



**URINARY SYSTEM OF MIZO LOCAL PIG (ZOVAWK): A GROSS  
MORPHOLOGICAL AND MORPHOMETRICAL STUDY**

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**ABSTRACT**

The morphology and morphometry of the urinary system was conducted on each of six adult Mizo local pigs of either sex. The adult body weight of the animals was recorded between 27.0 to 38.0 Kg. The kidneys of Mizo local pigs were brown coloured, smooth surfaced and bean-shaped. They were flattened dorsoventrally, elongated with slightly pointed poles. The left kidney was located little cranial than the right one. The cranial extremity of the right kidney had no contact with the liver. The renal pelvis was funnel shaped and divided into cranial and caudal major calyces. The major calyces give off eight to twelve numbers of minor calyces. Each of the minor calyx contained a

renal papilla. The renal pyramids were distinct and renal columns were present between the pyramids. The length of the ureter was slightly longer in the left side than the right in both male and female animals. The urinary bladder of Zovawk was large and oval shaped in empty condition. The caudal part of the female urethra was fused with the vagina and produced a corresponding elevation of the floor of the vagina. The male urethra was divided into pelvic and penile parts.

**KEY WORDS:** Urinary system, Morphology, Morphometry, Mizo local pig, Zovawk.

## INTRODUCTION

Mizo local pig or Zovawk is an indigenous non-descript pig of Mizoram, India. The size of the animal is small and adult body weight of male is approximately 27.0 to 38.0 Kg. The population of this pig is decreasing day by day because of lack of scientific breeding practice. However, scientific breeding practice of doom variety pig of Assam has started recently in National Research Centre on Pig, Assam, India. Morphology and morphometry of the urinary system especially the kidney play crucial role for solving many problems in human medicine. In the past, many authors studied the anatomical structure of the kidneys in different animals. [1-4] Today, it is believed that the pig kidney could be a suitable model for urological procedures because their anatomy and physiology resemble with human kidneys. [5,6] There is paucity of literature regarding the morphological and morphometrical data of urinary systems of Zovawk. Hence this study was planned to generate information on this aspect in adult Mizo local pigs.

## MATERIALS AND METHODS

The Mizo local pigs are reared in semi intensive system in the pig farm of the College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India, following the standard management procedures. Adequate feed, drinking water and health care are provided to the animals. Excess numbers of animals than the parent stock are slaughtered by using captive bolt pistol for commercial purpose. The present investigation was conducted on urinary organs collected from twelve adult (1 to 1½ years of age), apparently healthy Mizo local pigs of either sex, slaughtered in the college pig farm. The external morphological data of these animals were recorded before slaughtering. The organs were then collected and washed properly as per the method of Habel. [7] Biometry was done using a caliper divided in millimeters, monopan electronic balance, measuring tape and scale. [8, 9] The gross weight of the kidneys was obtained separately for right and left, using a precision scale. The data of the present investigation was analyzed by standard statistical procedure as described by Snedecor and Cochran [10] and by using SYSTAT Version 6.0.1., 1996 SPSS INC software.

## RESULTS AND DISCUSSION

The kidneys of Mizo local pigs were brown coloured, smooth surfaced and bean-shaped (Fig. 1,2,3) as recorded in common large breed of pigs, [3, 4] Sarma *et al.* [11] in dum pig of Assam and Sarma *et al.* [12] in leopard. They were flattened dorsoventrally, elongated with slightly

pointed poles (Fig. 3) under study. The surface lobation of the kidneys of Zovawk was not observed as occasionally recorded in common large breed of pig<sup>[4]</sup> and Sarma *et al.*<sup>[11]</sup> in dum pig of Assam. The length of the kidney of Mizo local pig was slightly more than the width. However, Getty<sup>[3]</sup> revealed that the length was about twice the width. In the present investigation the kidneys were placed symmetrically ventral to the transverse processes of the first four lumbar vertebrae. However, the left kidney was located little cranial than the right one. The cranial extremity of the right kidney had no contact with the liver. A well developed capsule with perirenal fat (Fig. 2) was observed in the kidneys of Mizo local pig. The biometrical values (Table 1) in respect of length, width, thickness and weight were varied from 6.85 to 9.0 cm, 3.60 to 5.0 cm, 2.20 to 3.12 cm and 42.0 to 90.0 gm, respectively. The present biometrical values (Table 1) were almost similar to the findings of Sarma *et al.*<sup>[11]</sup> in dum pig of Assam. However, the present values were lower than the common large breed of pigs.<sup>[3, 4]</sup> The variations might be due to the variation in breed and size of the animal. The biometrical values of kidney in the present investigation were found slightly higher in right side than the left (Table 1). However, these differences were not statistically significant.

