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A strategic plan to improve fertility rates after handling dystocia in Egyptian buffaloes

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ABSTRACT

The study investigated how veterinarians' management decisions during dystocia affected postpartum fertility in buffaloes. Conducted from October 2020 to September 2023, the study examined 288 buffaloes out of 655 dystocia cases observed at the Veterinary Teaching Hospital, Faculty of Veterinary Medicine, Assiut University, Egypt. Dystocia was evident in all the cases reviewed, as reported by the owners. After conducting vaginal examinations, the selected cases were identified to have fetal malposition (FM), incomplete cervical dilatation (ICD), or uterine torsion (UT). Out of the 288 buffaloes included in the study, 192 were chosen to test the research hypothesis. The first line of treatment for these animals involved either a cesarean section (n = 75), correction of fetal malposition (n = 35), management of insufficient cervical dilatation (n = 27), or detorsion of uterine torsion (n = 55). In the number of cases where the initial treatment was unsuccessful—such as fetal malposition (n = 20), incomplete cervical dilatation (n = 12), or uterine torsion (n = 20)—a cesarean section was performed as a secondary option to resolve the issues causing the failure of fetal expulsion. This study found that performing a cesarean section (CS) in cases of dystocia, based on the underlying reasons for the condition, leads to increased reproductive rates. Specifically, fertility rates are higher when a cesarean section is performed compared to when dystocia is managed based on its causes. In the study, buffaloes with dystocia who were treated with a cesarean section as the first option (n = 75) had an average number of services per conception (NSC) of 1.841±0.407 ($P < 0.01$). In contrast, buffaloes treated with corrective procedures based on the causes of dystocia as the first decision (n = 65) had a non-significant NSC of 2.336±0.808. Additionally, buffaloes (n = 52) that underwent a cesarean section as a second option, following a failed attempt at correction, had an NSC of 3.051±0.648, which was also non-significant. This highlights the importance of sound veterinary decision-making, which should be grounded in obstetric knowledge and inspection skills, to minimize the negative outcomes associated with poor choices

Introduction

Dystocia (one of the reproductive disorders) may be defined as the inability of the dam to deliver its calves from the uterus through the birth canal with its own effort (Jackson, 2004). Dystocia may be either of maternal or fetal origin. Maternal dystocia was mainly due to incomplete dilatation of the cervical canal followed by a narrow pelvis and uterine inertia. In addition, fetal dystocia is performed due to oversize, mal-disposition, and monsters (Noakes *et al*., 2009). Dystocia is one of the economically important reproductive disorders reported in various domestic animals (Dabas *et al*., 2013; Khudhair *et al*., 2020; Fotariya *et al*., 2020; Patel *et al*., 2020). Depending on their nature and severity, all such etiologies culminate in suboptimal reproductive performance. Sub-optimal reproductive performance has severe economic effects in terms of losses due to reduced production, reproduction and additional cost on management and treatment regimens (Mulligan *et al*., 2006).

The economic losses associated with dystocia are due to the increased number of stillbirths, maternal injuries, and calf deaths and affect productive and reproductive performance. The impact of dystocia also compromises the reproductive performance of lactating dairy cows, leading to increased uterine diseases, ovarian dysfunction, and decreased fertility (Aggarwal *et al.* 2005). Therefore, education on dystocia management (and its effects on calves and dams) to dairy personnel should be a priority. Moreover, it is necessary to activate awareness of the importance of the risk of dystocia. It requires the accuracy of the veterinarian's correct decisions to deal with dystocia after the examination. The important causes of dystocia are pelvic inadequacies, incomplete cervical dilation, uterine torsion, and fetal mal dispositions (Jackson, 2004; Noakes *et al*., 2009). The diagnosis of dystocia is based on the case history, general clinical examination of the cow, and specific examinations such as vaginal and rectal examinations. Diagnosis and treatment of dystocia constitute a large and important part of obstetrics and require a good understanding of normal parturition and careful awareness to make the right decision after the examination. There are different ways to manage dystocia in buffaloes viz., mutation operations alone (Singh *et al*., 2013) or with forced traction (Dabas *et al*., 2013), fetotomy (Gupta *et al*., 2017) and cesarean section (Wani *et al*., 2018). Among the methods used as a treatment for dystocia, buffalo cesarean section is a surgical procedure used to remove the cause of dystocia, (Wani *et al*., 2018). The operation is considered surgery of paramount importance due to the stress of dystocia during treatment with other methods. Delayed arrival and registration of dystocia cases in referral hospitals have been previously treated in the field, which may cause additional stress and tissue damage in the dam and fetus. The survival of the dam in such cases is always at risk and must be managed by understanding the history of the case and making a good and careful decision.

