Materials and Methods
III. MATERIALS AND METHODS

3.1 Factors influencing dystocia in dogs

The influence of breed, size, age and parity of the dam on the incidence of dystocia in bitches was studied by analyzing the medical records of dystocia cases presented at the department of Gynaecology and Obstetrics, Veterinary College, Hebbal, Bangalore between January 1997 to March 2009 as well as from the data generated from clinical cases of dystocia handled during the course of present study, (January 2008 and May 2009). A detailed proforma regarding different parameters considered for the present investigation was prepared (Annexure I) and the data was transferred into a proforma for the purpose of analysis.

3.1.1 Breed

The pooled data generated from the clinical records of dystocia cases treated retrospectively as well as dystocia cases treated during the course of the present investigation was analyzed to study the influence of the breed of the bitch on the incidence of dystocia.

3.1.2 Age

The age of the bitch at the time of the presentation with the complaint of dystocia was obtained from each case record as well as from the clinical cases handled during the course of investigation. The animals were grouped into less than 2 years, 2 to 4 years, 4 to 6 years, 6 to 8 years and more than 8 years. The frequency distribution of dystocia in
different age groups was compared to assess the possibility of predisposition of age of the animal to dystocia.

3.1.3 Size

Based on the recommended body weights of the breed of the animal, patients with dystocia were categorized into the following groups in an attempt to assess the relationship of the size of the animal with the incidence of dystocia

a. Small sized breeds (body weight less than 10 kgs)
b. Medium sized breeds (body weight between 10-25kgs)
c. Large sized breeds (body weight between 25-45 kgs) and
d. Giant sized breeds (body weight more than 45 kgs)

3.1.4 Parity

Data regarding the parity of the animal was obtained to compare variation, if any in the incidence of dystocia between primiparous and pluriparous animals.

3.1.5. Gestation period

Gestation period calculated as the interval from the day of first mating to the day of onset of parturient symptoms recorded in each bitch presented with history of dystocia in both retrospective study cases as well as from clinical cases presented during the course of the present investigation was utilized to assess the effect of the length of gestation period on incidence of dystocia.
3.2 Obstetrical history

The information regarding the behavioral signs exhibited by the bitches with dystocia and the interval from the time of onset of labour to the time of presentation to the obstetrical clinic were obtained only from clinical cases of dystocia handled during the course of present investigation as this information was not available in many of the clinical records of the cases treated earlier.

3.2.1 Behavioral signs exhibited by the bitches with dystocia

In clinical cases of dystocia presented during the course of the present investigation, the owners were specifically questioned about the behavioral signs exhibited by the bitch such as restlessness, anorexia, panting, nesting and vomiting.

3.2.2 Interval from onset of labour to its referral

The information regarding the approximate duration of dystocia was obtained in clinical cases of dystocia presented during the course of present investigation and based on the interval from the onset of labour to its referral, the animals were classified into,

A. Animals presented with the history of greenish/blackish green vaginal discharges for the past one to two hours without the expulsion of any of the fetuses (primary uterine inertia)

B. Animals presented with the history of greenish/blackish green vaginal discharges for the past two to six hours without the expulsion of any of the fetuses (primary uterine inertia).
C. Animals presented with the history of greenish/blackish green vaginal discharges for more than six hours without the expulsion of any of the fetuses (primary uterine inertia).

D. Animals presented between four and eight hours after the delivery of one or more puppies normally and subsequently showing weak or complete absence of clinical evidence of labor pains (partial primary uterine inertia).

E. Animals presented beyond eight hours after the delivery of one or more puppies normally and subsequently showing either weak or complete absence of clinical evidence of labor pains (partial primary uterine inertia).

F. Animals presented within one hour after the onset of strong and frequent abdominal straining that failed to deliver a puppy (Obstructive dystocia).

G. Animal presented between one to four hours after the onset of strong and frequent abdominal straining that failed to deliver a puppy (Obstructive dystocia).

H. Animals presented beyond four hours after the onset of strong and frequent abdominal straining that failed to deliver a puppy.

