



Phenotypic and morphometric characterization of Janwal Pashmi dog

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ABSTRACT

Janwal Pashmi is the medium sized dog found in the villages of Chakur tehsil of Latur and adjoining districts of Marathwada region of Maharashtra. Present investigation was carried out by collecting morphometric data on 207 Janwal Pashmi dogs from its breeding tract. Data collected was classified into two age groups, i.e. below one year (puppies) and above one year (adult). Majority of the dogs were found to be black in colour (78.26%), however, fawn (8.69%), brown (4.34%), grey (5.79%) and white (2.89%) were also noticed. Most of the dogs were found to have medium hairs length (51.20%) followed by long hairs (43.47%) and rarely short hair length (5.31%). The head was straight and wedge shaped with 69.56% and 30.43%, respectively. The colour of nostrils in majority of dogs was black (95.16%) and very few dogs had brown (3.86%) and pinkish (0.96%) colour nostrils. Eyes were light brown (47.34%) to dark brown (52.65%). Majority of dogs had long ear (54.58%) while medium sized ears were observed in 42.02% of dogs. Morphometric characters studied were body weight (BW), height at wither (HW), body length (BL), chest girth (CG), paunch girth (PG), tail length (TL), head length (HL), height at base of tail (HBT), neck length (NL), neck girth (NG), ear length (EL), ear width (EW), eye width (EYW), hind foot length (HFL), upper hind leg length (UHLL), lower hind leg length (LHLL), fore foot length (FFL), upper fore leg length (UFLL) and lower fore leg length (LFLL). The effect of sex was found to be non-significant on all the traits in puppies except BW, HW, HBT, NL, UHLL and UFLL. However, BW, HW, BL, CG, TL, HL, HBT, NL, NG, HFL, UHLL, LHLL, FFL and UFLL were found significantly higher in males of adult age group. Both vegetarian and non-vegetarian food was given to dogs and majority of farmers used iron mesh cages for keeping dogs. The characterization of Janwal Pashmi dog done in this study may help in the registration of this dog as a breed status and further conservation.

Keywords: Janwal Pashmi, Morphometric traits, Phenotypic traits

Dog (*Canis familiaris*) is one of the earliest domesticated species, originally used for hunting and companionship by humans. Dogs are mainly used for the shepherding, guarding, hunting, herding, sniffing, sport and companion. In India, the dogs are used for shepherding of livestock, guarding of houses along with companionship and sports. The Indian dog breeds are recognised for their intelligence (ICAR NBAGR, Annual Report 2020). India is rich in canine genetic resource, indigenous dogs like Rajapalayam, Chippiparai, Mudhol Hound, Rampur Hound, Caravan Hound, Banjara Hound, Himalayan sheep dog, Alangu, Indian Spitz and Jonangi are well known. But due to inflow of exotic canine breeds, the indigenous dogs did not get any attention from scientists, dog breeders and pet owners. (Karthickeyan *et al.* 2015).

The Maharashtra state of India is also bestowed with some well-known dogs. The most important is Janwal

Pashmi, the feathered variety. This dog is basically found in the villages of Chakur Tahsil of Latur district and adjoining districts of Marathwada region and known by various names such as Janwal Pashmi, Janwal Hound, Indian Hound. People believe that this majestic dog to be the descendant of Kyrgys Taigan and Afghan Hound. They were brought by the Arabs, Persians, Pathans to India through the Kyber pass with history of more than 100 years (Theodore 2015). The literature about the population these dogs is scanty and is not recognized till date. Black is the most noticeable colour, however, fawn, grey, white and brown colours are also present. It is a sturdy animal that can support itself in desert locations and is least likely to contact diseases. Till date these dog population have not been properly documented and registered by government agencies. These dogs have been developed as per the well adaptation to particular environment. There is wide scope for this unique canine germplasm to be documented and registered at national level as distinct breed for conservation and genetic improvement of this dog population.