In this study, the research hypothesis based on veterinarians' good decision to manage dystocia after examination led to increased post-operative fertility rates and reduced economic losses to the owner. This study aimed to find effective obstetrical management to relieve dystocia on future fertility in affected buffaloes.

Materials and methods

The collection of samples and the care of the animals used in this study adhered to the guidelines for experimental animals set forth by the

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Research Ethics Committee at the Faculty of Veterinary Medicine, Assiut University, Egypt. These guidelines align with the OIE standards for the use of animals in research, under protocol No. 06/2023/0139.

A retrospective study was conducted from October 2020 to September 2023 on 288 buffaloes that came to the Veterinary Teaching Hospital at the Faculty of Veterinary Medicine, Assiut University, Egypt. These cases were part of a total of 655 dystocia cases observed during this period. The ages of buffaloes ranged from 4 to 8 years. According to the owners' complaints, all cases included in this study experienced dystocia, specifically in the second stage of parturition, and had a history of failed expulsion of the fetus through the vagina. Upon vaginal examination, various fetal malpositions (FM) were identified, necessitating specific interventions. Additionally, some animals exhibited incomplete cervical dilation (ICD) and cases of uterine torsion (UT) during the examination. Table 1 summarizes the classification of 192 of the 288 animals included in this study.

In cases involving 192 buffaloes, the causes of dystocia were addressed through several procedures. This included performing cesarean sections for 75 buffaloes and correcting fetal malpositions in 35. Additionally, we handled cases of incomplete cervical dilation in 27 buffaloes and managed uterine torsion by rolling in 55 cases as the initial approach. If the primary interventions fail, we resorted to cesarean sections as a secondary option in specific situations. These included 20 cases of fetal malpositions, 12 cases of incomplete cervical dilation, and another 20 cases of uterine torsion. All these scenarios are detailed in Table 1, which outlines the reasons for the failure to expel the fetus

Table 1. Number of animals in study.

Treatment	Causes of Dystocia			Total number
	FM	ICD	UT	
Cesarean section	25	25	25	75
Correction	35	27	55	117
Total number	60	52	80	192
Cesarean section (as a second decision) after failure of correction in each group	20	12	20	

All cesarean sections were performed with the cow standing and positioned at the left paralumbar fossa, utilizing appropriate restraint facilities to ensure the animal could maintain its stance throughout the procedure. The animal was prepared by clipping the hair from the surgical area. A 40 cm vertical incision was made, starting in the caudal third of the paralumbar fossa and extending through all muscle layers to the peritoneal cavity. The incision was long enough to exteriorize the hindlimb of the calf, from the toe to the hock. This incision is crucial for holding the calf in place during the cesarean section.

In the studied buffaloes, cesarean sections were successfully performed using local infiltration analgesia with 2% lidocaine prior to making any incisions. In some cases, sedation agents such as triflupromazine, chlorpromazine, or xylazine were administered, based on Ganesan's findings from 1979. An initial local infiltration of 80–120 ml of 2% lidocaine hydrochloride was injected before incision. The skin, muscles, and peritoneum were then incised.

Once the cavity was opened, sterile sleeves and oversized surgical gloves were worn on both arms to maintain cleanliness. Instruments for closure were organized separately and covered to ensure they remained sterile. The uterus was identified and incised carefully between the caruncles to avoid bleeding, starting at the tip of the toes. Once the hindlimb was located, chains were placed on the limb to prevent the calf from moving. At this stage, no pulling was required; the limb was simply held in position.

The incision was then extended enough to locate the other hindfoot, allowing for chains to be put on that limb as well. The limbs were grasped and brought out through the incision. Following this, antibiotic boluses were introduced into the uterus before suturing with absorbable sutures using a Lambert suture pattern. The placenta was typically not removed at this point. During the suturing of the uterus, care was taken to ensure that no stitches included the placenta, which was pushed back into the uterus.