3.3 Clinical examination

The clinical examination included the ultrasonographic measurements of the fetal head to record the gestational age, assessment of temperature, pulse and respiration, recording the nature of discharges in bitches with dystocia and a detailed vaginal examination to identify the cause of dystocia. These observations were carried out only on patients handled during the course of the present investigation.
3.3.1 Gestation period calculated based on ultrasonographic measurements on the fetus

Patients with dystocia were subjected to ultrasonography using a 5 to 7.5 MHz trans- abdominal probe (HONDA ELECTRONICS, HS-2000). The ultrasonographic instrument used in the present study has been specifically designed for veterinary obstetrical use and has been pre-calibrated to provide the gestational age on the basis of the measurements of the fetal head diameter. The age of gestation is displayed in days as calculated from the day of LH surge during estrus.

Briefly, the procedure employed for ultrasonic measurements of the fetal head diameter was as follows. The hair on the ventral abdomen between xiphisternum and pubis and extending to several centimeters on either side of the midline was clipped and ultrasonography was carried with the patient in dorsal recumbency. After application of coupling gel to improve the contact, the sector probe was placed on the posterior abdomen and slowly moved anteriorly and laterally until the fetal head was clearly visible. The image was frozen and the fetal head diameter was measured. The measurements were then fed to the instrument which in turn gave the gestational age in days from the day of LH surge. The procedure was repeated on two other fetuses to obtain head diameter and the average gestation period was calculated.

3.3.2 Temperature, Pulse and Respiration

The temperature was recorded in Fahrenheit using a digital clinical thermometer. The pulse and the respiratory rate were recorded as number per minute.
3.3.3 Nature of discharges in bitches with dystocia

The nature of discharge exhibited by patients with dystocia was recorded by obtaining the history from the owner, visual inspection of the perineum and vulva and Endoscopic examination of the vaginal lumen which was carried out using a rigid fibroptic vaginal endoscope (STORZ, KARL STORZ-ENDOSCOPY). The endoscopy also enabled the presence or absence of water bag in the vaginal lumen which could not be identified by digital examination of the vagina and the patency of the cervix.

Based on the nature of vaginal discharges, animals with dystocia were categorized into,

a. Animals exhibiting no vaginal discharges.

b. Animals exhibiting greenish/blackish green vaginal discharges.

c. Animals exhibiting hemorrhagic vaginal discharges.

d. Animals exhibiting foul smelling brownish discharges.

3.4 Causes of dystocia

Every clinical case of dystocia presented during the course of present investigation was subjected to the following procedures to identify the cause of dystocia.

a. Trans-abdominal ultrasonographic examination to identify the approximate fetal number, fetal viability and fetal head abnormalities.

b. Gloved finger examination of the vagina to identify the abnormalities of the vagina such as vagino-vestibular constrictions, presence of vaginal bands/septum, pelvic bone abnormalities, narrow pelvic inlet, tumors of the vagina and the presentation, position and posture of the fetus.
c. Endoscopic examination of the vagina to identify vaginal abnormalities, presence of allanto-chorionic sac, nature of vaginal discharges and degree of dilation of cervix.

The clinical history obtained from the owner was correlated with the clinical findings of abdominal ultrasonography, gloved finger examination of the vagina and endoscopic examination and a final diagnosis with regard to the cause of dystocia was made. The cause of dystocia was further categorized broadly into either maternal or fetal in origin (Arthur et al., 1989). An attempt was also made to analyze the various causes of maternal and fetal dystocia in bitches. In addition, the relationship of the age, size and parity of bitch with the various forms of maternal and fetal dystocia were also studied.

