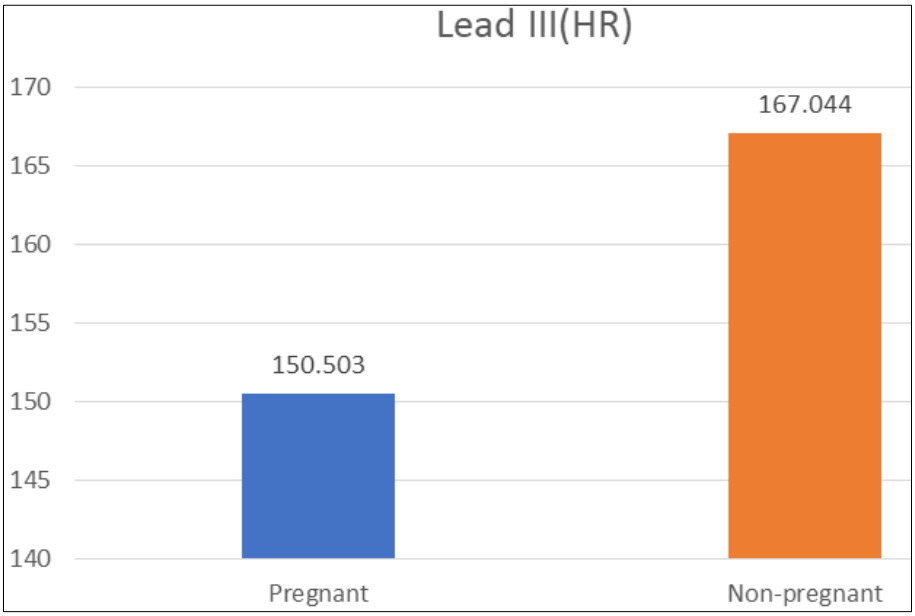

Fig 6: Graph showing Heart Rate (beats per minute) in Lead III of pregnant and non-pregnant Black Bengal goats

Ventricular repolarization is represented by T wave of ECG and T wave occurs just before the end of ventricular contraction. Amplitude of T wave was higher in pregnant goats in most of the leads although the values were statistically non-significant. In lead III, T wave was found inverted in 5 out of 6 cases. There was no significant difference between the duration of T wave between pregnant and non-pregnant goats. The PR interval which denotes atrio-ventricular conduction time was insignificantly higher in most of the leads. QT interval denotes duration of depolarization of the ventricles and the time required to complete the repolarization of ventricles. The QT interval was higher in pregnant goats in most of the leads. The RR interval of pregnant goats was significantly higher in lead I. Our findings are not in agreement with Marian *et al.*, 2022 [3] who reported a decrease in R-R range in pregnant goats. The PR segment, ST segment and TP segment in most leads were insignificantly higher in pregnant goats. P-R interval represents atrio-ventricular conduction time. The heart rate measured from ECG (1500/R-R) was significantly lower in pregnant goats in comparison to non-pregnant goats in lead I. In other leads, although heart rate was comparatively lower in pregnant but the values are not statistically significant. Conversely, Hydbring *et al.*, 1999 [1] reported higher heart rates in five months pregnant goats than lactating and dry goats.

4. Conclusion

The study concluded that pregnancy brings about changes in ECG of Black Bengal goats which needs to be considered during ECG interpretation by veterinarians.

5. References

1. Hydbring E, Cvek K, Olsson K. Telemetric registration of heart rate and blood pressure in the same unrestrained goats during pregnancy, lactation and the non-pregnant, non-lactating period. Acta Physiol Scand. 1999;165:135-141.
2. Laus F, Copponi I, Cerquetella M, Fruganti A. Congenital cardiac defect in a pygmy goat (Capra hircus). Turkish Journal of Veterinary & Animal Sciences 2011;35(6):471-475.
3. Marian G, Codreanu I, Petcu C, Raduta A, Popescu D, Cotor G. Research on the duration of electrocardiogram components in pregnant goats. Medycyna Weterynaryjna. 2022;78(03):6625. DOI:10.21521/mw.6625.
4. Mohapatra S, Kundu AK, Mishra SR, Senapati S, Jyotiranjan T, Panda G. HSF1 and GM-CSF expression, its association with cardiac health, and assessment of organ function during heat stress in crossbred Jersey cattle. Research in Veterinary Science. 2021;139:200-210.
5. Mohapatra S, Pradhan SR, Jyotiranjan T, Sahoo PR, Mahapatra APK, Kundu AK. Deciphering electrocardiogram of healthy male Ganjam goats (Capra Hircus). Applied Biological Research. 2018;20(1):94-97. DOI: 10.5958/0974-4517.2018.00012.5.
6. Parida S, Mishra SR, Mishra C, Dalai N, Mohapatra S, Mahapatra APK, Kundu AK. Impact of heat stress on expression kinetics of HSP27 in cardiac cells of goats. Biological Rhythm Research. 2020a;51(6):925-933. DOI: 10.1080/09291016.2018.1564578.
7. Parida S, Mishra SR, Mishra C, Mohapatra S, Dalai N, Mahapatra APK, *et al*. Impact of heat stress on transcriptional abundance of HSP70 in cardiac cells of goat. Animal Biotechnology. 2020b;31(3):223-228. DOI: 10.1080/10495398.2019.1583574.
8. Pourjafar M, Badiei K, Chalmeh AA, Sanati AR, Shahbazi A, Badkobeh M, *et al*. Age-Related Cardiac arrhythmias in clinically healthy Iranian Najdi goats. Bulgarian Journal of Veterinary Medicine. 2012;15(1):37-43.
9. Pradhan RR, Mahapatra APK, Mohapatra S, Jyotiranjan T, Kundu AK. Electrocardiographic reference values and configuration of electrocardiogram waves recorded in Black Bengal goats of different age groups. Veterinary World. 2017;10(9):1020-1025.
10. Samimi AS, Tajik J, Aghamiri SM, Karimi A. A Serial Evaluation of Electrocardiographic Indices and Cardiac Arrhythmias during Pregnancy, Lactation and Dry Periods in Saanen Goats. Bulgarian Journal of Veterinary Medicine. 2018;21(1):59-66.

11. Suguna K, Mehrotra S, Agarwal SK, Hoque M, Singh SK, Shanker U, *et al*. Early pregnancy diagnosis and embryonic and fetal development using real time B mode ultrasound in goats. Small Ruminant Research. 2008;80:80-86.
12. Sunitha M, Chandrasekharappa S, Brid SV. Electrocradiographic Qrs Axis, Q Wave and T-wave Changes in 2nd and 3rd Trimester of Normal Pregnancy. J Clin Diagn Res. 2014;8(9):BC17-21.
Doi: 10.7860/JCDR/2014/10037.4911. Epub 2014 Sep 20. PMID: 25386425; PMCID: PMC4225877.