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SHORT COMMUNICATION

Prevalence of pseudopregnancy in bitch attending a veterinary teaching hospital in Spain

Maria Victoria Falceto[1,2] | Ana Maria Garrido[1,2] | Marta Bueno[1] | Maria Teresa Tejedor[3] | Julia Cantin[1] | Laura Garza-Moreno[1] | Olga Mitjana[1,2]

[1]Department of Animal Pathology, Universidad de Zaragoza, Zaragoza, Spain

[2]Hospital Veterinario de la Universidad de Zaragoza, Zaragoza, Spain

[3]Department of Anatomy, Embryology and Animal Genetics, CiberCV, Universidad de Zaragoza, Zaragoza, Spain

Correspondence
Ana Maria Garrido, Department of Animal Pathology, Universidad de Zaragoza, C/Miguel Servet 177, Zaragoza 50013, Spain.
Email: 691306@unizar.es

Abstract

Pseudopregnancy (PSG) is one of the most common syndromes diagnosed after oestrous cycle in female dogs. We found a diagnosed prevalence of PSG at 30.81% among reproductive pathologies in bitch. Concentrated oestrous occurrences in spring and autumn influence PSG distribution. PSG onset is marked by behavioural changes, followed by physical signs (mammary enlargement and galactorrhea). The last oestrous-PSG onset interval ranged from 1 to 6 months (median = 3.0 months) and the median for the interval spaying-PSG onset was 7.0 days. Half of the cases were discharged after 16 days, surpassing recommended treatment periods for cabergoline (4–6 days) and metergoline (8 days). Although Elizabethan collars were recommended, actual compliance stood at two-thirds of cases. Our study highlights the possible underestimation of the PSG prevalence, probably due to lack of identification of clinical signs by owners. Further research is warranted to better understand possible risk factors, preventive measures or therapeutic options.

KEYWORDS
bitch, galactorrhea, maternal behaviour, prevalence, pseudogestation

1 | INTRODUCTION

The study investigates pseudopregnancy (PSG) in female dogs, a condition marked by hormonal fluctuations resembling pregnancy (Concannon & Lein, 1989). PSG, characterized by elevated plasma prolactin, mimics postpartum lactation (Concannon & Lein, 1989); though beneficial in wild canids (Macdonald et al., 2019) may cause exaggerated signs in domestic dogs. Prolactin plays a crucial role (Brugere, 1998), and individual variability is linked to sensitivity and molecular variants (Gobello, 2021). There are two major types of PSG in bitch: covert and overt, which is considered a huge clinical problem and in most cases requires treatment. It focuses on overt PSG, categorizing it based on clinical manifestations, to contribute insights into its epidemiology, clinical signs, and treatment over 7 years. Our aim is to provide a look into the typical clinical PSG caseload from reproduction primary care, based on bitches treated at a veterinary teaching hospital.

2 | MATERIALS AND METHODS

2.1 | Animals

From 1 January 2014 to 26 April 2021, the Reproduction Service at Hospital Veterinario de la Universidad of Zaragoza (HVUZ) managed data from 555 bitches. The information, anonymized and obtained

with routine owner consent, adhered to Spanish and European animal protection laws and ethical guidelines (RD 53/2013 and Directive 2010/63/EU), with the Ethical Committee approval (Ref. PD03/21NE).

2.2 | Data collection

Overt PSG was categorized into three levels: mild (slight mammary enlargement, turgid nipples, and slight milk secretion), moderate (manifest mammary enlargement and milk secretion from all mammas), and severe (clinical signs akin to advanced pregnancy and lactation, with large mammary size and abundant milk secretion). Behavioural changes (alterations in appetite, activity, breast licking, and maternal behaviour) and several additional data (breed, size, age, previous deliveries, reproductive status, monthly distribution, last oestrous-pseudopregnancy onset, pseudopregnancy diagnosis-medical discharge intervals, and treatment) were collected for a comprehensive dataset. Several variables showed reduced sample sizes due to missing data.

2.3 | Statistical analysis

IBM SPSS Statistics 26.0 software (IBM, Chicago, IL, USA) analysed data. Qualitative variables were presented as count/sample size and percentages. Time variables were summarized as median and interquartile range (IQR), and survival analysis employed the Kaplan–Meier method. Comparisons were made using Breslow's test, with multiple comparisons corrected by Bonferroni's method. A significance level of $p < .05$ was considered.

