RESULTS

R E S U L T S

Stainability of Adrenomedullary Cells :

I. Ammoniacal silver nitrate intensification method :

This method showed the medullary tissue to be formed of several types of cells (Fig. 3).

The majority of them were of the adrenaline type which appeared brownish in colour with few granules, they were aggregated into large irregulargroups seperated by blood sinusoids.

The noradrenaline cells, which acquired black colour with coarsely granular cytoplasm, appeared as scattered closely packed islets inbetween the groups of adrenaline cells.

Nerve cells together with scattered pale cortical cells were scarcely met with inbetween the medullary chromaffin cells especially at the periphery of the medulla.

II. Fontana - Masson method :

The results of double fixation in potassium dichromate and potassium chromate, followed by formalin, then impregnated with silver nitrate and stained with nuclear

Fig. (3) : Section in adrenal gland of rat showing adrenaline and noradrenaline cells in medulla. Ammoniacal silver nitrate method. (X 95).

fast red shows the adrenaline cells coloured dark brown while the noradrenaline cells were yellowish brown in colour with red nuclei, but as the stain fades away rapidly, we can differentiate the cortex from medulla as shown in (Fig. 4), but we cannot differentiate the two types of adrenomedullary cells.

III. Wood's stain :

The sections which were stained with buffered eosin yellow - aniline blue after being fixed in buffered potassium dichromate with formaldehyde for twenty four hours, presented the chromaffin cells in different colouration (Fig. 5).

The adrenaline secreting cells were brownish to purple in colour, with a granular cytoplasm and with their eccentric nuclei blue to deep purple in colour.

The noradrenaline cells were smaller in size with a yellowish granular cytoplasm and with blue nuclei.

Quantitative determination of the two chromaffin adrenomedullary cells :

Lack of differentiation between the two chromaffin cells in the young ages of one week (Fig. 6) and one month

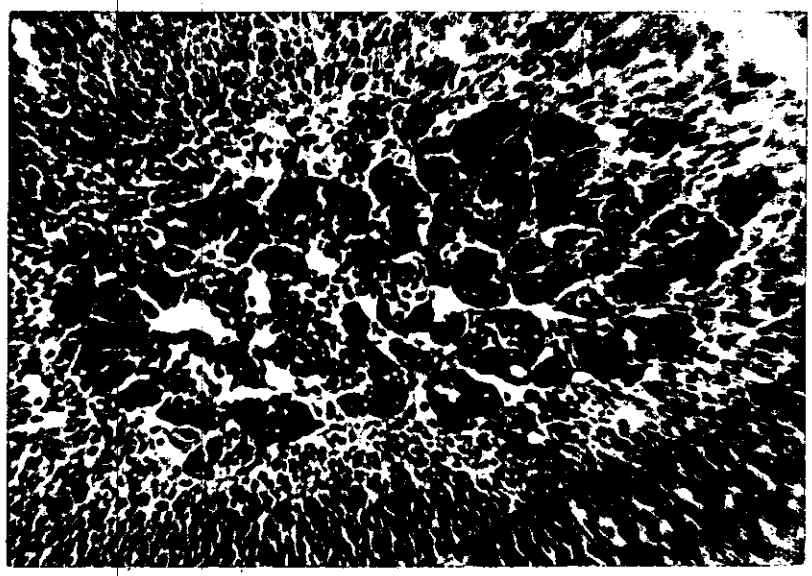


Fig. (4) : Section in adrenal gland of rat showing good differentiation of cortex from medulla but no differentiation between medullary cells. Fontana-Masson method. (X 90).

Fig. (5) : Section in adrenal gland of rat showing adrenaline and noradrenaline cells in medulla. Wood's stain. (X 420).

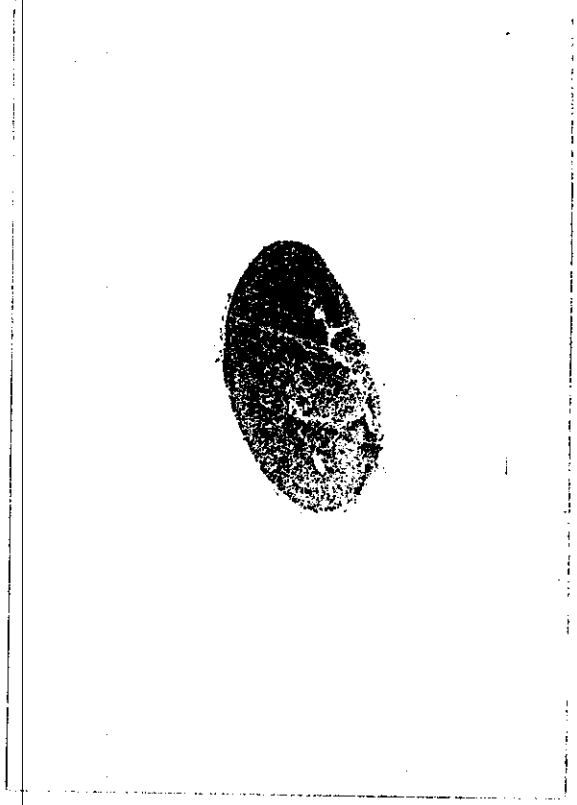


Fig. (6) : Section in adrenal gland of rat aged one week, showing no differentiation between cortex and medulla nor between medullary cells. (X 35).

(Fig. 7), made the differential counting at such ages impossible to be performed.

Planimetric measurements :

1. Rats aged one month :

The differentiation between the cortex and medulla (Fig. 7) enabled us to measure the adrenal medullary volume at this age.

The planimetric measurements of adrenal medullae of the studied ten female rats aged one month, showed that their volumes ranged from 0.074 mm^3 to 0.171 mm^3 with a mean of 0.109 mm^3 (SD ± 0.009 SE ± 0.003).

While the corresponding volumes in the studied five male rats of the same age group ranged from 0.086 mm^3 to 0.131 mm^3 with a mean of 0.106 mm^3. (SD ± 0.017 SE ± 0.008) as presented in(Table 1).

However the apparent decrease of male medullary volume than female ones of the same age group proved to be statistically non significant (P = 0.05).

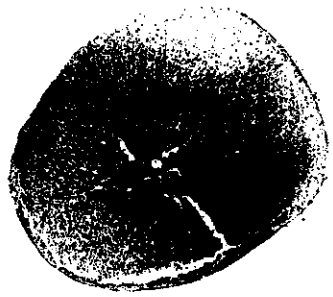


Fig. (7) : Section in adrenal gland of rat aged one month, showing differentiation between cortex and medulla, and the small size of medulla. (X 35).

Table 1 : The adrenal medullary volumes of female and male rats aged one month.

Animal's number	Volume in mm^3	Animal's number	Volume in mm^3	Animal's number	Volume in mm^3
♀ C_{11}	0.171	♀ ℓ_{21}	0.123	♂ C_{14}	0.131
♀ ℓ_{18}	0.074	♀ C_{22}	0.115	♂ ℓ_{24}	0.098
♀ ℓ_{19}	0.127	♀ C_{23}	0.092	♂ C_{15}	0.086
♀ C_{20}	0.121	♀ C_{25}	0.077	♂ C_{40}	0.101
♀ ℓ_{20}	0.084	♀ C_{26}	0.110	♂ ℓ_{45}	0.114

Pooled mean volume		S.D.	S.E
Female	0.109 mm^3	0.03	0.009
Male	0.106 mm^3	0.017	0.008

S.D. = Standard deviation
S.E. = Standard arror.

2. Rats aged three months :

This was the first age of sharp differentiation between the two adrenomedullary cells, so the counting can be performed. Through the application of the graphical method of Dornfeld et al. (1942). After estimation of nuclear population Abercrombie (1946) , the number of each cell type was determined.

The estimated number of adrenaline cells in the studied left sided glands of the five female rats aged three months ranged from 70200 to 108200 with a mean of 87000 (SD ± 13784 & SE ± 6156.3) (Table 2).