3.5 Evaluation of treatment procedures

The selection of treatment procedure employed was primarily based on the cause of dystocia and one of the following treatment protocols was employed to relieve dystocia.

a. Medical management
b. Vaginal manipulation
c. Caesarean section

3.5.1 Medical treatment

Medical treatment was carried out only in those cases of dystocia where the cause was diagnosed either as primary uterine inertia or partial primary uterine inertia. The medical treatment consisted of intravenous administration of 25 per cent Dextrose,
oxytocin at the rate of 0.1 IU per kg body weight intravenously and intravenous administration of 10 per cent calcium gluconate at the rate of 0.5 ml per kg body weight but not exceeding a total dose of 10 ml. Oxytocin was administered for a maximum of three injections, the interval between injections being not less than 30 minutes. Calcium gluconate was administered only once. Animals failing to respond to medical treatment were immediately subjected for caesarean section.

3.5.2 Vaginal manipulative procedures

Vaginal manipulative procedures were adopted in cases of dystocia diagnosed to have been caused by presentation, position and postural abnormalities of the fetus or structural abnormalities of the reproductive tract interfering with the normal passage of the fetus such as bands of septum in the vagina or an incompletely relaxed vagina and vulva. The vaginal manipulation was carried out following all aseptic precautions and using either a gloved finger or a vaginal sponge forceps. Cases of dystocia which could not be relieved through vaginal manipulative procedures were immediately subjected for caesarean section.

3.5.3 Caesarean section

Caesarean section as the first line of treatment was carried out in those cases of dystocia caused by pelvic bone abnormalities or complete primary uterine inertia which in the opinion of the obstetrician does not respond to conventional medical treatment. It was also the only line of treatment carried out in protracted cases of dystocia characterized by fetal death and emphysema and maternal septicemia. Caesarean section
was also carried out on those cases which failed to respond to medical treatment or vaginal manipulative procedures.

Before subjecting the animals for surgery, they were again subjected to ultrasonographic evaluation for determining the fetal viability. The fetal viability was assessed on the basis of the presence or absence of the heart beats and observations for fetal movements.

3.6 Evaluation of anesthetic protocols for cesarean section

Although, cesarean section was carried out in all those cases failing to respond to medical therapy or vaginal manipulative procedures, the evaluation of various anesthetic protocols for cesarean section was carried out only in those bitches where there was ultrasonographic evidence of viability of all the fetuses prior to surgery. Animals with dead fetuses or those with both dead and live fetuses were also subjected to cesarean section, but were not included for further evaluation and were excluded from the present study.

3.6.1 Hematological and Blood biochemical studies in animals subjected for cesarean section

Blood samples were obtained from every animal subjected for cesarean section in order to establish the hematological and biochemical changes if any in patients with dystocia. Blood samples were obtained once prior to premedication and again after the completion of the surgery. Blood samples were also obtained from six other animals just prior to onset of parturition and again after the completion of normal process of delivery
(control group). The hematological and biochemical parameters were recorded using SYSMEX model pocH-100i and BIOSYSTEMS A15 respectively. The hematological parameters studied were (a) Total leukocyte count (cells/cmm), (b) Hemoglobin (g/dl) and (c) Platelet count (Lakhs/dl).

The blood biochemical parameters studied were (a) Blood Urea Nitrogen (gms %) (b). Serum Creatinine (gms %) (c). Alanine amino transferase (SGPT) (U/l) (d). Random Blood sugar (gms %) and (e) Serum Calcium (mg/dl).

3.7 Electrocardiography

Electrocardiographic studies were carried out in animals selected to undergo cesarean section to evaluate cardiac changes if any. Electrocardiographic examination was carried out subjecting the animal to the least possible stress using a four lead electroradiographic machine (CARDIART 6108t, BPL). The interpretation of electrocardiograph was made by a Veterinary Physician specialized in canine cardiology

3.8 Preparation of the patient and premedication

Cesarean sections were carried out in 48 animals with viable fetuses through a mid-ventral incision which was aseptically prepared for surgery. The drugs used for premedication consisted of diazepam (0.5 mg per kg weight, IV) and atropine sulphate (0.04 mg per kg body weight, IM) which were administered about 10 minutes prior to surgery. During this period as well as during and after the entire surgical procedure, the animals were constantly infused with a balanced electrolyte solution (Ringer’s solution) in an attempt to correct hypotension and maintain hydration status. Following
premedication, the time of onset of sedation based on drooping of the eyelids, head down and attainment of recumbency were recorded.

