

A Study of the Craniofacial Morphometry of the Nigerian Local Dog

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Abstract

A study of the spatial relationship of the structures of the head and face of the Nigerian local dog was carried out using twenty-five clinically healthy dogs (11 males, 14 females). The males recorded a higher body weight and height of right external nares (15.75 ± 6.19 kg and 0.73 ± 0.15 cm respectively), when compared with the females (14.5 ± 4.38 kg, 0.72 ± 0.14 cm) ($P > 0.05$). Values for all other parameters (e.g. rima oris length, pinna length and width, external nares length and width, etc.) measured were found to be higher in the females, although no statistically significant differences ($P > 0.05$) were observed between the genders. There was a positive correlation between the weight of the animal and all other parameters measured. Data obtained from this study will find application in the field of comparative and clinical anatomy, morpho-physiology and possibly evolutionary studies.

Key words: Nigerian local dog, dolichocephalic, craniofacial region, morphometry, sexual dimorphism.

Introduction

In dogs, the shape of the skull is an important criterion to determine the standard breed [1]. The Nigerian local dogs are a breed indigenous to Nigeria; they are popularly referred to as 'mongrels' by indigenes. In some southern parts of Nigeria, the meat from this breed of dog is consumed as a delicacy [2]. They are dolichocephalic (long-headed) dogs and are highly domesticated, with their feeding pattern being majorly omnivorous due to the domestication.

The regional anatomy of the head is a very important aspect of anatomy, as it shows the spatial relationship of the organs in that region. Craniofacial indices in humans have been useful in the early detection, diagnosis and study of the development of the characteristic face of some syndromes like the Williams syndrome [3]. There are many reported works on the anatomy of different breeds of dogs [4, 1, 5], and also the craniofacial indices of some other species of animals [6, 7], but currently, careful electronic search did not reveal any

documented report on the craniofacial anatomy of the Nigerian local dog. This study aims to determine the craniofacial morphometric indices of this breed of dogs in an effort to provide basic research data, and also for comparative purposes with other reported breeds of dogs.

Materials and Methods

A total of twenty-five clinically healthy Nigerian local dogs (11 males, 14 females) were used for this study. The animals were anaesthetized with xylazine-ketamine combination, and weighed with a standard bathroom scale. All procedures followed the Guide for the care and use of laboratory animals [8]. Measurements were obtained with the aid of vernier callipers, a length of string and a metre rule.

Craniofacial parameters measured and their landmarks were:

- **Weight of Animal:** This was determined using a standard bathroom scale. Measurements were recorded in kilogrammes.
- **Rima Oris Length (ROL):** This was determined using a twine, as the distance between the lateral commissures of the closed lips. The linear measurement was then determined.

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- ***Pinna Lengths, Left and Right (PiLL & PiLR respectively):*** This was measured from the base of the pinna to its tip.
- ***Pinna Widths, Left and Right (PiWL & PiWR respectively):*** This was measured as the widest distance between the lateral edges of the pinna.
- ***Distance between Medial Canthi (DMC):*** Distance between the two medial canthi of the left and right eyes.
- ***Palpebral Fissure Lengths, Left and Right (PFLL & PFLR):*** Distance between the medial and lateral commissures of each eye.
- ***Philtrum Height (PH):*** Measured from the most dorsal and rostral aspect of the muzzle, to the lowest aspect of the philtrum.
- ***Width of the External Nares, Left and Right (ENWL & ENWR respectively):*** Maximum horizontal distance between the lateral and medial borders of each of the nares.
- ***Height of the External Nares, Left and Right (ENHL & ENHR respectively):*** Maximum vertical distance between the dorsal and ventral borders of each of the nares.

Statistical analysis: All data obtained were analysed with Student's 't' test (Graphpad prism), and level of significance was calculated at $P < 0.05$.

Results

Results are shown in Tables 1 and 2. Mean values are presented as Mean \pm Standard deviation. The mean body weight obtained in this study was 14 ± 4.44 kg, with the males (15.75 ± 6.19 kg) being heavier than the females (14.5 ± 4.38 kg). Although, no statistically significant difference was observed between the values for the males and females ($P > 0.05$), other parameters measured showed that the females had consistently higher values except for the height of the right external nares (males- 0.73 ± 0.15 cm; females- 0.72 ± 0.14 cm). A slight asymmetry was observed between the left and right values.

Correlation studies (Table 2) revealed that all parameters recorded showed positive correlation with the weight of the animal, with the width of the left pinna having the highest correlation coefficient ($r = 0.855$) while the width of the left external nares had the lowest ($r = 0.197$).