The corresponding number of adrenaline cells in the studied right sided glands of the three female rats of the same age group ranged from 81900 to 89500 with a mean of 84533 (SD ± 4301.2 & SE ± 2483.9).

The apparent decrease of the number of adrenaline cells in the right sided glands than the left sided ones proved to be statistically non significant (P = 0.05).

So the number of adrenaline cells in the adrenal medulla of female rats aged three months ranged from 70200 to 108200 with a mean of 86075 (SD ± = 10723.8 & SE = ± 3794.7).

Table 2 : The number of adrenaline cells in left and right sided adrenal medullae of female rats aged three months.

Left gland's number	Number of adrenaline cells	Right gland's number	Number of adrenaline cells
♀ D_4	108 200	♀ D_{11}	89 500
♀ D_9	70 200	♀ D_{15}	81 900
♀ D_{20}	82 000	♀ D_{20}	82 200
♀ D_{24}	86 400		
♀ D_{34}	88 200		

Mean number of adrenaline cells		S.D.	S.E.
Left	87 200	13 784	6156.3
Right	84 533	4301.2	2483.9

The corresponding number of noradrenaline cells in the studied left sided adrenal medullae of the five female rats aged three months ranged from 32200 to 55700 with a mean of 45280 (SD = ± 8336.6 & SE = ± 3728) (Table 3). While the number of noradrenaline cells in the studied three right sided female adrenal medullaeranged from 45500 to 50200 with a mean of 48433 (SD = ± 2653.3 & SE = ± 1479.8) (Table 3).

The apparent increase of the number of noradrenaline cells in right sided glands than left sided ones of the same age and sex group proved to be statistically non significant (P = 0.05).

So the number of noradrenaline cells in the adrenal medullaeof female rats aged three months ranged from 32200 to 55700 with a mean of 46463 (SD = ± 6964 & SE = ± 2461.7).

The number of adrenaline cells in the left adrenal medullae of two male rats, aged three months, ranged from 71500 to 73500 with a mean of 72500 (SD = ± 1449.1 & SE = ± 1024.7). The corresponding number in the three studied right sided adrenal medullae ranged from 67500 to 75100 with a mean of 70733 (SD = ± 670.8 & SE = ± 387.3) as shown in (Table 4).

Table 3: The number of noradrenaline cells in left and right sided adrenal medullae of female rats aged three months.

Left gland's number	Number of noradrenaline cells	Right gland's number	Number of noradrenaline cells
♀ D_9	32 200	♀ D_{11}	49 600
♀ D_{11}	55 700	♀ D_{15}	50 200
♀ D_{20}	42 100	♀ D_{20}	45 500
♀ D_{24}	47 500		
♀ D_{34}	48 900		

Mean number of noradrenaline cells	S.D.	S.E.
Left	45 280	8336.6	3728
Right	48 433	2653.3	1479.8

Table 4: The number of adrenaline cells in left and right sided adrenal medullae of male rats aged three months.

Left gland's number	Number of adrenaline cells	Right gland's number	Number of adrenaline cells
♂ D_{28}	73500	♂ D_{16}	75100
♂ D_{33}	71500	♂ D_{28}	67500
		♂ D_{36}	69600

Mean number of adrenaline cells		S.D.	S.E
Left	72500	1449.1	1024.7
Right	70733	670.8	387.3

The apparent decrease of the number of adrenaline cells in right sided glands than the left sided ones proved to be statistically non significant (P = 0.05).

So the number of adrenaline cells in the studied five adrenal medullae of male rats aged three months were found to range from 67500 to 75100 with a mean of 71440 (SD = ± 1300 & SE = ± 580.5).

The number of noradrenaline cells in the left glands of the studied two male rats, ranged from 37100 to 40000 with a mean of 38550 (SD = ± 2049.4 & SE = ± 1449.1) (Table 5). While the corresponding numbers of noradrenaline cells in right sided glands of the three male rats ranged from 36400 to 42400 with a mean of 39233 (SD = ± 3019.9 & SE = ± 1743.6) as shown in (Table 5).

This apparent increase of the number of noradrenaline cells in right sided glands than left sided ones of male rats aged three months proved to be statistically non significant (P = 0.05).

So the numbers of noradrenaline cells in the adrenal medullae of the studied five male rats aged three months ranged from 36400 to 42400 with a mean of 38960 (SD = ± 2397.9 & SE = ± 1072.4).

Table 5: The number of noradrenaline cells in left and right sided adrenal medullae of male rats aged three manths.

Left gland's number	Number of noradrenaline cells	Right gland's number	Number of noradrenaline cells
♂ D_{28}	40 000	♂ D_{16}	42 400
♂ D_{33}	37 100	♂ D_{28}	36 400
		♂ D_{36}	38 900

Mean number of noradrenaline cells		S.D	S.E.
Left	38 500	2049.4	1449.1
Right	39 233	3019.9	1743.6

Then we compared statistically the numbers of adrenaline and noradrenaline cells in the adrenal medullae of three months old female and male rats.

The number of adrenaline cells in the studied eight glands of female rats ranged from 70200 to 108200 with a mean of 86075 (SD = ± 10723.8 & SE = ± 3794.7), while the corresponding numbers in the studied five male rats ranged from 67500 to 75100 with a mean 71440 (SD ± 1300 & SE 580.5) as shown in(Tables 2 and 4).

The apparent decrease of the numbers of adrenaline cells in the male than the female rats of the same age group proved to be statistically significant (P = 0.05).

However, in the studied eight glands of female rats aged three months, the number of noradrenaline cells ranged from 32200 to 55700 with a mean of 46463 (SD = ± 6964 & S.E. = ± 2461.7). While the corresponding numbers in the studied five glands of male rats of the same age group ranged from 36400 to 42400 with a mean of 38960 (S.D. = ± 2397.9 & S.E. = ± 1072.4) as shown in(Tables 3 and 5).

Such values revealed an increase of noradrenaline cells in the female rats than the male ones of the same age group and the difference proved to be statistically significant (P = 0.05).

The planimetric measurements of adrenal medullae of the studied eight female rats aged three months, showed that their volumes ranged from 0.155 mm^3 to 0.449 mm^3 with a mean of 0.370 mm^3 (S.D. = $\pm$ 0.105 & S.E. = $\pm$ 0.036) (Fig. 8).

However, the corresponding volumes in the studied five male rats ranged from 0.209 to 0.349 mm^3 with a mean of 0.253 mm^3 (S.D. $\pm$ 0.059 & S.E. = $\pm$ 0.027).

The medullary volumes of female and male rats aged three months are shown in (Table 6).

This apparent decrease of medullary volume in male than female proved to be of statistical significance (P = 0.05).

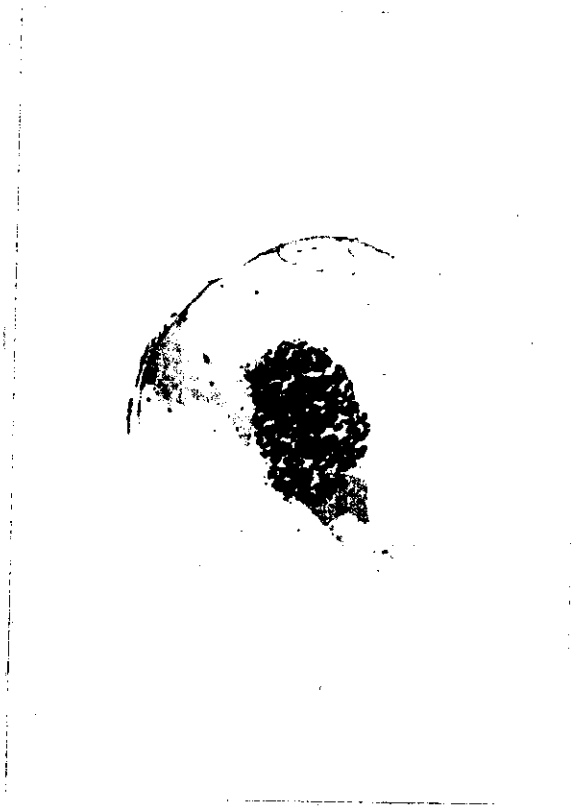


Fig. (8) : Section in adrenal gland of rat aged three months showing increased medullary size as compared to Fig. 7. (X 35).