MATERIALS AND METHODS

The extensive survey was carried out in 29 villages of ten tehsils of Latur, Nanded and Parbhani district

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in Marathwada region of Maharashtra. The data of unrelated 207 Janwal Pashmi dogs has been collected which comprised of 105 males and 102 females. The data collection was classified into two age groups, i.e. below one year and above one year.

The morphological characters studied were colour of body, length of hairs, shape of head, colour of nostrils, colour of eyes and length of ears, etc, whereas, the morphometric characters studied were body weight (BW) in kg and body length (BL), height at wither (HW), chest girth (CG), paunch girth (PG), tail length (TL), head length (HL), height at base of tail (HBT), neck length (NL), neck girth (NG), ear length (EL), ear width (EW), eye width (EYW), hind foot length (HFL), upper hind leg length (UHLL), lower hind leg length (LHLL), fore foot length (FFL), upper fore leg length (UFLL) and lower fore leg length (LFLL) in centimetre. All body measurements traits were recorded using measuring tape and the measurements were taken in standing upright position on ground level.

As per National Bureau of Animal Genetic Resources, questionnaires and breed descriptor formats were prepared for farmers in local language to collect phenotypic and morphometric information of Janwal Pashmi dogs. The obtained body measurements data were compiled, tabulated and analyzed by using SPSS version 24 (2020) statistical package. Student's "t" test was carried out to find any significant difference in parameters under study.

RESULTS AND DISCUSSION

Phenotypic traits: The phenotypic traits studied were colour of body, length of hairs, shape of head, colour of nostrils, colour of eyes and length of ears etc, Studied morphological traits are presented in Table 1. It was observed that these dogs were predominantly black in colour (78.26%) followed by fawn (8.69%), grey (5.79%), brown (4.34%) and rarely white (2.89%) in colour. In most of the dogs the hair length was medium (51.20%) and long (43.47%). Very few dogs were observed with short hairs (5.31%). Feathery hairs were observed predominantly at ears, tail, head, shoulder, thigh and abdomen. This is the typical character of this dog. The thick hairs on their paws resemble paw shoes.

Straight head was observed in 69.56% of the dogs, while remaining were wedge shaped (30.43%). Nostrils were mostly black in colour (95.16%), however, the brown (3.86%) and pinkish (0.96%) are uncommon. Eyes were bright, shining and mostly dark brown (52.65%) and frequently noticed light brown (47.34%). Ears were long (54.58%), followed by medium (42.02%) and rarely small (3.38%) in length (Table 1).

In the survey of Raja *et al.* 2017 observed that Rajapalayam dogs were medium in size with compact body, tucked-up abdomen, white coat colour, pink skin, nostrils and eyelids, dropping ears, semi-curved tail and straight top line. Eyes were golden in colour and the nasal bridge was straight. Whereas, Karthickeyan *et al.* 2014 study observed that the predominant body colour of Chippiparai dog is

Table 1. Distribution of phenotypic traits in Janwal Pashmi dogs.

Trait	Morphological character	Number (207)	Percentage (%)
Colour of body	Black	162	78.26
	Fawn	18	8.69
	Grey	12	5.79
	Brown	9	4.34
	White	6	2.89
Length of hair	Short	11	5.31
	Medium	106	51.20
	Long	90	43.47
Shape of head	Straight	144	69.56
	Wedge	63	30.43
Colour of nostrils	Black	197	95.16
	Brown	8	3.86
	Pinkish	2	0.96
Colour of eyes	Light brown	98	47.34
	Dark brown	109	52.65
Length of ear	Small	7	3.38
	Medium	87	42.02
	Long	113	54.58

fawn and occasionally brown or grey coloured animals are also found. The skin is tight and grey in colour. Their coat is short and smooth. They have a conical shaped head which is fawn in colour with black nostrils, black eyes and light brown eye lashes. Occasionally some black eye lashed dogs are also observed. While, in Pashmi dog feathery hairs were observed predominantly at ears, tail, head, shoulder, thigh and abdomen. The thick hairs on their paws resemble paw shoes. This is the typical character of these dogs and was not commonly observed in other indigenous breeds of this region like Mudhol Hound. Thus, it was observed that Janwal Pashmi dog is totally different in all phenotypic parameters and maintained its own distinct feature (Fig.1).



