

Original article

Medulla of kidney – A Postmortem Grossmorphological Study in Bangladeshi People

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Background:

In Bangladesh prevalence of kidney diseases is increasing day by day and it was observed that renal medulla is affected less in earlier period of life but in late period it becomes affected more. Moreover renal mass changes with age which affecting the medullary mass and consequently the number of medullary pyramids. So the present study was carried out to evaluate anatomical features of medulla and to count the medullary pyramids with age related changes in the number of the pyramids in Bangladeshi people. **Study type:** Cross sectional analytical type of study. **Place and period of study:** Department of Anatomy, Mymensingh Medical College, Mymensingh, Bangladesh from January 2004 to June 2005. **Materials and methods:** A total of 70 fresh human kidneys of both sexes and sides were collected from the morgue of Mymensingh Medical College at postmortem. The selected cases were between 5 to 60 years of age. The samples were divided into 3 different age groups (A: 05-15 years, B: 16-35 years, C: 36- 60 years) to observe the variations in number of medullary pyramid of kidney in different age groups. **Results:** Among three groups, highly significant (<0.001) differences were found statistically in the number of medullary pyramid. **Conclusion:** There were changes in the number of medullary pyramid of kidney in different age groups.

Keywords: Kidney, Postmortem, Grossmorphology, Medulla.

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Introduction:

The kidneys maintain the balance of sodium and water in blood plasma, they also excrete toxic wastes¹. On coronal section the kidney presents two parts-outer renal substance and inner renal sinus². Renal substance consists of outer cortex and inner medulla. Cortex is granular in appearance and medulla presents renal pyramids which are conical masses³⁻⁸. Cortex which contains the glomeruli and the convoluted tubules can be distinguished from the medullary pyramids which has the loops of Henle, collecting ducts and collecting tubules^{5,9}. In apex of pyramid 16-20 ducts of Bellini open. The apices of several pyramids open together into a renal papilla,

each of which projects into a minor calyx^{6,8}. Although the kidneys constitute 0.5% of the total body mass, they receive about 25% of the cardiac output. This richness of blood supply also makes the kidneys susceptible to toxic injuries by drugs and toxins. Of the amount of blood going to each kidney, 90% or more is distributed to the cortical area¹⁰. Thus the exposure to circulating toxic substance, culminating in loss of renal cells is greater for the cortex than medulla¹⁰⁻¹². Renal mass increases from about 50gm at birth to more than 400gm during the third and fourth decades¹³ and it decreases approximately one fifth of it between fourth to eighth decade of life. An increase in interstitial fibrosis may conceal some

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of the loss of substance. After the seventh decade, interstitial fibrosis becomes particularly pronounced in the medulla¹².

Available articles are the evidences that human kidney has been widely studied in different races by various investigators. By studying kidney of different age groups, it is found that there are considerable structural and functional changes. These studies show normal growth process as well as degenerative changes after certain age¹⁰⁻¹³. But regarding medullary pyramid, very few research works have been performed on kidneys collected from Bangladesh. So this study was intended to evaluate the number of medullary pyramid of kidney with changes of it in relation to age.

Materials and Methods:

The present study was performed on 70 kidneys of both sexes and sides in the Department of Anatomy of Mymensingh Medical College. The samples were collected from unclaimed fresh dead bodies that underwent routine postmortem examination in the morgue of the Department of Forensic Medicine, Mymensingh Medical College, Mymensingh from January 2004 to June 2005 due to accidental and unnatural death. Mymensingh is one of the largest districts in Bangladesh. Here people, who were migrated from all over Bangladesh live for various purposes. From this corner of views, the study of 70 samples of kidneys collected from Mymensingh can be taken into consideration that it might represent the status of 2

kidneys of whole Bangladeshi people. Moreover it is hardly possible to study the kidneys collected from the morgues of all over Bangladesh within the limited time during thesis period. The Kidneys of decomposed bodies, poisoned cases, kidneys with gross anatomical anomalies and known cause of renal death were excluded. The collected samples were divided into three age groups (Table-I). The samples preserved in 10% formol saline were washed to avoid irritation of the eyes and nasal mucosa. Then the samples were taken in metallic tray and the surrounding fat and other unwanted structures were removed carefully. After these by a sharp knife, coronal section of kidney was done through the lateral border to the hilum passing from upper to lower pole. Then medulla of the kidney was observed. After gross dissection mentioned above, the number of medullary pyramid in each half of the kidney was counted and noted¹⁴.

Table-I: Distribution of the study samples in different age groups.

Group	Age in years	Number of samples (%)
A	05-15	07 (10%)
B	16-35	42 (60%)
C	36-60	21 (30%)
Total	05-60	70 (100%)

Results:

Out of total 70 study samples the average number of medullary pyramid was approximately 9. The highest mean number of pyramids was found in group B. Highly significant (<0.001) differences were found in the number of medullary pyramid between groups as well as among groups when analyzed statistically (Table IIa and Table IIb).

Table-IIa: Number of medullary pyramids of kidney in different age groups.

Group	Number of Medullary pyramid Range	Number of medullary pyramid Mean ± SD
A	5-8	6.28±1.10
B	9-14	11.26±1.57
C	7-10	9.14±1.10
Total	5-14	8.89± 1.26

Table-IIb: Statistical analysis of table IIa

Group	Number of medullary pyramid	
	P value	Inference
A vs B	<0.001	HS
B vs C	<0.001	HS
C vs A	<0.001	HS

Discussion:

Snell⁴, Junqueira¹⁵, Ross¹⁶, Inke¹⁷ found medullary pyramids 12,8-15,8-18,4-19 respectively. In this study, number of medullary pyramids ranged from 5 to 14 which is considerably lower than the findings reported by the investigators mentioned above. This may be due to the higher body weight as well as greater body surface area of western people and the kidney mass being more dependent on the individual's body built¹⁸. For this reason, in the present study number of medullary pyramids was dissimilar to that of kidney of western people. However the

present study is consistent with the findings of the Sultana¹⁴ & Alam¹⁹ and Mullick²⁰, who found medullary pyramids 4-16, 5-14 and 6-14 respectively. In this study group B presented maximum number of medullary pyramids where as group A showed the minimum. These findings indicate that the pick number of medullary pyramids is confined to middle age (upto 35 years) group and the smaller number of medullary pyramid being observed at younger (upto 15 years) as well as elderly (upto 60 years) age groups. This is supported by the reports of Sultana¹⁴ & Alam¹⁹ that the kidney mass increases with increasing age upto 35 years and gradually decreases along with the increase of age particularly after 40 years, which may be a reflection of senile changes of the kidney and this was also correlated with the find-

ings reported by Maclachlan¹². Renal mass increases from about 50 gm at birth to more than 400 gm during the third and fourth decades¹³. So in our study, presenting lowest number of medullary pyramid at younger age group could be explained by the relation of kidney mass to one's body built; with smaller individuals having generally small kidney mass than larger individuals¹⁸.

In this study number of medullary pyramid of the kidney in relation to various age groups was established as well as changes of it among the age groups had been marked. The cause of increase or decrease of the number of medullary pyramid at different periods of life might be related to the increase or decrease in body surface area as well as renal mass with age.

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