Table 6: The adernal medullary volumes in female and male rats aged three months.

Animal's number	Volume in mm^3	Animal's number	Volume in mm^3	Animal's number	Volume in mm^3	Animal's number	Volume in mm^3
♀ D_9	0.405	♀ $\not{D}_{20}$	0.755	♂ $\not{D}_{16}$	0.349	♂ $\not{D}_{36}$	0.246
♀ D_{11}	0.412	♀ D_{20}	0.496	♂ D_{28}	0.215		
♀ $\not{D}_{11}$	0.470	♀ D_{24}	0.335	♂ $\not{D}_{28}$	0.209		
♀ $\not{D}_{15}$	0.338	♀ D_{34}	0.350	♂ D_{33}	0.245		

Mean volume of female	S.D.	S.E.	Mean volume of male	S.D.	S.E.
0.370 mm^3	0.105	0.036	0.253	0.059	0.027

Comparison of the medullary volumes of rats aged three months to those aged one month :

Female : In comparing the medullary volumes of the studied eight female rats aged three months, it ranged from 0.155 to 0.470 mm^3 with a mean of 0.370 mm^3 as shown in(Table 6). While the corresponding volumes in the studied ten females aged one month, ranged from 0.074 to 0.171 mm^3 with a mean of 0.109 mm^3 as shown in(Table 1).

This apparent increase of volumes in female rats aged three months than those aged one month proved to be of high statistical significance (P = 0.01).

Male : The medullary volumes in the studied five male rats aged three months ranged from 0.209 to 0.349 mm^3 with a mean of 0.253 mm^3 as shown in(Table 6). While the corresponding volumes in the studied five male rats aged one month ranged from 0.086 to 0.131 mm^3 with a mean of 0.106 mm^3 as shown in(Table 1).

This apparent increase of volume in male rats aged three months than those aged one month proved to be of high statistical significance (P = 0.01).

3. Rats aged six months :

In comparing the number of adrenaline and noradrenaline cells in left and right sided adrenal medullae of female rats aged six months, the following results were obtained:

The number of adrenaline cells in the studied three left sided medullae ranged from 137200 to 179400 with a mean of 164333 (S.D. = ± 24474 & S.E. = ± 14140). While the number of adrenaline cells in the studied three right sided adrenal medullae, ranged from 137700 to 214400 with a mean of 169767 (S.D. = ± 41713 & S.E. = ± 24104) as shown in (Table 7).

This apparent increase of the number of adrenaline cells in right sided adrenal medullae than the left ones in the female rats aged six months proved to be of no statistical significance (P = 0.05).

However, the number of noradrenaline cells in the studied three left sided adrenal medullae of female rats, ranged from 57700 to 79300 with a mean of 71000 (S.D. = ± 11619 & S.E. = ± 6710). While, the corresponding number in the right sided adrenal medullae ranged from 57300 to 90900 with a mean of 74933 (S.D. = ± 18762 & S.E. = ± 10820) as shown in (Table 8).

Table 7: The number of adrenaline cells in left and right sided adrenal medullae of female rats aged six manths.

Left gland's number	Number of adrenaline cells	Right gland's number	Number of adrenaline cells
♀ E_3	176 400	♀ E_6	131 700
♀ E_5	179 400	♀ E_5	214 400
♀ E_{21}	137 200	♀ E_{21}	163 200

Mean number	S.D.	S.E.	Mean number	S.D.	S.E.
164 333	24474	14140	169 767	41713	24104

Table 8: Number of noradrenaline cells in left and right sided adrenal medullae of female rats aged six months.

Left gland's number	Number of noradrenaline cells	Right gland's number	Number of noradrenaline cells
♀ E_3	76 000	♀ E_6	57 300
♀ E_5	79 300	♀ E_5	90 900
♀ E_{21}	57 700	♀ E_{21}	76 600

Mean number	S.D.	S.E.	Mean number	S.D.	S.E.
71 000	11619	6710	74 933	18762	10820

This apparent increase of the number of noradrenaline cells in right sided adrenal medullae than left sided ones proved to be of no statistical significance (P = 0.05).

However, the number of adrenaline cells in the three studied left sided adrenal medullae of male rats ranged from 153600 to 181900 with a mean of 168567 (S.D. = ± 14213 & S.E. = ± 8209.8).

While, the corresponding number of cells in the right sided adrenal medullae ranged from 142400 to 179500 with a mean of 165833 (S.D. = ± 28425 & S.E. = ± 16401.2) as shown in (Table 9).

This apparent decrease of the number of adrenaline cells in right sided adrenal medullae than left sided ones proved to be of no statistical significance (P = 0.05).

The number of noradrenaline cells in the studied three left sided adrenal medullae of male rats aged six months ranged from 67700 to 80800 with a mean of 73067 (S.D. = ± 6862.9 & S.E. = ± 3962.3). While, the corresponding number of cells in the studied three right sided

[illegible] 70700

[illegible] = ± 4098.8) as shown in (Table 10).

Table 9: Number of adrenaline cells in left and right sided adrenal medullae of male rats aged six months.

Left gland's number	Number of adrenaline cells	Right gland's number	Number of adrenaline cells
♂ E_4	170 200	♂ E_{15}	179 500
♂ E_{13}	153 600	♂ E_{18}	142 400
♂ E_{19}	181 900	♂ E_{19}	175 600

Mean number	S.D.	S.E.	Mean number	S.D.	S.E.
168 567	14213	8209.8	165 833	28425	16401.2

Table 10: The number of noradrenaline cells in left and right sided adrenal medullae of male rats aged six months.

Left gland's number	Number of noradrenaline cells	Right gland's number	Number of noradrenaline cells
♂ E_4	67 700	♂ E_{15}	74 600
♂ E_{13}	70 700	♂ E_{18}	62 500
♂ E_{19}	80 800	♂ E_{19}	75 000

Mean number	S.D.	S.E.	Mean number	S.D.	S.E.
73 067	6862.9	3962.3	70 700	7106.3	4098.8

This apparent decrease of the number of noradrenaline cells in right sided adrenal glands than left ones in male rats aged six months proved to be of no statistical significance (P = 0.05).

Then we compared the number of adrenaline and noradrenaline cells in the female and male rats aged six months, irrespective of the side of the gland.

The number of adrenaline cells in the studied six female rats aged six months ranged from 131700 to 214400 with a mean of 167050 (S.D. = ± 30757 & S.E. = ± 12570). While the corresponding number in the studied six male rats of the same age group, ranged from 142400 to 181900 with a mean of 167200 (S.D. = ± 18248, S.E. = ± 7449.8) as shown in (Tables 7 & 9).

This apparent decrease of the number of adrenaline cells in females than males proved to be of no statistical significance (P = 0.05).

The numbers of noradrenaline cells in the studied six female rats ranged from 57300 to 90900 with a mean of 72967 (S.D. = ± 13153 & S.E. = ± 5390). While, the

corresponding number in the studied six male rats of the same age group ranged from 62500 to 80800 with a mean of 71883 (S.D. = ± 7120.4 & S.E. = ± 2906.9) as shown in (Tables 8 & 10).

This apparent decrease of the number of noradrenaline cells in the male rats than female ones aged six months proved to be of no statistical significance (P=0.05).

The planimetric measurements of the studied six female adrenal medullae of rats aged six months revealed that their volumes ranged from 0.344 to 1.238 mm^3 with a mean of 0.616 mm^3 (S.D. = ± 0.321 & S.E. = ± 0.113). However, the corresponding medullary volumes of the studied six males adrenal medullae of the same age group ranged from 0.380 to 0.660 with a mean of 0.493 mm^3 (S.D. = ± 0.096 & S.E. = ± 0.039) as shown in (Table 11).