Fig. 1. Janwal Pashmi dogs.

Morphometric traits: The morphometric traits studied were BW in kg and HW, BL, CG, PG, TL, HL, HBT, NL, NG, EL, EW, EYW, HFL, UHLL, LHLL, FFL, UFLL and LFLL in centimetre. The descriptive analysis of these traits is presented in Table 2.

Body weight: The pooled mean for body weight at different age groups, i.e. below 12 months, 13-24, 25-36 and 37 months and above were 18.14±1.15, 23.43±0.48, 25.67±0.63 and 28.24±0.66 (kg), respectively. The average body weight (kg) of adult Pashmi dogs (13 months and

Table 2. Descriptive analysis of various morphometric traits in male and female Pashmi dogs

Trait	Below 1 yr (Mean ± SE)		Overall mean	Above 1 yr (Mean ± SE)		Overall mean
	Female	Male		Female	Male	
Weight (kg)	16.00±1.44	20.66±1.60	18.14±1.15*	24.46±0.49	26.75±0.52	25.63±0.36**
HW	59.46±1.25	64.55±1.40	61.79±1.05*	66.02±0.39	68.89±0.37	67.50±0.29**
BL	42.54±1.29	43.82±1.04	43.13±0.84	46.84±0.42	48.89±0.51	47.90±0.34**
CG	58.07±1.61	60.59±1.55	59.22±0.27	65.76±0.64	68.47±0.55	67.15±0.43**
PG	44.00±1.44	45.55±1.21	44.71±0.95	46.02±0.76	47.14±0.65	46.60±0.50
TL	45.00±1.61	48.00±0.67	46.38±0.96	45.91±0.84	48.04±0.59	47.00±0.51*
HL	21.00±0.48	21.57±0.37	21.26±0.31	21.94±0.06	22.78±0.16	22.37±0.09**
HBT	60.38±1.45	64.82±1.32	62.42±1.07*	66.60±0.41	69.16±0.39	67.91±0.29**
NL	19.26±0.36	20.54±0.28	19.85±0.26*	19.54±0.20	20.72±0.23	20.15±0.16**
NG	29.62±0.51	30.45±0.86	30.00±0.48	35.58±0.36	37.30±0.33	36.46±0.25**
EL	13.08±0.48	14.00±0.50	13.50±0.35	13.60±0.20	14.15±0.19	13.89±0.14
EW	7.23±0.12	7.27±0.14	7.25±0.09	7.36±0.06	7.50±0.06	7.43±0.04
EYW	4.96±0.02	5.01±0.01	4.99±0.01	5.02±0.01	5.04±0.00	5.03±0.00
HFL	18.92±0.41	19.55±0.28	19.21±0.26	18.97±0.15	20.05±0.15	19.53±0.11**
UHLL	27.62±0.40	29.00±0.50	28.25±0.34*	28.25±0.43	30.11±0.37	29.20±0.29**
LHLL	26.38±0.33	27.18±0.44	26.75±0.27	26.94±0.37	28.19±0.34	27.58±0.25*
FFL	14.77±0.42	14.91±0.45	14.83±0.30	15.69±0.17	16.51±0.16	16.11±0.12**
UFLL	20.54±0.40	21.73±0.38	21.08±0.30*	22.46±0.20	23.79±0.21	23.14±0.15**
LFLL	22.31±0.20	22.55±0.41	22.42±0.21	23.40±0.21	23.76±0.20	23.58±0.14

**Highly significant at 1% level; *Significant at 5% level; HW, Height at withers; BL, Body length; CG, Chest girth; PG, Paunch girth; BW, Body weight; HBT, Height at base of tail; EYW, Eye width; SL, Snout length; EL, Ear length; EW, Ear width; NL, Neck length; NG, Neck girth; HFL, Hind foot length; LHLL, Lower hind leg length; UHLL, Upper hind leg length; TL, Tail length, FFL, Fore foot length; LFLL, Lower fore leg length; UFLL, Upper fore leg length.