3 | RESULTS

Out of 555 female dogs examined, 30.81% (171) exhibited overt PSG. Table 1 shows their characteristics. Medium breeds and young bitches (≤60 months of age) were the most frequent ones among those affected by pseudopregnancy, 47.35% and 51.9% respectively. Table 2 outlines the behavioural changes and mammary clinical signs observed in overt PSG cases. The time intervals of interest are shown in the Table 3.

Mild PSG cases often resolved spontaneously, but the majority (94.08%) received treatment. Common treatments included cabergoline with an Elizabethan collar (53.02%), metergoline with an Elizabethan collar (7.38%), and an Elizabethan collar as the sole prescription (8.72%). Ovariohysterectomy was chosen for 20.86% of affected females, driven by owners' desire to prevent future episodes. Among treated patients, 20.8% required a change in therapy, with metergoline being a common modification. Changes were prompted by total ineffectiveness (24%), partial ineffectiveness (48%), and side effects (28%). Overall, 98.42% of cases showed favourable outcomes based on valid data from 125 out of 127 cases.

TABLE 1 Characteristics of overt PSG cases. Data are count/*n* (%).

Variable	Category	Count/*n* (%)
Breed	Purebred	94/171 (56.73%)
	Crossbred	74/171 (43.27%)
Size category	Small (≤10 kg)	50/171 (29.24%)
	Medium (10.1–25 kg)	81/171 (47.37%)
	Large (25.1–40 kg)	36/171 (21.05%)
	Giant (>40 kg)	4/171 (2.34%)
Age group	Young (≤60 months)	86/168 (51.19%)
	Mature (61–120 months)	57/168 (33.93%)
	Senior (≥121 months)	25/168 (14.88%)
Previous parturition		20/140 (14.28%)
Previous PSG		56/133 (42.10%)
Previously spayed in diestrus		57/171 (33.33%)
Monthly distribution	January	11/165 (6.67%)
	February	16/165 (9.70%)
	March	24/165 (14.54%)
	April	11/165 (6.67%)
	May	11/165 (6.67%)
	June	18/165 (10.91%)
	July	9/165 (5.45%)
	August	4/165 (2.42%)
	September	10/165 (6.06%)
	October	16/165 (9.70%)
	November	20/165 (12.12%)
	December	15/165 (9.09%)

Only six females suffered a second episode and the discharge interval was estimated for both the first and second episode. In the first one, this interval significantly differed for mild and medium cases ($p < .001$), with a shorter interval for mild ones.

4 | DISCUSSION

In this HVUZ Reproduction Service study, the diagnosed prevalence of PSG stands at 30.81%, offering Spain's first estimate. Despite potential underestimation and data constraints, the extensive dataset provides valuable PSG insights, emphasizing the need for cautious interpretation.

Our findings align with Gobello's (2021) assertion that a prior pregnancy does not shield against future pseudopregnancy episodes. PSG post-spaying is linked to the oestrous cycle's timing during surgery and a history of prior PSG. Diestrus spaying is commonplace, especially with uterine pathology or logistical constraints,

constituting 33.33% of PSG cases in this study. Root et al. (2018) noted 41% of England veterinarians diagnosing PSG in spayed dog females, underscoring the phenomenon. Sterilization during mid and late diestrus induces physiological changes, contributing to overt and sometimes persistent PSG in patients with prior episodes (Gobello et al., 2001).

Despite the non-seasonal nature of female dogs (Schaefers-Okkens, 2005), oestrous tends to be more prevalent in winter and summer (Bouchard et al., 1991). We observed peaks in PSG cases in March and November, maybe linked to the varying frequency of oestrous across different months. This distinctive oestrous distribution challenges the non-seasonal characterization.

Behavioural changes indicative of PSG onset (anorexia, decreased activity, aggression, breast licking, and maternal behaviour) align with previous canine behaviour studies (Gobello, 2021; Landsberg et al., 2012). However, our limited data on these changes hinder more detailed conclusions. In advanced PSG, physical signs typically manifest later (Root et al., 2018), often attributed to prolonged licking and self-suction (Johnston, 1980). In this study, mammary enlargement and galactorrhea surpassed behavioural changes in frequency. Notably, two patients exhibited behavioural symptoms without physical signs of PSG.

