

## Some reproductive indices of the Nigerian local bitches in Ibadan, Nigeria

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**Summary:** Some reproductive parameters of the Nigerian local bitches were studied at the kennel of the Department of Veterinary Surgery and Reproduction, University of Ibadan using 6 bitches and 1 stud aged between 2 and 3 years, weighing 10 to 12kg. The bitches were mated naturally by the stud at the second day of cytological oestrus and allowed to carry the pregnancy to term. The bitches and puppies were weighed weekly and observed till weaning. Mean gestation length was  $63.5 \pm 0.3$  day. Mean litter size was  $7.0 \pm 2.0$  puppies. Litter sex ratio was 1.25 females to 1 male puppy. Mean birth weights were  $308.3 \pm 15.3$  and  $286.3 \pm 11.8$  grammes for male and female puppies respectively, while the respective weaning live weights were  $1.5 \pm 0.2$  and  $1.8 \pm 0.1$ kg. Litter size affected the birth weight; the mean birth weight of puppies with the litter size 10 was significantly lighter ( $p < 0.05$ ) than those with litter sizes 7, 6 and 4 puppies. Mean age at testicular descent was  $6.1 \pm 0.6$  days while eyes of puppies were opened at mean age  $15.4 \pm 0.2$  days. Mean duration between whelping and first oestrus was  $3.9 \pm 0.07$  months. The neonatal mortality rate was 35.3%, more female puppies (26.4%) than male puppies (5.9%) died during the first week of life. These high mortalities might be due to cold and maternal negligence. With these basic data, the reproductive potential of the Nigerian local bitch can be harnessed.

**Keywords:** Reproductive parameters, Nigerian local bitches, Ibadan

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### INTRODUCTION

The Nigerian local breed of dogs is the indigenous breed of dogs found in Nigeria. These dogs have not been selected for any particular purpose and therefore their reproductive potential have not yet been harnessed (Ajala, 2010). The reproductive potential of a particular breed of animal is measured by considering its reproductive parameters. Some of these parameters in the female animals according to Mutembei et al. (2000) include: the oestrous cycle, interoestrous interval, age at puberty, litter size, sex ratio, gestation length, period of first oestrus after gestation, birth weight and growth rate of puppies and the neonatal mortalities. Following fertilization of the ova by spermatozoa, the fertilized egg will immediately divide to become a blastocyst, although these ova are not fertilized at the same time, some are fertilized earlier than the other because their ovulations are not also at the same time (Davol, 2000). The tubo-uterine junction through which the blastocysts will pass into the uterus will not open until about 10 days following luteinizing hormone (LH) surge (Nelson and Couto, 2003). So even when some of the blastocysts are older than others, (usually between 12-16 days following LH surge) they

implant in the uterus at the same time around day 20 (Davol, 2000). The gestation length is defined as the interval from a fertile mating to parturition. Its reported average in the exotic breeds of dogs is  $63 \pm 7$  days from the day of first mating to parturition,  $65 \pm 1$  days from LH peak and  $57 \pm 3$  days from the first day of cytological dioestrus (Nelson and Couto, 2003). Literature is scarce on the gestation length of the Nigerian local breed of dogs.

Litter size is another important parameter that describes the reproductive potential of an animal. This is the total number of puppies born by a bitch after a particular pregnancy (Mutembei et al., 2000). The number of puppies per litter varies with the size of the dog, toy breeds rarely bear more than two puppies while the large breeds' average close to 10 puppies per litter (Columbia Encyclopedia of Dogs, 2005). The very small litters by small breeds may be due to their very small size which limits their capacity to carry large litters compared to the larger breeds, in which litter size may range from one to twenty one (Battaglia, 2001). Mutembei et al. (2000) and Chatdarong (2007) recorded some litter sizes of  $6.6 \pm 2.8$  puppies for German Shepherd Dog and  $8.2 \pm 1.8$  puppies for Rottweiler, while Kelley (2001) in his own report stated litter size of  $5.0 \pm 2.1$  puppies