above) were 26.75±0.52, 24.46±0.49 and 25.63±0.36 (kg) for male, female and pooled of Pashmi dogs, respectively. The higher body weight in male dogs than female Pashmi dogs were observed by Sechi *et al.* (2017), Raja *et al.* (2017), Liotta *et al.* (2021) and Kirmizibayrak (2004). The mean adult body weight of male (38.70±0.80 kg) and female (32.25±0.61 kg) Gaddi dogs reported by Sankhyan *et al.* (2022) and male (35.3±0.47 kg) and female (30.9±0.38 kg) Kars dogs reported by Kirmizibayrak (2004) were larger than mean adult Janwal Pashmi dogs. While, the mean adult body weights in male and female Rajapalayam dog (24.69±0.43 and 21.42±0.47 kg), Turkish Tazi dogs (18.4±0.19 kg), Caravan dogs (18.60±0.17 and 17.65±0.18 kg) and Kanni dogs (24 kg) (kannidogs.blogspot.com) observed by Raja *et al.* (2017), Yilmaz and Ertugrul (2011) and Devale *et al.* (2023), respectively which was lesser than Pashmi dogs of the present study. As per the classification of hounds, Janwal Pashmi dog breed comes under the category of mid-size hounds with 51 to 70 cm of height at wither and a body weight between 20 to 40 kg (Yilmaz *et al.* 2007). The higher overall body weight in case of Pashmi dog as compared to other indigenous dog may be due to its compact and dense bone structure and also these dogs were responsible for high-speed endurance for hunting and chasing which was the main purpose of rearing these dogs (Karthickeyan *et al.* 2014).

Height at wither: The overall mean for height of wither were 61.79±1.05 cm and 67.50±0.29 cm in case of puppies and adult dogs, respectively. The males of the puppies

(64.55±1.05 cm) and adults (68.89±0.37 cm) were found to be having more height at wither as compare to the female puppies (59.46±1.25 cm) and adult females (66.02±0.39 cm). The height at wither in the present study is higher than Caravan dogs (67.64±0.27 and 64.99±0.27 cm), Chippiparai dog (63.0±1.25 and 56.30±2.00 cm) followed by Kanni dog (59.86±0.93 cm) and Rajapalayam dog (63.10±0.91 and 58.91±0.57 cm) as reported by Devale *et al.* 2023, Karthickeyan *et al.* 2015, Ravimurugan *et al.* (2014) and Raja *et al.* (2017), respectively. However, Devale *et al.* (2023) reported that the more height at wither is helpful for Caravan dogs to achieve more speed with long jumps while running and chasing.

Body length: There was not much difference in the body length of the male (43.82±1.40 cm) and female (42.54±1.29 cm) puppies however, the adult males (48.89±0.51 cm) were slightly longer than the females (46.84±0.42 cm). The body length observed in the present study was found to be much lower than male and female of other breeds like Caravan dog, Chippiparai dog and Rajapalayam dogs (54.09±0.26 and 52.42±0.23 and 52.42±0.23 cm, 63.90±1.60 and 58.08±1.95 cm and 58.95±0.49 and 55.95±0.65 cm, respectively) as reported by Devale *et al.* (2023), Karthickeyan *et al.* (2015) and Raja *et al.* (2014). In this case, all dogs body length was greater than the height at withers, which is typical characteristics of hound type dogs of both sexes (Drobnjak *et al.* 2012).

Chest girth and paunch girth: The chest girth of the males (68.47±0.55 cm) was found to be more than the female

