

Sudan University of Science and Technology

College of Graduate Studies

**Pseudopregnancy in Goats Diagnosed by
Ultrasonography and Treated by PGF_{2α} in Khartoum
State**

تشخيص الحمل الكاذب في الماعز بالموجات فوق الصوتية وعلاجه بالبروستاغلاندين في ولاية
الخرطوم

A thesis submitted in fulfillment of the requirement for Master Degree

M. V. M. (Theriogenology)

By

Areeg Mohamed Almubarak Alkhalifa

B. Sc. (Veterinary Medicine and Surgery), 2009, Sudan University of
Science and Technology

Supervisor: Dr. Rihab Mohamed Abdelghafar Osman

Co-Supervisor: Dr. Majdi Elnaim Badawi Mohammed Ahmed

August, 2016

Dedication

To the soul of my father

To my mother

To my sister Tagwa

To my brothers Ahmed and Fakhreldin

ACKNOWLEDGEMENT

Above all, I would like to thank Almighty Allah, the beneficent, the merciful for giving me health, patience and strength to accomplish this work.

Firstly I would like to thank my mother, without her continuous support and encouragement I never would have been able to achieve my goals. This one is for you mum!

I would like to express my sincere appreciation and deepest gratitude to my supervisor Dr. Rihab Mohamed Abdelghafar, for her scholastic supervision, keen interest, and continuous constructive suggestions throughout the period of research. I am grateful for your generosity and support under difficult circumstances, thank you for always being present and for unfailing attitude.

I am deeply grateful to my co-supervisor Dr. Majdi Elnaim Badawi, for his innovative suggestions, valuable information and help during research period and manuscripts preparation.

Special thanks also go to Professor Mohamed Tagelddin Ibrahim for doing the statistical analysis and to Professor Abdelhamid Ahmed Elfadil for his help with the design of this study. Their valuable comments and advice made this work complete.

I am sincerely indebted to my dear friends; Dr. Sumaia Awadelkariem Ali and Fatima Abdalrahman Ahmed for their unreserved assistance and support throughout this study.

My sincere appreciation also goes to Professor Ahmed Abdelrahim Gameel, professor Shadia Abdel Atti Omer and Professor Mohamed Abdalsalam Abdalla for their valuable suggestions and constructive comments from the initial conception to the end of this work.

I am thankful for Deutscher Akademischer Austauschdienst (DAAD) for providing the financial support and Sudan University of Science and Technology for providing the internal scholarship.

I would like to express my sincere appreciation to Dr. Naglaa Abd Elhakeem Abass for her help with statistical analysis and valuable suggestions during this study. My special thanks also go to Dr. Eihab Elnour Ahmed for his help in literature retrieval.

I acknowledge the animal's owners, workers and lab mates for their patience and endless support.

Finally, I wish to express my deepest love to my family for nursing me with love and giving me unlimited support in my academic progress. Thank you to everyone who assisted with this study.

Table of contents

No.	Subject	Page
	Dedication	ii
	Acknowledgement	iii
	Table of contents	v
	List of tables	viii
	List of figures	ix
	List of appendices	x
	List of abbreviations	xi
	Abstract	xii
	Arabic Abstract	xiii
	INTRODUCTION	
	Introduction	1
	Objectives	2
	CHAPTER ONE	
	LITERATURE REVIEW	
1.1.	Goats	4
1.1.1.	Goats population in the Sudan	4
1.1.2.	Reproductive characteristics of goats	4
1.1.3.	Reproductive efficiency	5
1.1.4.	Infertility in the female goat (doe)	5
1.1.4.1.	Pseudopregnancy	6
1.1.4.2.	Metritis and endometritis	7
1.1.4.3.	Pyometra	8
1.1.4.4.	Fetal death	8
1.1.4.5.	Ovarian cysts	8
1.2.	Ultrasonography	9
1.2.1.	Sound wave definition	9
1.2.2.	Spectrum of sound waves	9
1.2.3.	Production and detection of sound waves	9
1.2.4.	Transducer arrays	9
1.2.5.	Principal echo display modes	10
1.2.5.1.	Amplitude modulation (A-mode)	10

Table of contents (*continued*)

No.	Subject	Page
1.2.5.2.	Brightness modulation (B-mode)	10
1.2.5.3.	Motion modulation (M-mode)	11
1.2.6.	Sonographic echo texture	11
1.2.7.	Ultrasound safety and bioeffects	11
1.2.7.1.	Thermal effects	12
1.2.7.2.	Non thermal effects	13
1.2.8.	Methods of reproductive ultrasonography in goats	13
1.3.	Prostaglandins	13

