

Incidence of ovarian follicular cysts and their effect on reproductive performance in dairy cows: A case study in Mexico

Incidencia de quistes foliculares ováricos y su efecto en la eficiencia reproductiva en vacas lecheras: un estudio de caso en México

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ABSTRACT. The incidence of ovarian follicular cysts (OFC) in relation to reproductive performance in a dairy herd was determined. A total of 1,249 reproductive records of cows during their previous lactation cycle were reviewed. Of all cows submitted to reproductive evaluation due to anestrus or to diagnose pregnancy, 23% (290/1249) had OFC; 44% (128/290) developed OFC after first service; and 30% of those with OFC (86/290) were found to be open upon diagnosis of pregnancy (40 to 45 days). Cows with pathological puerperium had a higher (Odds ratio 1.5) incidence of OFC than those with normal puerperium (pathological = 26% vs. normal = 20%). Multiparous cows had a higher (Odds ratio 2.2) incidence of OFC (27.5%) than primiparous cows (15.5%). The percentage of non-pregnant cows 150 days postpartum was higher ($P < 0.05$) in cows with OFC (76%) than in those without OFC (24%); furthermore, the percentage of non-pregnant cows 300 days postpartum was higher ($P < 0.05$) in cows with OFC (24%) than in those without OFC (3%). It is concluded that 23% of cows developed OFC, and the only sign was anestrus. The cows that developed OFC had a greater probability of remaining open 300 days postpartum, which demonstrates the negative impact of this ovarian condition on modern milk herds.

Key words: ovarian follicular cysts, dairy cattle, fertility.

RESUMEN. Se determinó la incidencia de quistes foliculares ováricos (QFO) y su relación con la eficiencia reproductiva en un hato lechero. Se revisaron los registros reproductivos de 1.249 vacas durante su última lactación. Del total de vacas remitidas a revisión reproductiva por anestro o diagnóstico de gestación, 23% (290/1249) presentó QFO; 44% (128/290) de las vacas desarrolló QFO después del primer servicio; 30% de las vacas con QFO (86/290) llegaron al diagnóstico de gestación y estaban vacías. Las vacas con puerperio patológico tuvieron mayor (*Odds ratio* 1,5) incidencia de QFO que las vacas con puerperio normal (patológico = 26% vs. normal = 20%). Las vacas multíparas tuvieron mayor (*Odds ratio* 2,2) incidencia de QFO (27,5%) que las vacas primíparas (15,5%). La proporción de animales vacíos en el día 150 posparto fue mayor ($P < 0,05$) en las vacas con QFO (76%) que en las vacas sin QFO (24%); asimismo, la proporción de animales vacíos en el día 300 posparto fue mayor ($P < 0,05$) en las vacas con QFO (24%) que en las vacas sin QFO (3%). Se concluye que 23% de las vacas desarrolló QFO y el único signo clínico fue el anestro. Las vacas que desarrollaron QFO tuvieron mayor probabilidad de estar vacías en el día 300 posparto, esto muestra el impacto negativo que tiene esta condición ovárica en los hatos lecheros modernos.

Palabras clave: quistes foliculares ováricos, ganado lechero, fertilidad.

INTRODUCTION

In academic literature, it is debated whether ovarian follicular cysts (OFC) in dairy cows should be considered pathological or innocuous (Vanholder *et al* 2006). Up to the 1980s, classic clinical signs in cows with OFC as described in the literature were: short cycles, irregular estrus, nymphomania, masculinization, and relaxation of the pelvic ligaments (Kesler and Garverick 1982). However, dairy cows that currently develop OFC only present anestrus (Peter 2004, Vanholder *et al* 2006). Therefore, this ovarian condition is more often referred to as ovarian follicular cysts, and less as cystic ovarian disease.

According to Vanholder *et al* (2006), OFC can be defined as: follicles with a minimum diameter of 20 mm, present in one or both ovaries in the absence of a corpus

luteum, and which interfere with cyclicity. Moreover, OFC are dynamic structures that may undergo regression and be replaced by new follicles, which later become OFC (Hamilton *et al* 1995).