This apparent decrease of male adrenal medullary volume than in the female of the same age group proved to be of no statistical significance (P = 0.05). (Fig. 9) show the adrenal medullary volume of a rat aged six months.

Table 11: The adrenal medullary volumes of female and male rats aged six months.

Gland's number	Volume in mm^3	Gland's number	volume in mm^3
♀ E_3	0.629	♂ E_4	0.660
♀ E_5	1.238	♂ E_{13}	0.380
♀ E_5	0.474	♂ E_{15}	0.514
♀ E_6	0.583	♂ E_{18}	0.436
♀ E_{21}	0.344	♂ E_{19}	0.501
♀ E_{21}	0.429	♂ E_{19}	0.478

Mean volume in female	S.D.	S.E.	Mean volume in male	S.D.	S.E.
0.616 mm^3	0.321	0.113	0.493 mm^3	0.096	0.039

Fig. (9) : Section in adrenal gland of rat aged six months showing increased medullary size as compared to Fig. 8. (X 35).

Comparison of the results of rats aged six months to those aged three months :

A. Cell counts :

Female : The number of adrenaline cells in the studied eight adrenal medullae of female rats aged three months ranged from 70200 to 108200 with a mean of 86075, while the corresponding numbers in the studied six adrenal medullae of female rats aged six months ranged from 131700 to 214400 with a mean of 167050, as shown in (Tables 2 & 7).

This apparent increase of the number of adrenaline cells in female rats aged six months than those aged three months proved to be of high statistical significance (P = 0.01).

However, the number of noradrenaline cells in the studied eight females aged three months ranged from 32200 to 55700 with a mean of 46463, while the corresponding numbers in the studied six females aged six months ranged from 57300 to 90900 with a mean of 72967, as shown in (Tables 3 & 10).

Increase of the number of noradrenaline cells in females aged six months than those aged three months, proved to be of high statistical significance (P=0.01).

Males : The number of adrenaline cells in the studied five adrenal medullae of male rats aged three months ranged from 67500 to 75100 with a mean of 71440, while the corresponding numbers in the studied six adrenal medullae of male rats aged six months ranged from 142400 to 181900 with a mean of 167200 as shown in(Tables 4 & 9).

This apparent increase of the number of adrenaline cells in male rats aged six months in comparison to the number of adrenaline cells in those aged three months proved to be of high statistical significance (P = 0.01).

However, the number of noradrenaline cells in the studied five adrenal medullae of male rats aged three months ranged from 36400 to 42400 with a mean of 38960, while the corresponding numbers in the examined six adrenal medullae of male rats aged six months ranged from 62500 to 80800 with a mean of 71883 as shown in(Tables 5 & 10)

The apparent increase of the number of noradrenaline cell in male rats aged six months than those aged three months proved to be of high statistical significance P = 0.01).

B. Medullary Volumes :

Female : In comparing the medullary volumes of the studied eight adrenal medullae of female rats aged three months to those aged six months the following results were obtained :

In the three months old, the adrenal medullary volume ranged from 0.155 to 0.470 with a mean of 0.370 mm^3 (Table 6), while the corresponding volumes of the studied six females rats, aged six months, ranged from 0.344 to 1.238 with a mean of 0.616 mm^3 as shown in (Table 11).

This apparent larger volume in female rats aged six months than those of three months old ones proved to be of statistical significance (P = 0.05).

Male : While, the adrenal medullary volumes in the studied five male rats aged three months ranged from 0.209 to 0.349 with a mean of 0.253 as shown in (Table 6) while the corresponding volumes in the studied six male rats aged six months ranged from 0.380 to 0.660 mm^3 with a mean of 0.493 mm^3 as shown in (Table 11).

This apparent increase of volume in male rats aged six months than those aged three months proved to be of high statistical significance (P = 0.01).

4. Rats aged one year :

Female : The estimated number of adrenaline cells in the studied three left sided adrenal medullae of female rats aged one year ranged from 185000 to 280200 with a mean of 222900 (S.D. = ± 52154 & S.E. = ± 30133), while the corresponding number of adrenaline cells in the studied three right sided adrenal medullae ranged from 194800 to 226500 with a mean of 214333 (S.D. = ± 72801 & S.E. = ± 41952) as shown in (Table 12).

This apparent decrease of the number of adrenaline cells in right sided glands than the left sided ones proved to be of no statistical significance (P = 0.05).

However, the number of noradrenaline cells in the studied three left sided adrenal medullae of female rats aged one year ranged from 77000 to 80000 with a mean of 78467 (S.D. = ± 1516.6, S.E. = ± 875.8). While the corresponding number of noradrenaline cells in the studied right sided adrenal medullae of the three female rats of the same age group ranged from 72300 to 78400 with a mean of 74433 (S.D. = ± 3449.6 & S.E. = ± 1992.5) as shown in (Table 13).

Table 12: The number of adrenaline cells in left and right sided adrenal medullae of female rats aged one year.

Left gland's number	Number of adrenaline cells	Right gland's number	Number of adrenaline cells
♀ H_1	185000	♀ H_2	194 800
♀ H_4	280200	♀ H_4	221 700
♀ H_5	195500	♀ H_9	226 500

Mean number	S.D.	S.E	Mean number	S.D.	S.E.
222 900	52154	30133	214 333	72801	41952

Table 13: The number of noradrenaline cells in left and right sided adrenal medullae of female rats aged one year .

Left gland's number	Number of noradrenaline cells	Right gland's number	Number of noradrenaline cells
♀ H_1	78 400	♀ H_2	72 300
♀ H_4	80 000	♀ H_4	78 400
♀ H_5	77 000	♀ H_9	72 600

Mean number	S.D.	S.E.	Mean number	S.D.	S.E.
78 467	1516.6	875.8	74 433	3449.6	1992.5

This apparent decrease of the number of noradrenaline cells in right sided glands than left sided ones of the same age group and sex proved to be statistically non significant (P = 0.05).

Male : The calculated number of adrenaline cells in the studied left sided adrenal medullae of the three male rats aged one year ranged from 178400 to 22000 with a mean of 200733 (S.D. = ± 23324 & S.E. = ± 13454). However, the corresponding number of adrenaline cells in the studied right sided adrenal medullae of the four male rats of the same age group, ranged from 192300 to 222300 with a mean of 210150 (S.D. = ± 13229 & S.E. = ± 6610.6) as shown in (Table 14).

This apparent increase of the number of adrenaline cells in right sided adrenal glands than left sided ones proved to be of no statistical significance (P = 0.05).

The number of noradrenaline cells in the studied three left sided adrenal medullae of male rats aged one year, ranged from 69900 to 73900 with a mean of 71933 (S.D. = ± 2000, S.E. = ± 1153.3). While the corresponding number of noradrenaline cells in the studied four right

Table 14: The number of adrenaline cells in left and right sided adrenal medullae of male rats aged one year.

Left gland's number	Number of adrenaline cells	Right gland's number	Number of adrenaline cells
♂ H_3	207 400	♂ $И_3$	192 300
♂ H_{12}	220 000	♂ $И_7$	217 600
♂ H_{13}	178 400	♂ $И_{13}$	222 300
		♂ $И_8$	208 700

Mean number	S.D.	S.E.	Mean number	S.D.	S.E.
200 733	23324	13454	210150	13229	6610.6

ided adrenal medullae of the same age group ranged from 4700 to 75000 with a mean of 70850 (S.D. = ± 6292.9 & .E. = ± 3148), as shown in (Table 15).

This apparent decrease of the number of noradrenaline ells in right sided adrenal medullae of male rats than eft sided ones of the same age group proved to be of no tatistical significance (P = 0.05).

Then we compared statistically the number of adre- aline and noradrenaline cells in adrenal medullae of emale and male rats aged one year, irrespective of the ide of the gland.

The number of adrenaline cells in the studied six male rats aged one year ranged from 185000 to 280200 ith a mean of 217283 (S.D. = ± 56745 & S.E. = ± 7334.8). ile the corresponding number in the studied seven male ts of the same group ranged from 174800 to 222300 with mean of 206157 (S.D. = ± 17146 & S.E. = ± 6488.5) as own in (Tables 12 & 14).