for Beagle dogs,  $5.8 \pm 2.4$  for Boxer,  $3.3 \pm 1.5$  for Chihuahua,  $5.0 \pm 2.0$  for Cocker Spaniel,  $3.9 \pm 1.5$  for Dachshund,  $6.6 \pm 2.7$  for German Shepherd,  $7.6 \pm 2.7$  for Golden Retriever,  $7.6 \pm 2.6$  for Labrador Retriever,  $4.6 \pm 1.8$  for Miniature Schnauzer,  $3.0 \pm 1.4$  for Pomeranian,  $3.4 \pm 1.8$  for Poodle,  $6.6 \pm 2.9$  for Rottweiler,  $4.3 \pm 1.9$  for Shetland Sheepdog, and  $3.3 \pm 1.5$  for Yorkshire Terrier. The physical conditions of the dam at the time of breeding have been shown to affect the litter size. Nutrition also has been reported as a factor affecting litter size, obese bitches have smaller litter than those that are fit and trim (Russ, 2000). Parity also has a great influence on the litter sizes of bitches; primiparous have smaller litter sizes than multiparous bitches (Schreiber et al., 1975).

The Nigerian Local dogs have been used for many biomedical studies, also as models for the study of human diseases and pets and companion to hunters and the rural populace of Nigeria. However, there is a dearth of information on the parameters of reproduction and hence the reproductive potential of this valuable animal. This study was therefore conducted to document the gestation length of this breed, the time for the first oestrus after parturition, the litter size, sex ratio, birth weight, age at testicular descent and opening of the eyes of the puppies and body weight changes of the puppies from birth to weaning. This study will help to elucidate the reproductive potential of this breed.

## **MATERIALS AND METHODS**

Six females and 1 male Nigerian Local Breed of dogs were used for this study. Their ages were between 2 and 3 years and body weight 10-12kg. They were acclimatized for 1 month, during which period they were vaccinated against rabies using CANVAC® rabies vaccine and Leptospirosis using CANVAC® DHLPP vaccine. They were routinely dewormed using mebendazole at 22mg/kg body weight orally daily for 3 consecutive days and with praziquantel at the rate of 20.0mg/kg body weight once orally at three months interval before pregnancy. They were washed with Amitrax® against ectoparasites. Other Veterinary attentions were given as at when indicated. All dogs were clinically examined and confirmed free from any obvious reproductive and systemic disorders. Rectal temperature pulse rate and heart rate were monitored to be within normal ranges for dogs. Faecal samples and whole blood were examined for gastro-intestinal and haemoparasitic infections in order to ascertain the health status of the dogs. They were fed on compounded ration with crude protein of 26.36% and Energy of 2.82kcal/g/DM.

The six bitches were fed once daily at about 8.00am in their separate kennels from the first

trimester to midgestation and then twice daily till the end of gestation. They were daily allowed to exercise around the central space in the kennel from 8.15 am to 6.00 pm in the evening before they were returned to the kennel. The bitches were observed for onset of heat and then mated naturally at the second day of their acceptance of the male which coincided with the second day of oestrus as indicated by vaginal cytology. They were allowed to carry the pregnancy to term. After whelping, the bitches and the puppies were monitored till weaning.

The bitches were weighed weekly throughout the periods of gestation and postpartum till weaning using the bathroom scale, while the puppies were weighed with the "Top-Loading" scale from day old to four weeks of age after which the bathroom scale was used to weigh them till weaning.

The trimesters were differentiated as first trimester, 1<sup>st</sup> to 20<sup>th</sup> day after mating; second trimester was 21<sup>st</sup> to 42<sup>nd</sup> day after mating and 3<sup>rd</sup> trimester 43<sup>rd</sup> to 63<sup>rd</sup> day after mating.

### **Statistical analysis**

The mean and standard error of mean ( $\pm$  SEM) of the reproductive parameters were calculated and the data generated were subjected to Analysis of variance (Bamgboye, 2006) and confirmed by the Tamhane Statistical model.

## **RESULTS**

The live weight during pre-mating, 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> trimesters were 10.83, 11.28, 12.53 and 14.42 Kgs respectively. The only apparent weight increase was during the 3<sup>rd</sup> trimester. The increase from the pre-mating weight to the third trimester weight was 33.15%. There was a weight loss between 3<sup>rd</sup> trimester ( $14.41 \pm 0.18$ ) and the postpartum period  $10.78 \pm 0.19$  (Table 1). The gestation period was  $63.5 \pm 0.31$  days from the second day of oestrus to the day of parturition. The litter size was  $7.0 \pm 1.25$ . The sex ratio was 1: 1.25 male: female and the first oestrus after parturition was  $3.9 \pm 0.70$  months (Table 1).