Ovarian follicular cysts in dairy cattle cause economic losses as a result of extension of the open period, cost of treatment, and risk of elimination of cows from the herd. OFC incidence has risen with increasing milk production. In these conditions, between 15 to 30% of cows develop this ovarian condition within 60 days postpartum (Peter 2004). The clinical characteristics of OFC and associated factors have changed due to the features of modern intensive systems, such as: increase in milk production; metabolic state of high producing cows; and management practices (López-Gatius *et al* 2002, Silvia *et al* 2002, Vanholder *et al* 2006, Braw-Tal *et al* 2009).

Although global scientific literature offers outstanding reviews and original articles about OFC, to our knowledge, there are still no studies describing their clinical presentation in a herd. Therefore, this study determined the incidence of OFC, the factors associated with their

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development, and their effects on reproductive efficiency in a dairy herd under intensive management.

MATERIAL AND METHODS

The study was conducted on a dairy farm located in the central highlands region of Mexico (El Marqués County, Querétaro). The herd studied has 1,300 dairy cows in production, in confined housing, milked twice daily, and with an average production per lactation cycle of 11,500 kg of milk. The cows were fed a total mixed ration diet (TMR), which covers their nutritional requirements according to the NRC (National Research Council, 2001). Reproductive handling consisted of a gynecological examination of all cows in the first 10 days postpartum, in order to treat pathologies associated with puerperium. The voluntary waiting period was 60 days. Estrus detection was carried out visually for periods of two hours in the morning and two in the afternoon. Cows in estrus were inseminated with the am-pm and pm-am program. Pregnancy diagnosis was determined between 45 and 50 days post-insemination. Cows that did not have an insemination record 70 days postpartum were examined rectally, in order to diagnose and apply the corresponding treatment.

Reproductive records of 1,249 lactating cows in their last lactation cycle were analyzed. The criteria used for the diagnosis of OFC were: palpation of follicles over 20 mm in diameter in one or both ovaries, absence of corpus luteum, absence of uterine tone, and history of anestrus (Vanholder *et al* 2006). The same reproductive clinician made all diagnoses.

A logistic regression analysis [SAS version 9.2 (SAS Institute Inc., Cary, NC)] was used to compare the incidence of OFC in different groups of cows according to the type of puerperium [normal or pathological (history of any of these pathologies: retained placenta, metritis, or endometritis)] and parity (primiparous or multiparous). The study used descriptive statistics to determine the time postpartum in which the cows presented OFC, as well as the temporal relationship between this presentation and certain management practices (first service and evaluation of pregnancy). A Kaplan-Meier survival analysis was used to compare the proportion of non-pregnant cows 150 and 300 days postpartum in cows with and without OFC.

RESULTS AND DISCUSSION

Twenty-three percent of cows (290/1249) presented OFC. This percentage, while consistent with other observations in similar conditions (Melendez *et al* 2003, Vanholder *et al* 2006), contrasts with what was recorded in the 1980s, where incidences of 1 to 16% were reported (Kesler and Garverick 1982, Bartlett *et al* 1986). As already mentioned, short estrus cycles and irregular estrus were regarded as the classic clinical signs of cows with OFC; in this study, however, cows diagnosed with OFC were submitted to reproductive examination due to absence of estrus or failure to return to estrus after insemination.

A relationship between postpartum disease and the incidence of OFC was observed (Table 1), as cows with pathological puerperium had a higher (Odds ratio 1.5) incidence of OFC than those with normal puerperium (pathological = 26% vs. normal = 20%). These results are consistent with other studies, in which the increased incidence of OFC in cows is evident due to postpartum abnormalities (Lopez-Gatius *et al* 2002, Peter, 2004). The relationship between uterine pathologies and the pathogenesis of ovarian cysts is unknown; nonetheless, negative effects of endometritis on follicular development, particularly on steroidogenesis, have been demonstrated (Sheldon *et al* 2002). For this reason, it can be speculated that the ovulatory follicles developed in cows with a history of pathologic puerperium have a reduced capacity to trigger the preovulatory LH surge. Although the etiology of OFC has not been established, the absence or insufficiency of the preovulatory LH surge is considered to be a crucial factor in the development of this condition (Peter 2004, Ortega *et al* 2015).