This apparent decrease of the number of adrenaline lls in male than female rats aged one year proved to be atistically nonsignificant (P = 0.05).

Table 15: The number of nordrenaline cells in left and right sided adrenal medullae of male rats aged one year.

Left gland's number	Number of noradrenaline cells	Right gland's number	Number of noradrenaline cells
♂ H_3	72000	♂ $И_3$	68700
♂ H_{12}	73900	♂ $И_7$	75000
♂ H_{13}	69900	♂ $И_{13}$	75000
		♂ $И_8$	64700

Mean number	S.D.	S.E.	Mean number	S.D.	S.E
71933	2000	1153.3	70 850	6292.9	3148

The number of noradrenaline cells in the studied six female rats aged one year ranged from 72300 to 80000 with a mean of 76450 (S.D. = ± 3240.4 & S.E. = ± 1326.7). While the corresponding number in the studied seven male rats of the same age group ranged from 64700 to 75000 with a mean of 71314 (S.D. = ± 3741.7 & S.E. = ± 1414.2) as shown in (Tables 13 & 15).

This apparent decrease of the number of noradrenaline cells in the adrenal medullae of male rats than female ones proved also to be statistically non significant (P = 0.05).

The planimetric measurements of the studied six female adrenal medullae of rats aged one year revealed that their volumes ranged from 0.568 to 1.433 mm^3 with a mean of 1.046 mm^3 (S.D. = ± 0.293 & S.E. = ± 0.120) while the corresponding adrenal medullary volumes of the studied six glands of male rats of the same age group ranged from 0.474 to 1.254 mm^3 with a mean of 0.935 mm^3 (S.D. = ± 0.288 & S.E. = ± 0.118) as shown in (Table 16).

[illegible] male adrenal medullary [illegible] of no statistical

Table 16: The adrenomedullary volumes of female and male rats aged one year.

Gland's number	Volume in mm^3	Gland's number	Volume in mm^3
♀ H_1	0.568	♂ H_3	1.254
♀ H_2	1.096	♂ H_7	0.967
♀ H_4	1.105	♂ H_8	1.046
♀ H_4	1.433	♂ H_{12}	1.144
♀ H_5	1.169	♂ H_{13}	0.474
♀ H_9	0.907	♂ H_{13}	0.725

Mean Volume of female	S.D.	S.E.	Mean Volume of male	S.D.	S.E.
1.046 mm^3	0.293	0.120	0.935 mm^3	0.288	0.118

significance (P = 0.05). (Fig. 10) shows the adrenal medulla of a rat aged one year.

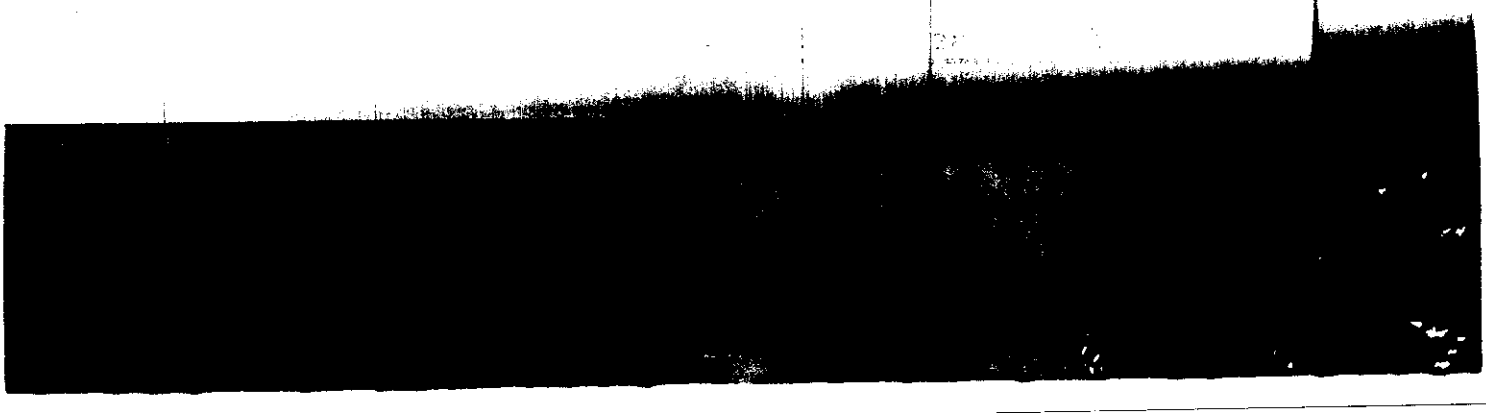
Comparison of the results of rats aged one year to those aged three months :

A. Cell counts :

Female : The number of adrenaline cells in the studied eight female rats aged three months ranged from 70200 to 108200 with a mean of 86075, while the corresponding number in the studied six female rats aged one year ranged from 185000 to 280800 with a mean of 217283 as shown in(Tables 2 and 12).

This apparent increase of the number of adrenaline cells in female rats aged one year than those aged three months proved to be statistically highly significant (P = 0.01).

However, the number of noradrenaline cells in the studied eight female rats aged three months ranged from 32200 to 55700 with a mean of 46463, while the corresponding number of noradrenaline cells in the studied six females aged one year ranged from 72300 to 80000 with a mean of 76450 as shown in(Tables 3 & 13).



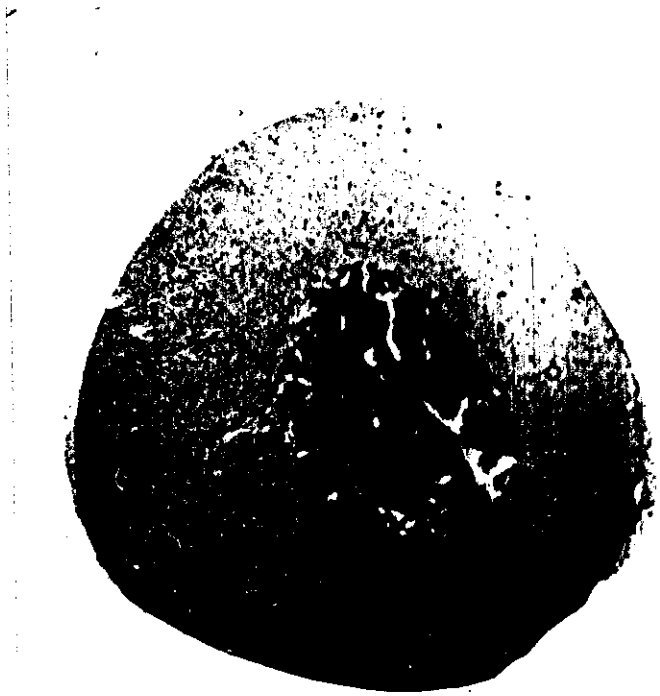


Fig. (10) : Section in adrenal gland of rat aged one year showing increased medullary size as compared to Fig. 9. (X 35).

This apparent increase of the number of noradrenaline cells in female rats aged one year than those aged three months proved to be of high statistical significance (P = 0.01).

Male : The number of adrenaline cells in the studied five male rats aged three months ranged from 67500 to 75100 with a mean of 71440. While the corresponding numbers of adrenaline cells in the studied seven male rats aged one year ranged from 174800 to 222300 with a mean of 206157 as shown in(Tables 4 & 14).

This apparent increase of the number of adrenaline cells in male rats aged one year than those aged three months proved to be of high statistical significance (P = 0.01).

However, the number of noradrenaline cells in the studied five male rats aged three months ranged from 36400 to 42400 with a mean of 38960. While, the corresponding number of noradrenaline cells in the studied seven male rats aged one year ranged from 64700 to 75000 with a mean of 71314; as shown in(Tables 5 & 15).

This apparent increase of the number of noradrenaline cells in male rats aged one year than those aged three months proved to be statistically highly significant (P = 0.01).