The hilus of the kidneys of Zovawk was about in the middle of the medial border as also revealed in sheep<sup>[13]</sup>, goat<sup>[3]</sup> and dog.<sup>[4]</sup> The renal parenchyma of the kidney was divided into outer paler cortex and inner medulla (Fig. 4). The renal pelvis was funnel shaped and divided into cranial and caudal major calyces (Fig. 4). The major calyces give off eight to twelve numbers of minor calyces (Fig. 4). Each of the minor calyx contained a renal papilla (Fig. 4). Some of the renal papillae were narrow and conical, and correspond to a single pyramid (Fig. 4) whereas others were wide and flattened because of the fusion of two or more pyramids (Fig. 4). The renal pyramids were distinct and renal columns were present between the pyramids (Fig. 4). These findings of the present investigation were in accordance with the findings of Getty<sup>[3]</sup>, Nickel *et al.*<sup>[4]</sup> and Sarma *et al.*<sup>[11]</sup> in different breeds of pig.

In the present investigation the biometrical values of the ureter are presented in Table 1. The ureters left the kidney at the hilus, turned caudally and joined with the neck of the urinary bladder (Fig. 1, 2). The width of the ureter was gradually diminished. The biometrical values in regards to length, width and thickness varied from 20.0 to 24.50 cm, 0.45 to 0.90 cm and 0.29 to 0.49 cm in female and 21.50 to 24.50 cm, 0.47 to 0.90 cm and 0.32 to 0.50 cm in male, respectively. The length of the ureter was slightly longer in the left side than the right in both male and female animals under study. However, these differences were not

statistically significant. The biometrical values of the ureter in the present investigation could not be compared due to lack of available literature.

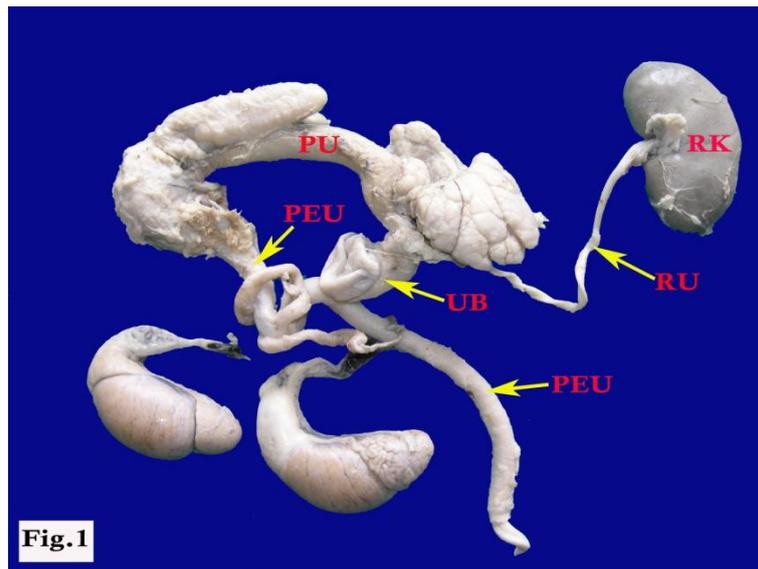
The urinary bladder of Zovawk was large and oval shaped in empty condition (Fig. 1). The dorsal surface was almost completely covered with peritoneum as also recorded by Getty<sup>[3]</sup> and Nickel *et al.*<sup>[4]</sup> The biometrical values (Table 1) in respect of length, width and thickness of urinary bladder varied between 4.13 to 4.52 cm, 2.48 to 2.72 cm and 0.37 to 0.47 cm, respectively.