Multiparous cows had a higher (Odds ratio 2.2) incidence of OFC (27.5%) than primiparous cows (15.5%) (table 1). These results are similar to those obtained in other studies (Lopez-Gatius *et al* 2002, Peter 2004). However, the mechanism explaining the association of parity or age with OFC remains unknown. This difference may be related to increased milk production in multiparous versus primiparous cows, as cows with higher milk production have an increased incidence of OFC (Lopez-Gatius *et al* 2002, Fitzgerald *et al* 2014).

Table 1. Effect of parity and postpartum diseases on the incidence of ovarian follicular cysts (OFC) in dairy cows. Efecto de paridad y enfermedades posparto sobre la incidencia de quistes foliculares ováricos (QFO) en vacas lecheras.

Effect	Class	OFC	Odds Ratio	95% Confidence interval	P-value
Parity	Primiparous	15% (444/1249)	Reference	1.1-2.0	0.000
	Multiparous	27% (805/1249)	2.2		
Type of puerperium	Normal	20% (582/1249)	Reference	1.6-2.9	0.002
	Pathological	26% (667/1249)	1.5		

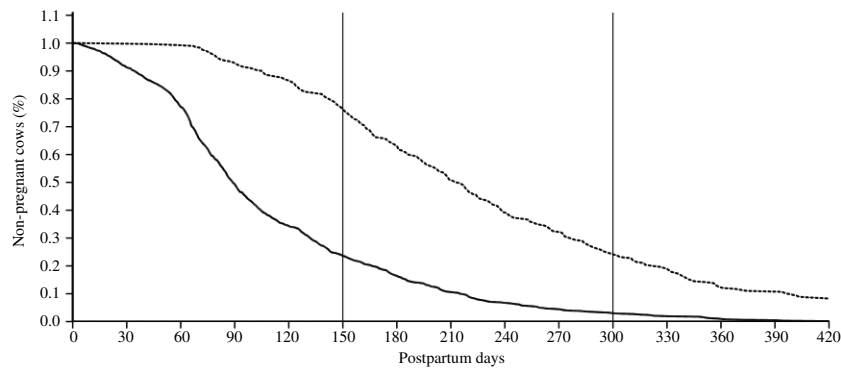


Figure 1. Survival curve showing the percentage of cows with OFC (---) and without OFC (—) remaining open; $P < 0.05$.

Curva de sobrevivencia que indica el porcentaje de vacas con OFC (---) y sin OFC (—) aún abierto; $P < 0,05$.

It is noteworthy that, of all cows with OFC, 30% (86/290) were diagnosed as non-pregnant between 45 and 50 days post-insemination. The literature also points out that follicular cysts occur mainly in the first 60 days postpartum and result in delay of first service (Kesler and Garverick 1982). In the present study, 44% (128/290) of cows with OFC presented this condition after first service; that is, almost half of the cows with OFC began their ovarian postpartum activity, entered in estrus, were inseminated, and subsequently developed OFC. In opposition to the classic description of OFC as occurring within 60 days postpartum (Kesler and Garverick 1982), 72% of cows with OFC (209/290) were diagnosed with this condition after 70 days postpartum.

Significantly, of all cows whose OFC recovered with some hormonal treatment, 71% (207/290) relapsed. Moreover, the average number of hormonal treatments that cows with OFC received was 1.9 (1-6 range).

It has been mentioned that follicular cysts reduce reproductive efficiency. In this study, it was found that the percentage of non-pregnant cows 150 days postpartum was higher ($P < 0.05$) in cows with OFC (76%) than in those without OFC (24%); furthermore, the percentage of non-pregnant cows 300 days postpartum was higher ($P < 0.05$) in cows with OFC (24%) than in those without OFC (3%) (Figure 1). Reproductive clinicians should be attentive to these findings, as this ovarian condition not only increases the calving interval, but also significantly raises the risk of elimination of cows from the herd.

It is concluded that 23% of cows developed OFC, and the only sign was anestrus. The cows that developed OFC had a greater probability of remaining open 300 days postpartum, which demonstrates the negative impact of this ovarian condition on modern milk herds.

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