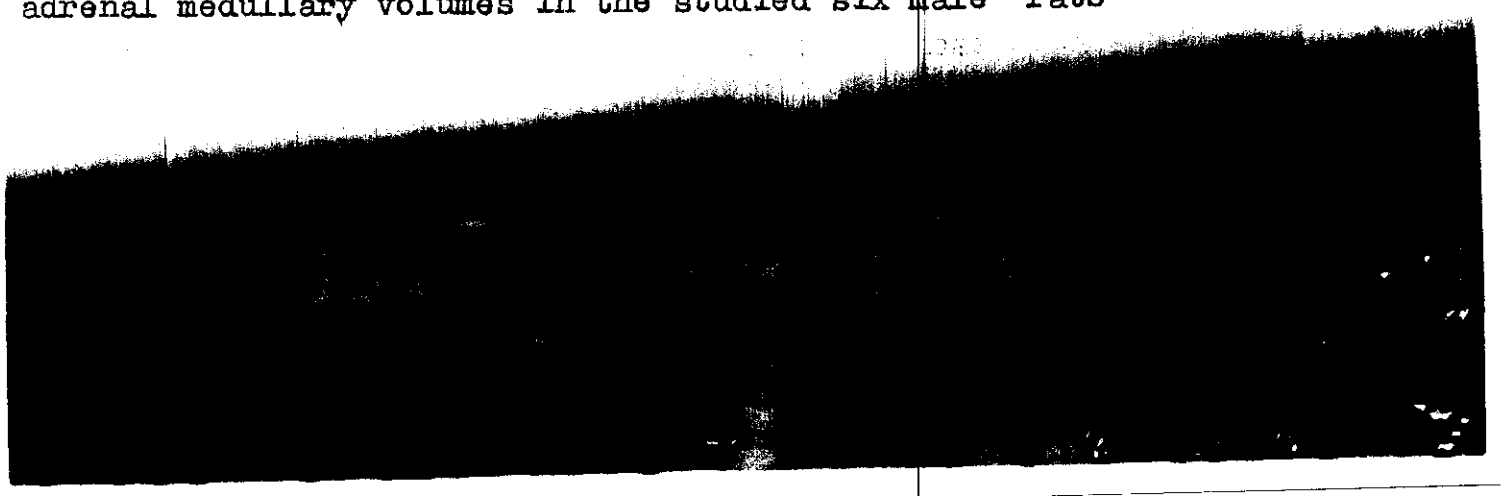
B. Medullary Volumes :

Female : In comparing the medullary volumes of the studied eight female rats aged three months to the studied six female rats aged one year the following results were obtained :

The adrenal medullary volumes in females aged three months ranged from 0.155 to 0.470 mm^3 with a mean of 0.370 mm^3. While the corresponding volumes in females aged one year ranged from 0.568 to 1.433 mm^3 with a mean of 1.046 mm^3 ; as shown in(Tables 6 & 16).

Such larger volumes in female rats aged one year than those aged three months proved to be of high statistical significance (P = 0.01).

Male : The adrenal medullary volumes in the studied five male rats aged three months ranged from 0.209 to 0.349 mm^3 with a mean of 0.253 mm^3. While the corresponding adrenal medullary volumes in the studied six male rats



aged one year ranged from 0.474 to 1.254 with a mean of 0.935 mm^3; as shown in(Tables 6 & 16). This apparent larger volumes in male rats aged one year than those aged three months proved to be of high statistical significance (P = 0.01).

Comparison of the results of rats aged one year to those aged six months :

As in the two ages there is no difference according to the sex, so we compare the results of the two ages irrespective of the sex of the animal.

A. Cell counts :

The number of adrenaline cells in the studied twelve rats aged six months ranged from 131700 to 214400 with a mean of 167125 (S.D. = ± 23130.07 & S.E. = ± 6678.32) as shown in(Table 17), while the corresponding numbers of adrenaline cells in the studied thirteen rats aged one year ranged from 174800 to 280200 with a mean of 211908 (S.D. = ± 38987.18 & S.E. = ± 10816.65) as shown in (Table 17).

This apparent increase of the number of adrenaline cells in rats aged one year than those aged six months proved to be statistically highly significant (P = 0.01).

Table 17: The number of adrenaline cells in rats aged six months and those aged one year.

RATS AGED SIX MONTHS				RATS AGED ONE YEAR			
Gland's number	Number of adrenaline cells	gland's number	Number of adrenaline cells	gland's number	Number of adrenaline cells	Gland's number	Number of adrenaline cells
E_3	176400	E_{13}	153600	H_1	185000	H_3	192300
E_5	179400	E_{15}	179500	H_2	194800	H_7	217600
E_5	214400	E_{18}	142400	H_4	221700	H_8	208700
E_6	131700	E_{19}	181900	H_4	280200	H_{12}	220000
E_{21}	137200	E_{19}	175600	H_5	195500	H_{13}	174800
E_{21}	163200			H_9	226500	H_{13}	222300
E_4	170200			H_3	207400		
Mean number of adrenaline cells		S.D.	S.E.	Mean number of adrenaline cells		S.D.	S.E.
167 125		23130.07	6678.32	211 908		38987.18	10816.65

However, the number of noradrenaline cells in the studied twelve rats aged six months ranged from 57300 to 90900 with a mean of 70758 (S.D. = ± 9864.08 & S.E. = ± 2846.05) as shown in(Table 18). While the corresponding number of noradrenaline cells in the studied thirteen rats aged one year ranged from 64700 to 80000 with a mean of 73685 (S.D. = ± 4301.16 & S.E. = ± 1191.64) as shown in(Table 18).

This apparent increase of the number of noradrenaline cells in rats aged one year than those aged six months proved to be statistically highly significant (P = 0.01).

The adrenal medullary volumes of the studied twelve rats aged six months ranged from 0.344 mm^3 to 1.238 with a mean of 0.555 mm^3 (S.D. = ± 0.233 & S.E. = ± 0.067)as shown in (Table 19). While the corresponding adrenal medullary volumes in the studied twelve rats aged one year ranged from 0.474 mm^3 to 1.433 mm^3 with a mean of 0.991 mm^3 (S.D. = ± 0.284 & S.E. = ± 0.082) as shown in(Table 19).

This apparent increase of the volume of adrenal medullae in rats aged one year than those aged six months proved to be statistically highly significant (P = 0.01).

'able 18 : The number of noradrenaline cells in rats aged six months and those aged one year.

RATS AGED SIX MONTHS				RATS AGED ONE YEAR			
Gland's number	Number of norad. cells	Gland's number	Number of norad. cells	gland's number	Number of norad. cells	Gland's number	Number of norad cells
E_3	76000	E_{13}	70700	H_1	78400	H_3	68700
E_5	79300	E_{15}	74600	H_2	72300	H_7	75000
E_5	90900	E_{18}	62500	H_4	80000	H_8	64700
E_6	57300	E_{19}	80800	H_4	78400	H_{12}	73900
E_{21}	57700	E_{19}	75000	H_5	77000	H_{13}	69900
E_{21}	76600			H_9	72600	H_{13}	75000
E_4	67700			H_3	72000		

Mean number of noradrenaline cells	S.D.	S.E.	Mean number of noradrenaline cells	S.D.	S.E.
70758	9864.08	2846.05	73685	4301.16	1191.64

Table 19: The adrenomedullary volumes of rats aged six months and those aged one year.