Intravenous administration of oxytocin (50 IU) and calcium boro-gluconate (450 ml) was performed slowly after suturing the muscles, which were closed using a lock stitch with chromic catgut size no. 3, and the skin was closed with a horizontal mattress suture pattern. Feedback was collected telephonically from the animal owners at regular intervals of 15 days post-surgery.

A Statistical Analysis test (ANOVA) was conducted to compare the incidence of recovery rate, conception rate between the cesarean and other handling groups.

Results

A total of 192 buffaloes, referred from the field to the Veterinary Clinic due to a history of dystocia, were included in this study. Among these 192 dystocia-affected buffaloes, approximately 60 cases were due to fetal malpositions, 52 cases were caused by incomplete cervical dilatation, and 80 cases were attributed to uterine torsion (Table 1). Table 2 presents the average timing of the appearance of fertile heat signs postpartum in buffaloes suffering from dystocia. The overall average timing across all study animals (n= 192) was 97.27±1.62 days. For those buffaloes treated with cesarean section (CS) as the first course of action (n= 75), the average timing of estrus signs after birth was 87.41±0.92 days postpartum. In contrast, for buffaloes treated with corrective measures (based on the causes of dystocia) as the first treatment option (n= 65), signs of fertile heat appeared at an average of 101.92±2.43 days postpartum. Furthermore, for buffaloes (n= 52) that underwent the cesarean section as a second intervention after unsuccessful corrections, the average timing of estrus signs was 102.47±1.51 days postpartum.

There were statistical differences in the timing of the appearance of estrus signs postpartum (in days) based on whether cesarean section was used as the initial treatment, depending on the causes of dystocia (FM, ICD, and UT). The timings observed were 88.54±1.13 (not significantly different), 89.21±0.73 (not significantly different), and 84.48±0.92 ($P < 0.01$), respectively. Additionally, when correction was performed as the first treatment for dystocia (FM, ICD, and UT), the timings for the appearance of estrus signs postpartum in buffaloes were 102.75±2.07 (not

Table 2. The time (per day) of postpartum fertile heat in buffaloes.

Treatment	Causes of Dystocia			Total
	FM	ICD	UT	
C.S.	88. 54±1.13 ^{NS} (n = 25)	89.21±0.73^{NS} (n = 25)	84.48±0.92* (n = 25)	87.41±0.92 (n = 75)
Correction	102.75±2.07 ^{NS} (n = 15)	99.20±2.37* (n = 15)	103.80±2.86 ^{NS} (n = 35)	101.92±2.43 (n = 65)
C.S after correction	103.22±1.23 ^{NS} (n = 20)	99.46±2.05* (n = 12)	104.73±1.25 ^{NS} (n = 20)	102.47±1.51 (n = 52)
Total	n = 60	n = 52	n = 80	97.27±1.62 (n = 192)

C.S: Cesarean Section; FM: fetal mal dispositions; ICD: Incomplete Cervical Dilatation; UT: uterine Torsion; *: significant at P<0.01; NS: non-significant

Table 3. The number of services per conception (NSC) in buffaloes.

Treatment	Causes of Dystocia			Total
	FM	ICD	UT	
C.S.	1.846±0.662 (n = 25)	1.689±0.373 (n = 25)	1.987±0.186 (n = 25)	1.841±0.407* (n = 75)
Correction	2.323±0.765 (n = 15)	1.997±0.735 (n = 15)	2.687±0.924 (n = 35)	2.336±0.808 ^{NS} (n = 65)
C.S. after correction	3.643±0.745 (n = 20)	2.538±0.674 (n = 12)	2.973±0.525 (n = 20)	3.051±0.648 ^{NS} (n = 52)
Total	n = 60	n = 52	n = 80	2.409±0.621 n = 192

C.S: Cesarean Section; FM: fetal mal dispositions; ICD: Incomplete Cervical Dilatation; UT: uterine Torsion; *: significant at P<0.01; NS: non-significant

significantly different), 99.20±2.37 (P < 0.01), and 103.80±2.86 (not significantly different), respectively. For animals in which cesarean section was used as a secondary treatment after failed correction, the timings for the appearance of estrus signs postpartum were 103.22±1.23 (not significantly different), 99.46±2.05 (P < 0.01), and 104.73±1.25 (not significantly different), respectively.