The birth weight (g) of puppies from this study was  $308.3 \pm 15.3$  for males and  $286.3 \pm 11.8$  for females (Table 2). The male puppies were significantly heavier than the female puppies at birth ( $P < 0.05$ ) while at weaning the weights (kg) of the females  $1.8 \pm 0.1$  kg were heavier than the males  $1.5 \pm 0.2$  kg (Table 2).

Litter size affected the birth weight of the Nigerian local puppies, the larger litter size (10 puppies) had birth weights that were significantly ( $P < 0.05$ ) lighter than those of smaller litter sizes (4, 6 and 7 puppies), while the birth weights of the litter with 4 puppies were significantly heavier ( $P < 0.05$ ) than those of 10, 7 and 6 puppies, but the litters with 4 and 6 puppies were not significantly different from each other ( $P < 0.05$ ) (Table 3).

**Table 1.** Some Reproductive Parameters of the Nigerian Local Bitches

Parameter	
Number of bitches (n)	6
Premating weight (Kg)	10.83 ± 0.14
Weight during pregnancy (kg)	
1 <sup>st</sup> Trimester	11.28 ± 0.13
2 <sup>nd</sup> “	12.53 ± 0.12
3 <sup>rd</sup> “	14.42 ± 0.18
Weight immediately after parturition (kg)	11.50 ± 0.15
Weight during postpartum till weaning (kg)	10.78 ± 0.19
Gestation length (in days; from the 2 <sup>nd</sup> day of cytological oestrus)	63.5 ± 0.31
Litter size (puppies)	7.0 ± 2.0
Neonatal mortality rate (within the first week of life) (%)	35.3%
Female:Male	1.25 :1
1 <sup>st</sup> oestrus after parturition (months)	3.9 ± 0.07
mean ± SEM (standard error of mean)	

**Table 2.** Preweaning Parameter of the Nigerian Local Puppies

Parameter	Male	Female
n=27	12	15
Birth weight (g)	308.3±15.3*	286.3±11.8
Weight at weaning (kg)	1.5±0.2	1.8±0.1
Age at weaning (weeks)	8weeks	8weeks
Age at testicular (days)	6.2±0.6	-
Opening of the eyes (days)	15.4±0.2	15.4±0.2
Neonatal mortality rate (within first week of life) (%)	5.9%	29.4%*

Note: Values are expressed as means ± SEM (standard error of mean)\*P<0.05 males significantly different from females

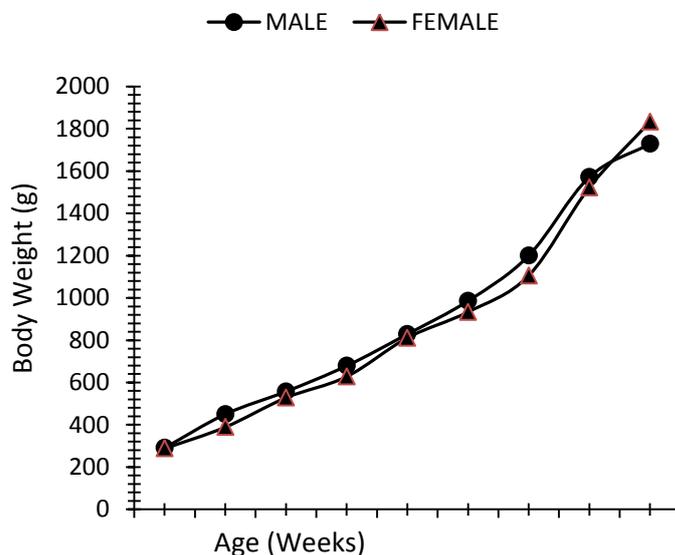
**Table 3.** Effect of litter size on birth weight of the Nigerian Local puppies

Birth weight (g)	Litter size (puppies) per dam
241.67±15.37*	10
280.00±13.33*	7
320.00±5.77	6
321.43±10.10	4
Total	27

Note: Values are expressed as mean ± SEM (Standard Error of Mean) \*P<0.05 means significantly different from each other.