The female urethra of Mizo local pig was 6.57 to 7.17 cm in length and 0.67 to 0.73 cm in diameter. Its caudal part was fused with the vagina and produced a corresponding elevation of the floor of the vagina.

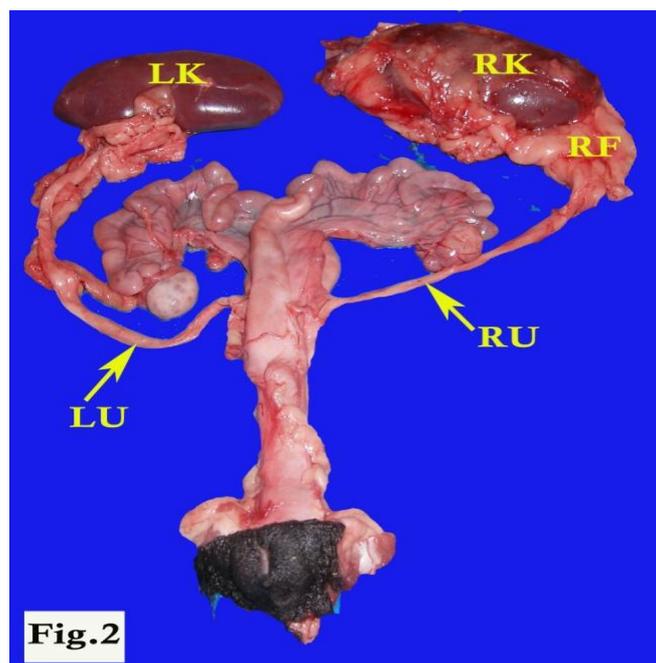
The male urethra of Zovawk was divided into pelvic and penile parts (Fig.1). The length of the pelvic urethra varied in between 9.50 to 13.50 cm under study. It was covered by a thick urethralis muscle ventro-laterally. The dorsal part was covered by dense fibrous tissue. The penile part of the urethra was surrounded by erectile tissue. The length of the penile urethra was recorded in between 23.10 to 27.0 cm in the present investigation. These present findings were in accordance with the findings of Getty<sup>[3]</sup> and Nickel *et al.*<sup>[4]</sup> in common large breed pigs except the length of the urethra. It was recorded lower value in the present study might be due to smaller body size of Mizo local pig.

**Table 1: Biometry (Mean  $\pm$  SE) of organs of urinary system of adult Mizo local pig**

Organ	Side	Length (cm)	Width (cm)	Thickness (cm)	Weight (gm)
Kidney	Overall	8.09 $\pm$ 0.11	4.30 $\pm$ 0.07	2.56 $\pm$ 0.04	65.63 $\pm$ 2.45
	Right	8.25 $\pm$ 0.14	4.41 $\pm$ 0.11	2.58 $\pm$ 0.05	67.42 $\pm$ 3.50
	Left	7.93 $\pm$ 0.15	4.20 $\pm$ 0.08	2.55 $\pm$ 0.07	63.83 $\pm$ 3.50
Ureter (Male)	Overall	22.71 $\pm$ 0.28	0.67 $\pm$ 0.04	0.40 $\pm$ 0.02	-
	Right	22.54 $\pm$ 0.40	0.67 $\pm$ 0.06	0.40 $\pm$ 0.02	-
	Left	22.88 $\pm$ 0.39	0.67 $\pm$ 0.06	0.40 $\pm$ 0.02	-
Ureter (Female)	Overall	22.39 $\pm$ 0.38	0.66 $\pm$ 0.04	0.39 $\pm$ 0.02	-
	Right	22.04 $\pm$ 0.61	0.66 $\pm$ 0.06	0.39 $\pm$ 0.02	-
	Left	22.73 $\pm$ 0.40	0.66 $\pm$ 0.06	0.39 $\pm$ 0.03	-
Urinary bladder	-	4.35 $\pm$ 0.04	2.60 $\pm$ 0.03	0.43 $\pm$ 0.01	-
Pelvic urethra (Male)	-	11.58 $\pm$ 0.65	-	-	-
Penile urethra (Male)	-	25.35 $\pm$ 0.58	-	-	-
Female Urethra	-	6.81 $\pm$ 0.10	-	-	-



**Fig. 1:** Photograph showing right kidney (RK), right ureter (RU), urinary bladder (UB), pelvic urethra (PU) and penile urethra (PEU) in male urogenital system of Mizo local pig.