In this study, we obtained several results regarding the number of services per conception (NSC) in buffaloes, as presented in Table 3. The average NSC for buffaloes experiencing dystocia (n= 192), who were treated to address the causes of dystocia, was found to be 2.409±0.621. When looking specifically at buffaloes that were treated with cesarean section (CS) as the first intervention (n = 75), the NSC was significantly lower at 1.841±0.407 (P < 0.01). In contrast, for buffaloes treated with corrective measures based on the underlying causes of dystocia—as the first approach (n = 65), the NSC was 2.336±0.808, a difference that was not statistically significant. Furthermore, the NSC for buffaloes (n = 52) that were treated with CS as a secondary option, following a failure of corrective measures, was 3.051±0.648. This difference was also not statistically significant. When comparing the NSC of buffaloes that received CS as their initial treatment with those who underwent CS after a failed corrective intervention, we observed significant differences: 1.841±0.407 (P < 0.01) for the first treatment and 3.051±0.648 for the second treatment, the latter being non-significant.

Discussion

The objective of this study was to analyze how effective veterinary interventions in managing dystocia can lead to increased fertility rates in buffaloes after treatment. Our findings are consistent with previous research on the impact of dystocia on postpartum fertility rates and the efficacy of interventions aimed at addressing the causes of dystocia (Kaya *et al*., 2015; Ghavi Hossein-Zadeh, 2016; Hiew *et al*., 2018; Megahed, 2016; 2018; 2022; Megahed and Hassan, 2023). Dystocia presents a significant challenge for livestock production and carries considerable economic implications. It can inflict pain and injury on cows (EFSA, 2009) and negatively influence reproductive performance, leading to complications such as stillbirth, maternal death, retained placenta, uterine infections, and increased rates of involuntary culling (Barrier and Haskell, 2011; Gaafar *et al*., 2011; Ghanem *et al*., 2013; Zobel, 2013; Ghavi Hossein-Zadeh, 2016). Additional consequences of dystocia include veterinary expenses, increased labor requirements, and higher management costs (Dekkers, 1994; Dematawewa and Berger, 1997). For these reasons, dystocia is regarded as an undesirable reproductive event associated with an elevated risk of calf morbidity and mortality (Bicalho *et al*., 2007; Lombard *et al*., 2007), reduced fertility rates (Lopez de Maturana *et al*., 2007; Tenhagen *et al*., 2007), and decreased milk production (Berry *et al*., 2007; McGuirk *et al*., 2007).

In this study, we evaluated the reproductive performance of cattle by examining several key parameters, including the number of services per conception and the timing of postpartum estrus. The findings revealed differences in these parameters among buffalo that experienced dystocia, following interventions aimed at resolving the underlying causes, regardless of the specific causes of dystocia or the interventions used. The results indicated that the average service per conception (S/C) for all buffalo in this study was 2.409±0.621 times. In contrast, after normal births, the average services per conception were measured at 1.25±0.4, 1.3±0.07, and 1.82±0.82 times, as reported by Nastiti *et al*. (2023); Budiarto *et al*. (2020) and Reswati *et al*. (2021), respectively. The number of services per conception for buffalo exhibiting dystocia was influenced by the methods employed to address the condition. Veterinarians can utilize several procedures to manage dystocia effectively. These obstetrical operations primarily aim to deliver a viable fetus and ensure the well-being of the dam. The procedures are categorized into four types: mutation, forcible extraction (correction), and Cesarean section (Benesch and Wright, 2001).

The results for Services per Conception (S/C) were as follows: 1.841±0.407 after the cesarean section (CS), 2.336±0.808 after correction, and 3.051±0.648 after a second decision involving CS. These findings align with those reported by Dematawewa and Berger (1998) and Lee *et al*. (2003), who noted that dystocia delays fertile heat and increases S/C, which is influenced by the type of handling. Additionally, these results are consistent with Lopez de Maturana *et al*. (2007), who found that the number of services per conception was significantly higher (P<0.05) in cattle experiencing dystocia compared to those with normal parturitions (3.4 vs. 2.7). However, Ibrahim *et al*. (2015) suggested that dystocia does not affect fertility, particularly in terms of days to first service and days open. The observed outcomes may stem from the extended handling period for animals (cows or buffaloes) that experienced dystocia. This prolonged handling is thought to impair fertility, reducing the success rate of the first insemination by 12%, compounded by the longer duration for cows with dystocia, as noted by Berry *et al*. (2007). The differences in the timing of fertile heat after birth and S/C in buffaloes suffering from dystocia, post-intervention, may be attributed to the veterinarian's experience in making timely and effective decisions to address the underlying causes of dystocia during treatment.