(65.76±0.64 cm), whereas there was little difference in the paunch girth of the males (47.14±0.65 cm) and females (46.02±0.76 cm) in both the age groups. The average chest girth in puppies and adult dogs were 59.22±0.27 cm and 67.15±0.43 cm, whereas, the paunch girth varies from 44.71±0.95 to 46.60±0.50 cm, respectively. The similar findings for overall chest girth were reported by Devale *et al.* 2023 (67.50±0.22 cm) while the overall paunch girth recorded in the present study (47.63±0.44 cm) is more as compare to 44.65±0.25 cm in Caravan dogs. However, the paunch girth observed in male and female Janwal Pashmi dogs in present study was more than Chippiparai dog, i.e. 40.95 and 37.75 cm (Karthickeyan *et al.* 2015). The paunch girth is less than chest girth indicates that they have a trucked-up abdomen. The mean belly girth as well as chest girth indicates that it could be classified under hound type of dogs. It was reported that in sight hound anatomy, the chest is deeper and the abdomen is narrower than in other dog breeds (Yilmaz and Ertugrul 2011). It is normally accepted that the chest and abdomen depth are very important traits to evaluate speed of sight hound. Secondly, speed factor in sight hound depends on strength of its hind legs (Yilmaz and Ertugrul 2011). Therefore, Janwal Pashmi dogs with deep chest, narrow abdomen and strong legs can be considered as a sight hound.

Length of tail: The length of tail was slightly more than the female in puppies as well as adult dogs. Similarly, the overall mean for tail length in male dogs (45.00±1.61 cm) was also slightly more than the overall mean of female dogs (48.00±0.67 cm). The tail length observed in male and female Janwal Pashmi dog (48.04±0.59 and 45.91±0.84 cm) in present study is found to be higher than tail length observed in Caravan dog (46.90 and 45.50 cm), Chippiparai dog (42.47 and 38.2 cm), Kanni dog (39.20 and 38.23 cm) and Rajapalayam dog (35.55 and 33.83 cm) reported by Devale *et al.*, (2023), Karthickeyan *et al.* (2015), Ravimurugan *et al.* (2014) and Raja *et al.* (2014), respectively. Long tail length in the Janwal Pashmi dogs indicates good hounding behaviour than other indigenous dog breeds. A unique feature of Pashmi dog is a rolled-up ring at the end of its tail. It is actually the jointed vertebrae of the ring that do not make it unrollable.

Length of head: As far as the head length is concerned there was no sex wise difference observed in both the age groups. The head length observed in male and female Janwal Pashmi dog (22.78±0.16 and 21.94±0.06 cm) in present study is found to be higher than head length observed in Chippiparai dog (22.21 and 19.85 cm), Rajapalayam dog (21.30 and 19.41 cm) and Fino of Tonya (Kobi) dog (21 and 19.9 cm) dog reported by Karthickeyan *et al.*, (2015), RAJA *et al.* (2017) and Yilmaz *et al.* (2011), respectively.

Height at base of tail: Overall average height at base of tail was found to be significantly higher in adult male than adult female Janwal Pashmi dogs. The height at base of tail observed in male (69.16±0.39 cm) and female (66.60±0.41 cm) Janwal Pashmi dog in present study is found to be higher than height at base of tail in Caravan dog

(68.60 and 65.23 cm), Chippiparai dog (62.41 and 57.35 cm) and Rajapalayam (61.55 and 57.65 cm) reported by Karthickeyan *et al.* (2015), Ravimurugan *et al.*, (2014) and Raja *et al.* (2014), respectively. The similar criteria were also observed in case of height at base of tail. The more height at wither and height at base of tail are criteria for judging the speed and endurance in dogs and also induces long jumps while running (Devale *et al.* 2023).

Neck length and neck girth: There was small difference in the length of neck. The males have slightly longer neck length than the females. The overall neck length in of puppies and adults were 19.85±0.26 and 20.15±0.16 cm, whereas the neck girth was 30.00±0.48 and 36.46±0.25 cm, respectively. The more neck length was reported by Devale *et al.* (2023) in Caravan dog (23.52 and 22.84 cm) while the lower neck length was reported in Rajapalayam dog (18.40 and 17.53 cm) by Raja *et al.* (2017). Devale *et al.* (2023) reported the neck girth of 36.66±0.14 and 35.57±0.19 cm in adult males and females caravan dogs, respectively. The moderately long neck and thick neck girth contributes for the fast running and chasing ability in Janwal Pashmi dogs.