3.9 Anesthetic protocols

The animals which were subjected to premedication as described above were randomly allotted to three general anesthetic protocols with each group comprising of 12 animals. In addition, another group of 12 animals premedicated similarly were subjected to cesarean section under epidural analgesia.

3.9.1 Group I: Rapid acting intravenous anesthetic agent

The general anaesthesia was induced and maintained in 12 animals with dystocia by administrating the anaesthetic agent, intravenously. The anaesthetic agent (propofol) was administered initially at a dose rate of 5-10mg/kg body weight to effect general anaesthesia as evidenced by the absence of pedal reflexes, palpebral reflexes and ventro-medial deviation of the eyeball (third stage of anesthesia). Subsequently, Propofol was administered intermittently as and when needed to maintain general anaesthesia.

3.9.2 Group II: Combination of fast acting intravenous anaesthetic agent and dissociative anaesthetic agent

In another group of 12 patients with dystocia the general anaesthesia was induced and maintained using a combination of fast acting IV anaesthetic agent (Propofol) and dissociative anaesthetic agent (ketamine). The anesthetic agents propofol and ketamine were drawn into the same syringe in ratio of 1:1 (V/V) and administered i.v to effect general anaesthesia as judged by the signs of third stage of anaesthesia.
3.9.3 Group III: Inhalant anaesthesia agent

In 12 animals with dystocia, cesarean section was carried out under general anaesthesia using Isoflurane (FORANE, Abbott Laboratories Ltd., England) an inhalant anaesthetic agent. Isoflurane was administered through a face mask using a Boyle’s anesthetic apparatus initially at the rate of 3-5 per cent administered until the animal attained the third stage of anesthesia. Simultaneously, oxygen was also infused at the rate of 1.5 per cent. Once the animal attained third stage of anesthesia, animals were maintained in the third stage using Isoflurane at 1 per cent concentration and oxygen at 1.5 per cent concentration.

3.9.4 Group IV: Epidural analgesia for cesarean section

A group of 12 animals with dystocia were subjected to cesarean section using epidural analgesia. Epidural anesthesia was induced by injecting 2 per cent Lignocaine hydrochloride solution at the rate of 1 ml per 3 kg body weight. Briefly, the technique of epidural anesthesia carried out was as follows.

The site for needle placement was clipped and prepared in a sterile manner similar for surgery. Sterile gloves were worn for the procedure. A spinal needle with a stylet of about 22–20 g x 1½”–2½” in length placed exactly on midline in the center of the hollow palpated between the dorsal spinal processes of L7 and S1. A “pop” could be felt as the needle traverse through the tough interspinous ligament and into the much less resistant epidural space. A sterile syringe containing air was connected to the spinal needle and a small amount of air was injected. After verification of the position of the needle, the
syringe containing the analgesic agent was connected and the agent was injected slowly. The needle was withdrawn completely after the agent was administered.

### 3.10 Evaluation of anesthesia

In every anesthetic protocol used, the following parameters were recorded in an attempt to compare the effects of the anesthetic protocol on the dam and the neonates. The duration of surgical anesthesia and complications of anesthetic procedure observed if any

- a. Time taken for induction of general anesthesia.
- b. The ease of induction of anaesthesia and the degree of skeletal muscle relaxation.
- c. Time taken by the dam to exhibit the first sign of recovery from anesthesia after the completion of surgical procedure and discontinuation of administration of anaesthetic agent.
- d. The degree of cardiovascular and respiratory depression of the neonate with various anesthetic protocols.
- e. Percentage of viable fetuses delivered with each anesthetic protocol.

### 3.11 Statistical analysis

Wherever deemed necessary, the data generated from the present investigation were subjected to chi-square test, as per the procedures described by Snedecor and Cochran (1996) to study the variations in the frequency of dystocia.