CHAPTER TWO

MATERIALS AND METHODS

2.1.	Study design, duration and location	15
2.2.	Sample size calculation	15
2.3.	determination of age and Body condition	15
2.4.	Ultrasound scanning	16
2.4.1.	Animal preparation and positioning	16
2.4.2.	Scanning technique	16
2.4.3.	Machine and image recording	16
2.4.4.	Ultrasound fine-needle guided aspirates	16
2.5.	Questionnaire	16
2.6.	Treatment	16
2.7.	Ethical approval	17
2.8.	Statistical Analysis	17

CHAPTER THREE

RESULTS

3.1.	Sonographic pregnancy diagnosis	20
3.2.	Prevalence and associated risk factors of pseudopregnancy	20
3.2.1.	Breed	25
3.2.2.	General body condition	25
3.2.3.	Age of the dam	25
3.2.4.	Type of estrus	25
3.2.5.	Milk yield	25

Table of contents (continued)

No.	Subject	Page
3.2.6.	Previous history	26
3.2.7.	Type of feeding	25
3.2.8.	Season	26
3.2.9.	Localities	26
3.2.10.	Parity number	27
3.2.11.	Rearing system	27
3.2.12.	Type of insemination	27
3.3.	Results of multivariate analysis	27
3.4.	Treatment with PGF _{2α}	27
3.5.	Subsequent fertility	28
CHAPTER FOUR		
DISCUSSION		
	Discussion	33
	Conclusions	38
	Recommendations	38
	References	39
	Appendix	46

List of tables

No.	Table	Page
2.1.	Climatic conditions during study period March 2015-February 2016	18
3.1.	Prevalence of pseudopregnancy in 378 goats examined in Khartoum State from March 2015-February 2016	29
3.2.	Univariate analysis of association of potential risk factors with pseudopregnancy in goats using the Chi-square test	29
3.3.	Multivariate analysis of association of potential risk factors with pseudopregnancy in goats using Logistic Regression	32

List of figures

No.	Figure	Page
2.1.	Transabdominal ultrasound scanning	19
3.1.	Fetus	22
3.2.	Viable fetus (heart beats shown in M-mode)	22
3.3.	Dead fetus	22
3.4.	Bilateral abdominal distension	23
3.5.	Udder development in pseudopregnant nulliparous goat	23
3.6.	Hydrometra: Sonographic image (A) and physical appearance (B)	24
3.7.	Mucometra: Sonographic image (A) and physical appearance (B)	24
3.8.	Pyometra: Sonographic image (A) and physical appearance (B)	24

List of Appendices

No.	Appendix	Page
1.	Data collection form	46

List of abbreviations

µg: Microgram

2D: Two Dimensional

ALARA: As low As Reasonable Achievable

CL: Corpus Luteum

FAO: Food and Agriculture Organization

HCENR: Higher Council for Environment and Natural Resources

Hz: Hertz

IU: International Unit

KHz: Kilohertz

mg: Milligram

MHz: Megahertz

MOAR: Ministry of Animal Resources

P4: Progesterone

PGF_{2α}: Prostaglandin

PMSG: Pregnant Mare Serum Gonadotropin

PRF: Pulse Repetition Frequency

PRL: Prolactin

RCR: Royal College of Radiologists

WHO: World Health Organization

Abstract

The present study was conducted to diagnose and treat pseudopregnancy in goats, follow the treated animals as well as to report the prevalence and associated risk factors of pseudopregnancy in goats in Khartoum State, Sudan. A Cross-sectional study was carried out from March 2015 to February 2016 on 378 female goats that presented to the Veterinary Teaching Hospital, College of Veterinary Medicine, Sudan University of Science and Technology, for routine sonographic pregnancy diagnosis. Ultrasound scanning was performed using a real-time scanner (Pie Medical, Easote, The Netherlands) equipped with dual frequency (3.5-5) MHz transabdominal curvilinear transducer while the animal was in a dorsal recumbency in especial designed table. The results showed that out of 378 examined goats, 40 were pseudopregnant. Pseudopregnant goats showed compartmentalized fluid-filled uterus without fetal parts and placentomes. The overall prevalence of pseudopregnancy in goats in Khartoum State was 10.6%. Risk factors such as breed (P-value = 0.082), general body condition (P-value = 0.05), age (P-value = 0.019), type of estrus (P-value = 0.000), milk yield (P-value = 0.114), previous history of reproductive performance (P-value = 0.020) and type of feeding (P-value = 0.190) showed significant association (P-value \leq 0.25) with the occurrence of pseudopregnancy in the univariate analysis. However, season (P-value = 0.264), locality (P-value = 0.264), parity number (P-value = 0.767) and rearing system (P-value = 0.451) were not significantly associated with pseudopregnancy. One risk factor (type of insemination) was not subjected to statistical analysis due to the fact that all animals in the present study were naturally mated. Results also revealed that breed (P-value = 0.018) and type of estrus (P-value = 0.019) had statistical significant association with pseudopregnancy (p-value \leq 0.05) in the multivariate analysis. All positive cases were successfully treated using 125 μ g intramuscular injection of Cloprostenol. Out of 40 treated animals, 4 (10%) of them showed recurrent pseudopregnancy. 2 out of 4 goats with recurrent pseudopregnancy responded to additional dose of Cloprostenol and conceived as confirmed by ultrasound. The other two goats were diagnosed again as pseudopregnant. In conclusion, this study showed for the first time that pseudopregnancy is a real- reproductive problem in goats in Khartoum State and ultrasonography is an accurate, rapid, reliable and non-invasive technique for diagnosis of this condition as well as Cloprostenol proved an efficient treatment.