The age at testicular descent of male puppies was 6.1 ± 0.6 days after birth (Table 2). The Nigerian local puppies in this study were born with their eyes closed and their eyes were opened at 15.4 ± 0.25 days of age,(Table 2). The neonatal mortality rate (within the first week of life) of puppies was 35.3% (Table 1). More female (29.4%) than male (5.9%) puppies died

within the first one week of life (Table 2). The body weight changes of the male and female Nigerian local puppies from birth to weaning were as depicted in Fig 1. Growth rate as measured by weekly weight gain was faster in the female than in male puppies (Fig 1).



**Figure1.** Body weight changes of male and female Nigerian Local puppies from birth to weaning.

## DISCUSSION

The live weight of pregnant bitches showed that there was an increase in their weights pre mating to the weight at 3<sup>rd</sup> trimester 33.15%. This result is at variance with the average weight increase obtained by Concannon et al. (1997) who reported an average of 36% and Concannon (2002) who also reported 35% but was within the range of 20-55% reported by this same worker. These reports are at variance with the reports in Pregnancy Info for Dogs (2008) which stated that the body weight of dogs increased only by 15% to 25% during pregnancy. The body weight decreased twelve hours post whelping compared with third trimesters (14.42 ± 0.18kg to 11.50 ± 0.15kg) but this weight was about 6.2% more than the pre mating weight of the bitches (10.83 ± 0.14). This finding is similar with the reports in Pregnancy Info for Dogs (2008) which stated that just after whelping the decrease in body weight of bitches should not be more than 10% of the pregnant weight.

The gestation length of 63.5 ± 0.3 days obtained in this study is the minimum of the 64 to 66 days range reported by Concannon (2000) when measured from the day of LH surge to parturition. The slight variation might be due to the fact that the dog sperm may survive in the bitch’s tract for up to seven days and still remain viable in terms of being able to achieve fertilization and result in pregnancy.

The litter size obtained for the Nigerian local breed of bitches used for this study was  $7.0 \pm 2.0$ . This is similar to the report by Der-Rottweiler (2006) that bitches belonging to large working breeds have up to 6-7 puppies and sometimes up to 10 to 12 puppies. Battaglia (2001) stated that most of the small breeds, notably the toys and terriers usually produce very small litters and this might be because of their very small size which limits their capacity to carry large litters. The sex ratio of puppies in this study was 1:1.25 male: female. This agrees with the report of Cox (2007) that there are usually many more females than males, but sometimes there could be litters with all males or all females. The sex of puppies in a litter, are determined by the stud that served the bitch, in this study the same stud was used for all the bitches.

The first cytological oestrus was  $3.9 \pm 0.07$  months after parturition in the bitches used for this study and this is at variance with the reports of Johnston (1986) and Gilbert (1998) who reported 5 and 4 months respectively for exotic breeds of dogs. Mutembei et al., (2000) also reported 6.1 months for German shepherd bitch in Kenya.

It was found that the Nigerian local puppy's eyes were opened at  $15.4 \pm 0.25$  days of age and this is similar to the report of Foster and Smith (1997) that puppies' eyes were open around 12 to 15 days of age in the exotic breeds.

The neonatal mortality rate in this study was 35.4% for the male puppies and 29.4% for the female puppies and this higher mortality rate in the female puppies was due mainly to maternal negligence and exposure of puppies to cold. This shows that lighter weight Nigeria local dogs are prone to cold during the first week of life. Future breeders of this breed are therefore advised to always provide extra warmth to supplement the effort of the local bitches so as to reduce preweaning mortalities especially when the birth weight is low. Average neonatal mortality for exotic puppies ranged from 15 to 25% due to various causes. The causes range from respiratory distress following dystocia, bacterial infection and "fading puppy" syndrome due to hypothermia when bitches do not retrieve wandering puppies, unrecognized infection, congenital abnormalities and failure to suckle competitively. Some of these causes are similar to those observed in this study. Haskins (2000) also reported that about 20% of puppies die within the first week of life. In conclusion, the study presented neonatal mortality rate and the causes in the Nigerian local puppies so that future occurrence could be prevented. The age at testicular descent observed was reported to be  $6.1 \pm 0.6$  days. This is comparable to the report of Hoskins and Taboada (1992) that testicular descent is complete by about day 10 after birth in normal dogs. The male puppies were also heavier than the female puppies. The

neonatal mortality rate in the Nigerian local puppies in this study is higher than the rate reported in some exotic breeds by Lawler (1989), Haskin (2000) and Concannon (2002). The result of this study presented useful information in diagnosing cases of cryptorchidism and infertility in the Nigerian local dogs.

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