While Elizabethan collars were commonly prescribed (88.76% of cases), actual compliance stood at 66.42%, indicating potential owner reluctance. Drug treatments predominantly involve ergot derivatives like cabergoline and metergoline to inhibit prolactin release (Gobello et al., 2001). Cabergoline, favoured for prolonged action, has a transient central emetic side effect (Gobello, 2021), while metergoline is cautioned when behavioural changes are present (Fieni et al., 1999).

Among 127 patients, 98.42% exhibited favourable PSG progression outcomes. Some patients didn't return for follow-up, potentially due to positive results, changes in practitioners, or unknown reasons. Half were discharged after 16 days, surpassing recommended treatment periods for cabergoline (4–6 days) and metergoline (8 days).

In conclusion, the study underscores a PSG diagnosed prevalence of 30.81%, possibly underestimated. Pet owners should comprehend the normal reproductive cycle, prompting veterinary consultation for abnormal signs. Effective pharmacological treatments include cabergoline or metergoline, with management adjustments enhancing outcomes. The use of an Elizabethan collar to prevent teat-suckling, avoiding practices that encourage maternal behaviour and removing stimuli that promote nesting are advised. With a 98.42% favourable outcome rate, surgery is recommended for unresponsive or recurrent PSG cases. Further research is warranted to better understand possible risk factors, preventive measures or therapeutic options.

TABLE 2 Behavioural changes and mammary clinical signs of overt PSG patients. Data are count/*n* (%).

Variable	Category	Count/*n* (%)
Behavioural changes		
Appetite change	Global	32/139 (23.02%)
	Decrease	25/30 (83.33%)
	Increase	5/30 (16.67%)
Character change	Global	48/141 (30.04%)
	Passive	20/29 (68.96%)
	Active	7/29 (24.14%)
	Aggressive	2/29 (6.90%)
Licking		38/44 (86.36%)
Nesting		15/134 (11.19%)
Adoption		32/135 (23.70%)
Mammary clinical signs		
Mammary enlargement	Mild	111/163 (68.10%)
	Moderate	51/163 (31.29%)
	Severe	1/163 (0.61%)
Galactorrhea		157/164 (95.73%)
Aspect of mammary secretion	Milk secretion	75/149 (50.33%)
	Serous secretion	34/149 (22.82%)
	Mixed	40/149 (26.85%)

TABLE 3 Time intervals for PSG cases.

Time intervals	PSG grade	*n*	Median [IQR]
Last oestrous-PSG onset interval (months)	Global	116	3.0 [1.00]
Spaying-PSG onset interval (days)	Global	57	7.0 [1.00]
PSG diagnosis-medical discharge interval (days, first episode)	Global	113	16.0 [21.00]
	Mild	82	14.5 [15.00][a]
	Medium	29	30.0 [25.00][b]
	Severe	2	41.0 [NE][c]
PSG diagnosis-medical discharge interval (days, second episode)	Global	6	30.0 [25.00]
	Mild	3	33.0 [NE][a]
	Medium	3	25 [NE][a]

Note: Data are medians and IQRs of days or months. [a,b,c]: different superscript letters indicate significant differences between PSG grades ($p < .05$).

Abbreviations: *n*, number of available data; NE, not estimable.

AUTHOR CONTRIBUTIONS

MVF, AMG, MB, MTT, OM, JC, LGM developed the concept of the present study and was involved in interpreting data. MVF and OM performed the diagnosis and clinical treatment of the patients. MVF, AMG, MTT and OM drafted the manuscript. MTT performed the statistical analysis. MVF, AMG, MB, MTT, OM, JC, LGM were involved in knowledge transfer and critical discussion of data. MVF, AMG, MB and OM were involved in developing and supervising the project. JC and LGM critically revised the manuscript. All authors read and approved the final manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Ana Maria Garrido https://orcid.org/0000-0003-0418-3476
Maria Teresa Tejedor https://orcid.org/0000-0001-5026-5144
Olga Mitjana https://orcid.org/0000-0001-9907-2941

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