In buffaloes, the average time to postpartum fertile heat (leading to the first service) is 97.27±1.62 days after birth and interventions. This duration is longer than the 90 days typically seen after normal parturition. The extended time to fertile heat following dystocia cases can be attributed to the longer period needed for complete uterine and cervical involution compared to normal births. Additionally, subclinical uterine infections that may occur after interventions, particularly if hygiene is not maintained can further delay uterine involution (Usmani *et al*., 2001; El-Wishy, 2007). Recent studies have also indicated that any form of calving assistance, whether minimal or requiring veterinary intervention, is linked to an increased risk of reduced fertility (Bicalho *et al*., 2007; McGuirk *et al*., 2007).

When discussing the impact of the decision-making process before addressing the causes of dystocia in buffaloes and the insemination rates for each lamb, the results of this study indicate the following: the number of services per conception (NSC) for buffaloes with dystocia, treated with cesarean section (CS) as the first intervention (n = 75), was 1.841±0.407 (P < 0.01). This outcome is more favorable than the NSC after treating the condition through correction (based on the causes of dystocia) as the initial decision, which resulted in an NSC of 2.336±0.808. In comparison, when CS was performed as a second intervention after a corrective attempt failed, the NSC was even higher at 3.051±0.648. The NSC in this

study (1.841±0.407) is like following normal parturition, which was reported to be 1.82±0.82 according to Reswati *et al*. (2021). The differences in NSC observed in this study—specifically between the treatment with CS as the first intervention (1.841±0.407), treatment by correction first (2.336±0.808), and CS as a second intervention after a failed correction (3.051±0.648) may be attributed to the delay in the uterus returning to its normal state post-delivery. Additionally, there is a significant correlation between the period of uterine involution and the interval to the first estrus, as noted by El-Wishy (2007). Prompt decision-making in performing a cesarean section with an appropriate technique can mitigate the risk of postpartum fertility complications, as highlighted by Kolkman *et al*. (2007).

Several unmeasured variables could influence the outcome of dystocia in this study. These include the amount of traction applied, the skills and judgment of the personnel involved, and the timing of the veterinarians' interventions before the animals arrived at the Veterinary Teaching Hospital, Faculty of Veterinary Medicine, Assiut University, Egypt. In this study, the increased average time to fertile heat after calving for buffaloes may be explained by a greater risk of contamination following treatment based on the causes of dystocia. This is compared to buffaloes that were initially treated with a cesarean section (CS). The potential for more severe contamination due to unhygienic interventions related to dystocia may be higher than in buffaloes that received a cesarean section. This interpretation aligns with findings from Roger and Matthew (2018); Kumar and Purohit (2019); Negasee (2020) and Kalacho (2024). They reported that dystocia is a significant risk factor that increases the overall incidence of clinical problems following calving.

Conclusion

In conclusion, to reduce the negative impact of choosing obstetrical methods for managing dystocia, veterinarians should receive improved training on the appropriate timing and procedures for interventions. Additionally, they should develop effective plans for postpartum care of the dam. The decisions made by veterinarians must be informed by sound obstetric knowledge and strong examination skills. In veterinary medicine education, the focus on handling dystocia should aim at minimizing its impacts by utilizing proper methods to address the causes of dystocia and ensuring appropriate care for the dam after parturition. Economically, dystocia is one of the most significant factors affecting fertility following parturition. We recommend that a cesarean section be considered a clinically viable and appropriate option for resolving dystocia, as it can result in an acceptable postoperative fertility rate. In managing dystocia, veterinarians must know when and how to intervene. Timely intervention can significantly reduce the risk of dystocia negatively affecting postpartum fertility rates.

Conflict of interest

The authors have no conflict of interest to declare.

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