**Fig. 2:** Photograph showing right kidney (RK), left kidney (LK), right ureter (RU) and left ureter (LU) in female urogenital system of Mizo local pig.

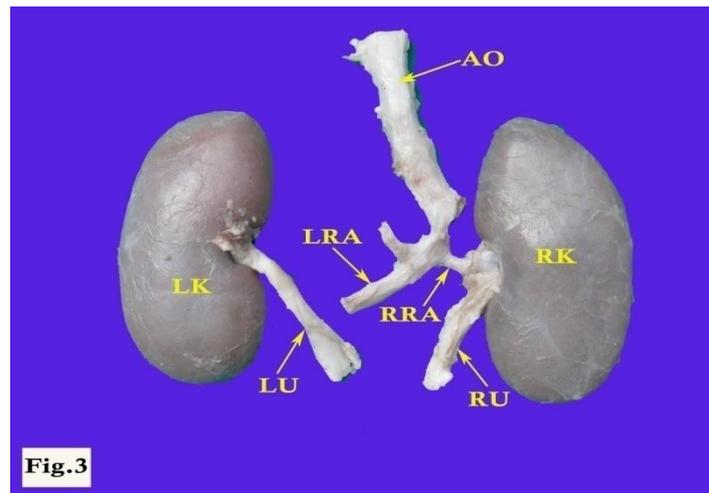


Fig.3

**Fig. 3:** Photograph showing right kidney (RK), left kidney (LK), right ureter (RU), left ureter (LU) aorta (AO), right renal artery (RRA) and left renal artery (LRA) in Mizo local pig.

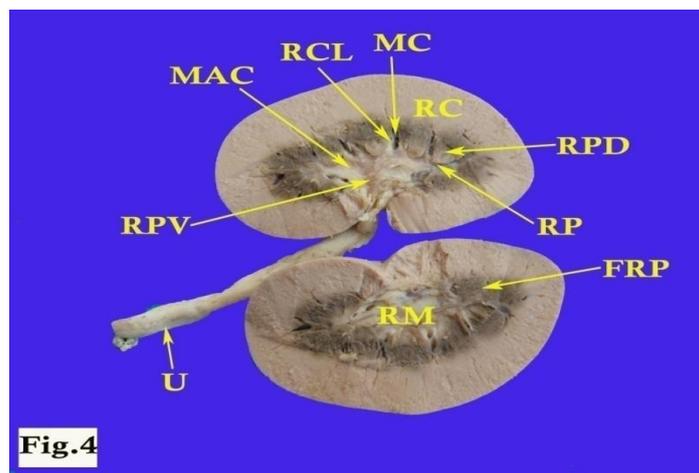


Fig.4

**Fig. 4:** Photograph showing renal cortex (RC), renal medulla (RM), renal papilla (RP), renal pyramid (RPD), renal pelvis (RPV), renal column (RCL), major calyx (MAC), minor calyx (MC), fused renal pyramid (FRP) and ureter (U) in Mizo local pig.

## CONCLUSION

The morphology and morphometry of the urinary system was conducted on each of six adult Mizo local pigs of either sex. The adult body weight of the animals was recorded between 27.0 to 38.0 Kg. The kidneys of Mizo local pigs were brown coloured, smooth surfaced and bean-shaped. They were flattened dorsoventrally, elongated with slightly pointed poles. The left kidney was located little cranial than the right one. The cranial extremity of the right kidney had no contact with the liver. The renal pelvis was funnel shaped and divided into cranial and caudal major calyces. The major calyces give off eight to twelve numbers of

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