Table 1: Craniofacial dimensions of the Nigerian Local Dog

	Total n=25	Male, n= 11	Female, n= 14	Dogs ≤12kg, n=12	Dogs >12kg, n=13
Weight of animal (kg)	14±4.44	15.75±6.19	14.5±4.38	11.33±1.12	17.43±4.83
Rima oris length (cm)	14.54±1.48	14.5±0.5	15.0±1.84	14.0±1.23	15.4±1.55
Left pinna length (cm)	8.53±1.37	8.1±0.81	8.85±1.72	8.14±1.07	9.33±1.70
Right pinna length (cm)	8.33±1.47	8.0±0.81	8.27±1.92	7.86±1.06	9.15±1.87
Left pinna width (cm)	5.48±1.18	5.13±0.15	6.05±1.47	4.95±0.31	6.53±1.63
Right pinna width (cm)	5.64±1.29	5.37±0.47	6.14±1.70	5.07±0.60	6.5±1.65
Distance between medial canthi (cm)	4.32±0.65	4.13±0.47	4.54±0.78	3.91±0.28	4.96±0.53
Left palpebral fissure length (cm)	2.02±0.48	2.03±0.23	2.26±0.48	1.76±0.35	2.44±0.36
Right palpebral fissure length (cm)	1.94±0.45	2.03±0.15	2.08±0.53	1.65±0.21	2.39±0.34
Left external nares width (cm)	1.42±0.16	1.43±0.06	1.47±0.17	1.38±0.13	1.48±0.20
Right external nares width (cm)	1.43±0.15	1.37±0.15	1.49±0.15	1.38±0.12	1.51±0.18
Left external nares height (cm)	0.72±0.16	0.73±0.15	0.77±0.14	0.64±0.11	0.84±0.13
Right external nares height (cm)	0.67±0.17	0.73±0.15	0.72±0.14	0.60±0.15	0.79±0.13
Philtrum height (cm)	2.02±0.37	2.0±0.27	2.17±0.34	1.9±0.35	2.21±0.33

Table 2: Correlation Coefficients (Pearson’s correlation) of Body Weight against other Parameters in the Nigerian Local Dog

	ROL (cm)	PiLL (cm)	PiLR (cm)	PiWL (cm)	PiWR (cm)	DMC (cm)	PFL (cm)	PFLR (cm)	ENWL (cm)	ENWR (cm)	ENHL (cm)	ENHR (cm)	PH (cm)
WOA (kg)	0.474	0.490	0.636	0.855	0.829	0.846	0.798	0.837	0.197	0.311	0.585	0.535	0.692

Key: WOA- Weight of animal; ROL-Rima oris length; PiLL & PiLR- Length of pinna, left and right respectively; PiWL & PiWR- Width of the pinna, left and right respectively; DMC-Distance between medial canthi; PFL & PFLR- Palpebral fissure length, left and right respectively; ENWL & ENWR- External nares width, left and right respectively; ENHL & ENHR- External nares height, left and right respectively; PH- Height of philtrum.

Discussion

In spite of the heavier body weight obtained in the males, the females recorded higher values for almost all the other parameters. Previously in some other species, it was speculated that the males might be more voracious eaters due to their wider rima oris length, and also probably possess a keener sense of hearing and smell due to their larger pinnae and external nares [7]. This speculation of the males possessing a keener sense was not supported in this study since the females had higher values for the parameters afore-mentioned (Table 1).

Furthermore, external nares width values obtained previously in goats (left-3.18 ± 1.46 cm; right -3.19± 1.47 cm) [7] are quite higher than values obtained in this study, despite the fact that dogs are widely known to have a keener sense of smell due to their larger olfactory bulb [9]. This speculation should therefore be restricted to animals of the same species and breed.

The value obtained for the rima oris length in this study (14.54±1.48 cm) when compared with other domestic animals was higher than that reported in the goat (8.69 ± 1.64 cm) [10], but lower than that of pig

(19.51±2.89 cm) [7]. Although not statistically significant ($P>0.05$), the females showed a higher distance between medial canthi, showing that their eyes are more laterally placed than the males. The value obtained in this study (4.32±0.65 cm) is higher than previous values obtained in dogs and cats (3.55 cm and 2.30 cm respectively) [6], but considerably lower than the 8.81 ± 1.08 cm obtained in goats [7], 15.14 cm in cattle [6] and 17.28 cm in equine [6]. The slight asymmetry observed in some parameters between the left and right sides is also consistent with the earlier report of the same between the two halves of the animal body [4] and in human osteometric studies [11]. It has been reported that the more lateral placement of the eyes helps in survival, as witnessed in animals which are preys [9], this might therefore suggest that the females were more likely to be attacked by animals higher in the food chain (before the era of domestication). This can also account for the larger pinnae and wider external nares (which speculatively may indicate a keener sense of hearing and smell respectively). These factors could have helped to increase the chances of survival of the female and so preserve this particular species to date.

All the parameters measured were found to be higher in animals weighing above 12 kg when compared with those weighing 12 kg or below. This suggests that all these parameters are size dependent and may probably increase as the weight of the animal increases, even if not all at the same rate. This is supported with the correlation studies (Table 2), which shows that all the parameters had positive correlation coefficient values when compared with the body weight. The distance between the medial canthi had a very high positive correlative coefficient ($r = 0.846$), which may show that this value is the most likely to increase when an increase is recorded in the body weight.

In conclusion, the data obtained in this study will be found useful in the fields of comparative and clinical anatomy, morpho-physiology research and evolutionary studies.

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