Ear length and ear width: There is no significant difference in the ear length and ear width in puppies and adult dogs. The mean for ear length of male and female adult dogs were found to be 14.15±0.19 and 13.60±0.20 cm which is more than Caravan dog (12.76 and 12.61 cm), Chippiparai dog (11.56 and 10.40 cm) and Rajapalayam dog (11.33 and 10.52 cm) as reported by Devale *et al.* (2023), Kartikeyan *et al.* (2015) and Raja *et al.* (2014), respectively. The overall mean for ear width in male and female adult dogs were found to be 7.50±0.06 and 7.36±0.06 cm which is slightly more than in Caravan dogs (7.05 cm for both) reported by Devale *et al.* (2023). It is observed that the ear length and ear width in Pashmi dogs is higher than the other indigenous dog breeds.

Eye width: The values for eye width for female, male and overall, for the puppies were 4.96±0.02, 5.01±0.01 and 4.99±0.01 cm while for adult dogs 5.02±0.01, 5.04±0.00 and 5.03±0.00 cm, respectively. Devale *et al.* reported the more eye width in male, female and overall, in puppies (5.00±0.00, 5.01±0.01 and 5.02±0.02 cm). While for adult dogs there was no significant difference observed (5.01±0.01, 5.00±0.01 and 5.00±0.01 cm) in eye width of both the dogs.

Hind foot length (HFL) and fore foot length (FFL): There was no sex wise difference in hind foot length in male (19.55±0.28 cm) and female (18.92±0.41 cm) puppies but in adult dogs the hind foot length in male (20.05±0.15 cm) was found to be more than female (18.97±0.15 cm). The overall HFL of adult male and female was more than adult males (19.20±0.10 cm) and females (18.69±0.10 cm) of caravan dogs (Devale *et al.* 2022). The similar criteria were also observed for FFL. The overall FFL of adult male (16.51±0.16 cm) and female (15.69±0.17 cm) was more than adult males (14.98±0.15 cm) and females (15.69±0.17 cm) of caravan dogs (Devale *et al.* 2022).

Upper hind leg length (UHLL) and lower hind leg

length (LHLL): The result for UHLL and LHLL reported by Devale *et al.* in Caravan dogs were also observed contradictory. The overall mean of these results in adult male and female for UHLL (30.11 ± 0.37 and 28.25 ± 0.43 cm) and LHLL (28.19 ± 0.34 and 26.94 ± 0.37 cm) were observed contradictory for overall mean of male and female for UHLL (21.17 ± 0.13 and 21.10 ± 0.15 cm) and LHLL (24.62 ± 0.16 and 24.48 ± 0.16 cm) reported by Devale *et al.* 2023 in Caravan dogs. All the parameters of hind leg were higher than that of the fore leg. Therefore, it indicates that this dog can run faster which is one of the characters of guard dogs.

Upper front leg length (UFLL) and lower front leg length (LFLL): The similar pattern of measurement is also observed for UHLL and LHLL. It was observed that the male dogs of puppies as well as adults were having more UFLL and LFLL as compare to female dogs. The overall mean of these results in male and female for UFLL (23.79 ± 0.21 and 22.46 ± 0.20 cm) and LFLL (23.76 ± 0.20 and 23.40 ± 0.21 cm) were observed contradictory for overall mean of male and female for UFLL (19.36 ± 0.12 and 19.47 ± 0.15 cm) and LFLL (22.66 ± 0.16 and 22.65 ± 0.15 cm) reported by Devale *et al.* (2023) in Caravan dogs. All the parameters of hind legs were higher than that of the fore leg which indicates that this dog can run faster which is one of the characters of guard dogs (Raja *et al.* 2017).

Janwal Pashmi dog is the medium sized, muscular, massive wedge-shaped head with a tapering muzzle, predominantly black in colour with black nostrils, light brown to dark brown eyes colour, with deep chest, trucked-up abdomen and a rolled-up ring at the end of its tail. Their ears and tails are heavily feathered, thick hairs on their paws resembles winter shoe appearance, a soft hairy body coat and strong bone structure helping them in working in rough terrain. Study indicates, Janwal Pashmi dog is phenotypically different from other dogs and thus may be considered for registration as a distinct dog breed of India.

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