RATS AGED SIX MONTHS				RATS AGED ONE YEAR			
Gland's number	Volume in mm^3	Gland's number	Volume in mm^3	Gland's number	Volume in mm^3	Gland's number	Volume in mm^3
E_3	0.629	E_4	0.660	H_1	0.568	H_3	1.254
E_5	0.474	E_{18}	0.426	H_2	1.096	H_7	0.967
E_5	1.238	E_{13}	0.380	H_4	1.105	H_8	1.046
E_6	0.583	E_{15}	0.514	H_4	1.433	H_{12}	1.144
E_{21}	0.344	E_{19}	0.501	H_5	1.169	H_{13}	0.474
E_{21}	0.429	E_{19}	0.478	H_9	0.907	H_{13}	0.725
Mean Volume in mm^3		S.D.	S.E.	Mean Volume in mm^3		S.D.	S.E.
0.555		0.233	0.067	0.991		0.284	0.082

3. Senile rats : (2 years of age)

Female : The number of adrenaline cells in the studied left sided adrenal medullae of the two senile female rats ranged from 230400 to 235400 with a mean of 232900 (S.D. = ± 3549.6 & S.E. = ± 2509.9). While, the corresponding adrenaline cells in the studied right sided adrenal medullae of the two female rats of the same age group ranged from 201400 to 231700 with a mean of 226550 (S.D. = ± 21424 & S.E. = ± 15166) as shown in(Table 20).

This apparent decrease of the number of adrenaline cells in right sided adrenal medullae than the left sided ones proved to be of no statistical significance(P = 0.05).

However, the number of noradrenaline cells in the studied left sided adrenal medullae of the two senile female rats ranged from 57300 to 68800 with a mean of 63050 (S.D. = ± 10195.6 & S.E. = ± 7287). While, the corresponding number of noradrenaline cells in the studied right sided adrenal medullae of the two senile female rats ranged from 53700 to 62500 with a mean of 58100 (S.D. = ± 9672.2 & S.E. = ± 6906.5) as shown in(Table 21).

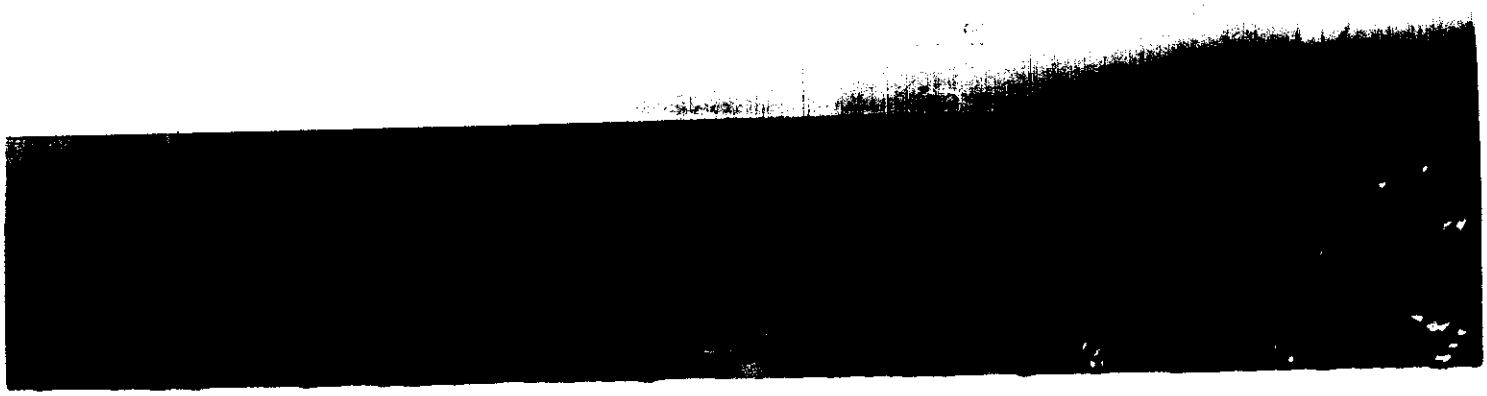


Table 20: The number of adrenaline cells in left and right sided adrenal medullae of senile female rats.

Left gland's number	Number of adrenaline cells	Right gland's number	Number of adrenaline cells
♀ S_5	230 400	♀ $\not{S}_5$	231 700
♀ S_2	235 400	♀ $\not{S}_{12}$	201 400

Mean number of adrenaline cells	S.D.	S.E.	Mean number of adrenaline cells	S.D.	S.E.
232 900	3549.6	2509.9	226 550	21424	15166

Table 21: The number of noradrenaline cells in left and right sided adrenal medullae of senile female rats.

Left gland's number	Number of noradrenaline cells	Right gland's number	Number of noradrenaline cells
♀ S_5	68 800	♀ $\not{S}_5$	53 700
♀ S_2	57 300	♀ $\not{S}_{12}$	62 500

Mean number of noradrenaline cells	S.D.	S.E.	Mean number of noradrenaline cells	S.D.	S.E.
63 050	10195.6	7287	58100	9762.2	6906.5

This apparent decrease of the number of noradrenaline cells in right sided glands than the left sided ones proved to be of no statistical significance (P = 0.05).

Male : The number of adrenaline cells in the studied left sided adrenal medullae of the two senile male rats ranged from 217500 to 220500 with a mean of 219000 (S.D. = ± 2144.7 & S.E. = ± 1516.6). While the corresponding number of adrenaline cells in right sided adrenal glands of the two senile male rats ranged from 203700 to 219200 with a mean of 211450 (S.D. = ± 12010 & S.E. = ± 7746) as shown in(Table 22) .

This apparent decrease of the number of adrenaline cells in right sided adrenal glands, of senile male rats, than the left sided ones proved to be of no statistical significance (P = 0.05).

However, the number of noradrenaline cells in the studied left sided adrenal medullae of the two senile male rats ranged from 55800 to 62300 with a mean of 59050 (S.D. = ± 4593.5 & S.E. = ± 3255.8). While, the corresponding number of noradrenaline cells in right sided

of the two senile male rats ranged from

Table 22: The number of adrenaline cells in left and right sided adrenal medullae of senile male rats.

Left gland's number	Number of adrenaline cells	Right gland's number	Number of adrenaline cells
♂ S_3	220 500	♂ $\not{S}_3$	203 700
♂ S_7	217 500	♂ $\not{S}_8$	219 200

Mean number of adrenaline cells	S.D.	S.E.	Mean number of adrenaline cells	S.D.	S.E
219 000	2144.7	1516.6	211450	12010	7746

56700 to 60500 with a mean of 58600 (S.D. = ± 2701.9 & S.E. = ± 1910.5) as shown in(Table 23).

This apparent decrease of the number of noradrenaline cells in right sided adrenal medullae, of the senile male rats, than the left sided ones proved to be of no statistical significance (P = 0.05).

Then, we compared statistically the number of adrenaline and noradrenaline cells in adrenal medullae of senile female and male rats, irrespective of the side of the gland.

The number of adrenaline cells in the studied four senile female rats ranged from 201400 to 235400 with a mean of 224725 (S.D. = ± 15684.39 & S.E. = ± 7848.6). While, the corresponding number of adrenaline cells in the studied four senile male rats ranged from 203700 to 220500 with a mean of 215225 (S.D. = ± 7784.6 & S.E. = ± 3885.87) as shown in(Tables 20 & 22).

This apparent increase of the number of adrenaline cells in senile female rats than in male ones proved to be of no statistical significance (P = 0.05).

Table 23: The number of noradrenaline cells in left and right sided adrenal medullae of senile male rats.

left gland's number	Number of noradrenaline cells	Right gland's number	Number of noradrenaline cells
♂ S_3	62 300	♂ β_3	56 700
♂ S_7	55 800	♂ β_8	60 500

mean number of noradrenaline cells	S.D.	S.E.	Mean number of noradrenaline cells	S.D.	S.E.
59050	4593.5	3255.8	58600	2701.9	1910.5

The number of noradrenaline cells in the studied four senile female rats ranged from 53700 to 68800 with a mean of 61825 (S.D. = ± 8312.6 & S.E. = ± 4159.3). While, the corresponding number of noradrenaline cells in the studied four senile male adrenal medullae, ranged from 55800 to 62300 with a mean of 58825 (S.D. = ± 3103.2 & S.E. = ± 1552.4) as shown in(Tables 21 & 23).

This apparent increase of the number of noradrenaline cells in senile female rats than male ones proved to be of no statistical significance (P = 0.05).