الملخص

هدفت هذه الدراسة لتشخيص، وعلاج الحمل الكاذب ومتابعة الحيوانات المعالجة وتسجيل نسبة الانتشار والعوامل المؤثرة المرتبطة بالحمل الكاذب في الماعز بولاية الخرطوم، السودان. أجريت دراسة استقصائية في الفترة من مارس 2015- فبراير 2016 وتم فحص 378 من إناث الماعز التي أحضرت للمستشفى البيطري التعليمي بغرض فحص الحمل باستخدام الموجات فوق الصوتية. تم استخدام جهاز موجات صوتية حية مزود بمجس ذو تردد قابل للتغيير (5- 3.5 ميجاهيرتز (عن طريق البطن بعد تثبيت الحيوان في وضع الرقاد الظهرى على منضدة مخصصة لهذا الغرض. أظهرت نتائج الدراسة انه من العدد الكلي (378) للماعز التي تم فحصها (40) ،منها كانت مصابة بالحمل الكاذب (امتلاء الرحم بالسوائل مع عدم وجود الجنين أو المشيمة). كما أوضحت الدراسة أن نسبة انتشار الحمل الكاذب في الماعز بولاية الخرطوم (10.6%). وارتبطت العوامل مثل السلالة (القيمة الاحتمالية = 0.082)، الحالة العامة لجسم الحيوان (القيمة الاحتمالية = 0.050)، العمر (القيمة الاحتمالية = 0.019) ، نوع الشبق (القيمة الاحتمالية = 0.000)، إنتاج اللبن (القيمة الاحتمالية = 0.114)، التاريخ السابق للأداء التناسلي (القيمة الاحتمالية = 0.020) و نوع التغذية (القيمة الاحتمالية = 0.190) بحدوث الحمل الكاذب في الماعز باستخدام التحليل أحادي المتغير بعلاقة إحصائية معنوية. أما العوامل التالية: الموسم (القيمة الاحتمالية = 0.264)، المحلية (القيمة الاحتمالية = 0.264)، عدد الولادات (القيمة الاحتمالية = 0.767) و نظام التربية (القيمة الاحتمالية = 0.541) لم يكن لها ارتباط معنوي بالحمل الكاذب. عامل واحد (نوع التلقيح) لم يخضع للتحليل الإحصائي بسبب أن كل الماعز في هذه الدراسة لقحت طبيعياً. كما أوضحت النتائج باستخدام التحليل متعدد المتغيرات أن هنالك علاقة إحصائية معنوية بين السلالة (القيمة الاحتمالية = 0.018) ونوع الشبق (القيمة الاحتمالية = 0.019) وحدث الحمل الكاذب. عولجت كل الحالات الموجبة بنجاح باستخدام هرمون البروستاغلاندين بجرعة قدرها (125 ميكروجرام من كلوبروستينول في العضل) وبعد العلاج تكرر حدوث الحمل الكاذب في 4 حالات (10%)، اثنتان منها استجابت لجرعة أخرى من البروستاغلاندين ولاحقاً تم تأكيد الحمل فيهما بالموجات فوق الصوتية، واثنتان تكرر فيهما حدوث الحمل الكاذب. اتضح من هذه الدراسة أن الموجات فوق الصوتية وسيلة دقيقة وسريعة لتشخيص الحمل الكاذب في الماعز وان البروستاغلاندين علاج فعال لهذه الحالة. كما أظهرت الدراسة وللمرة الأولى أن الحمل الكاذب مشكلة ذات أهمية في قطع الماعز بولاية الخرطوم.