The planimetric measurements of the studied four senile female adrenal medullae revealed that their volumes ranged from 0.866 to 1.081 with a mean of 0.980 mm^3 (S.D. = ± 0.108 & S.E. = ± 0.054). While, the adrenal medullary volumes, of the studied four senile male rats, ranged from 0.656 to 0.807 with a mean of 0.758 mm^3 (S.D. = ± 0.070 & S.E. = ± 0.035) as shown in(Table 24).

This apparent increase of the volume of adrenal medullae of senile female rats than senile male ones proved to be of statistical significance (P = 0.05).

Fig. 11 show the adrenal medullary volume of a senile rat.

Table 24: The adrenomedullary volumes of senile female and male rats.

Gland's number	Volume in mm^3	Gland's number	Volume in mm^3
♀ β_5	1.067	♂ S_3	0.807
♀ β_{12}	0.906	♂ S_7	0.800
♀ S_5	1.081	♂ β_3	0.768
♀ S_2	0.866	♂ β_8	0.656

Mean Volume of female	S.D.	S.E.	Mean Volume of male	S.D.	S.E.
0.980 mm^3	0.108	0.054	0.758	0.070	0.035

Fig. (11) : Section in adrenal gland of rat aged two years (senile) shpwing decreased medullary size as compared to Fig. 10. (X 35).

Comparison of the results of senile rats to those aged three months :

A. Cell Counts :

Female : The number of adrenaline cells in the studied eight female rats aged three months ranged from 70200 to 108200 with a mean of 86075. While, the corresponding number in the studied four senile females ranged from 201400 to 235400 with a mean of 224725 ; as shown in (Tables 2 & 20) .

This apparent increase of the number of adrenaline cells in senile female rats, than those aged three months proved to be of high statistical significance (P = 0.01).

However, the number of noradrenaline cells in the studied eight female rats aged three months ranged from 32200 to 55700 with a mean of 46463. While, the corresponding numbers of noradrenaline cells in the studied four senile female rats ranged from 53700 to 68800 with a mean of 61825 ; as shown in (Tables 3 & 21) .

This apparent increase of the number of noradrenaline
[illegible]male rats than those aged three months
[illegible]highly significant (P = 0.01).

Male : The number of adrenaline cells in the studied five male rats aged three months ranged from 67500 to 75100 with a mean of 71440. While, the corresponding number of adrenaline cells in the studied four senile male rats ranged from 203700 to 220500 with a mean of 215225; as shown in(Tables 4 & 22).

This apparent increase of the number of adrenaline cells in senile female rats than females aged three months proved to be statistically highly significant (P = 0.01).

However, the number of noradrenaline cells in the studied five male rats aged three months, ranged from 36400 to 42400 with a mean of 38960. While, the corresponding number of noradrenaline cells in the studied four senile male rats, ranged from 55800 to 62300 with a mean of 58825; as shown in(Tables 5 & 23).

This apparent increase of the number of noradrenaline cells in senile male rats than males aged three months proved to be of high statistical significance (P = 0.01).

B. Medullary Volume :

Female : In comparing the adrenal medullary volumes of the studied eight female rats aged three months, it

ranged from 0.155 to 0.470 mm^3 with a mean of 0.370 mm^3. While, the corresponding adrenal volumes of the studied four senile female rats ranged from 0.866 to 1.081 with a mean of 0.980 mm^3 ; as shown in(Tables 6 & 24) .

This apparent larger volume of adrenal medulla in senile female rats than females aged three months proved to be statistically highly significant (P = 0.01).

Male : The adrenal medullary volumes, in the studied five male rats aged three months, ranged from 0.209 to 0.349 mm^3 with a mean of 0.253 mm^3. While, the corresponding adrenal medullary volumes in the studied four senile male rats, ranged from 0.656 to 0.807 mm^3 with a mean of 0.758 mm^3 ; as shown in(Tables 6 & 24) .

This apparent larger volume of senile male adrenal medullae than those aged three months, proved to be statistically highly significant (P = 0.01).

Comparison of the results of senile rats to those aged one year:

A. Cell Counts :

As in these two ages, there was no statistical significance of the difference in cell counts according to the sex, so we compare the results of the two ages irrespective of the sex of the animals.

The number of adrenaline cells in the studied thirteen rats aged one year ranged from 174800 to 280200 with a mean of 211908 (S.D. = ± 38987.18 & S.E. = ± 10816.65) as shown in(Table 25). While, the corresponding number of adrenaline cells in the studied eight senile rats ranged from 201400 to 235400 with a mean of 219975 (S.D. = ± 12529.96 & S.E. = ± 4438.47) as shown in(Table 25).

This apparent increase of the number of adrenaline cells in senile rats than those aged one year, proved to be statistically non significant (P = 0.05).

However, the number of noradrenaline cells in the studied thirteen rats aged one year ranged from 64700 to 80000 with a mean of 73685 (S.D. = ± 4301.16 & S.E. = ± 1191.64) as shown in(Table 26). While the corresponding

Table 25: The number of adrenaline cells in rats aged one year and senile ones.

RATS AGED ONE YEAR				SENILE RATS			
Gland's number	Number of adrenaline cells	Gland's number	Number of adrenaline cells	Gland's number	Number of adrenaline cells	Gland's number	Number of adrenaline cells
H_1	185000	H_3	192300	S_5	230400	S_8	219200
H_2	194800	H_7	217600	S_5	231700		
H_4	280200	H_8	208700	S_2	235400		
H_4	221700	H_{12}	220000	S_{12}	201400		
H_5	195500	H_{13}	174800	S_3	220500		
H_9	226500	H_{13}	222300	S_3	203700		
H_3	207400			S_7	217500		

Mean number of adrenaline cells	S.D.	S.E.	Mean number of adrenaline cells	S.D.	S.E.
211 908	38987.18	10816.65	219975	12529.96	4438.47

Table 26: The number of noradrenaline cells in rats aged one year and senile ones.

RATS AGED ONE YEAR				SENILE RATS.			
Gland's number	Number of norad. cells	Gland's number	Number of norad. cells	Gland's number	Number of norad. cells	Gland's number	Number of norad. cells
H_1	78400	H_3	68700	S_5	68800	S_8	60500
H_2	72300	H_7	75000	S_5	53700		
H_4	80000	H_8	64700	S_2	57300		
H_4	78400	H_{12}	73900	S_{12}	62500		
H_5	77000	H_{13}	69900	S_3	62300		
H_9	72600	H_{13}	75000	S_3	56700		
H_3	72000			S_7	55800		

Mean number of norad. cells	S.D.	S.E.	Mean number of norad. cells	S.D.	S.E.
73 685	4301.16	1191.64	59 700	11090.54	3924.28

number of noradrenaline cells in the studied adrenal medullae of the eight senile rats ranged from 53700 to 68800 with a mean of 59700 (S.D. = ± 11C90.54 & S.E. = ± 3924.28) as shown in(Table 26).

This apparent decrease of the number of noradrenaline cells in senile rats than those aged one year, proved to be statistically highly significant (P = 0.01).

Medullary Volume :

As there was statistical significance of the difference in volume of adrenal medullae in the senile rats, according to the sex, so we compared every sex alone.

Female : The adrenal medullary volumes in the studied six female rats aged one year, ranged from 0.568 to 1.433 mm^3 with a mean of 1.046 mm^3. While the corresponding adrenal medullary volumes in the studied four senile female rats ranged from 0.866 to 1.081 mm^3 with a mean of 0.980 mm^3 as shown in(Tables 16 & 24).

This apparent decrease of the volume of adrenal medullae of senile female rats than those females aged one year proved to be statistically non significant (P = 0.05).

Male : The adrenal medullary volumes in the studied six male rats aged one year, ranged from 0.474 to 1.254 mm^3 with a mean of 0.935 mm^3. While, the corresponding adrenal medullary volumes in the studied four senile male rats, ranged from 0.656 to 0.807 mm^3 with a mean of 0.758 mm^3 as shown in(Tables 16 & 24).

This apparent decrease of adrenal medullary volumes of senile male rats than those aged one year proved to be statistically non significant (P = 0.05).

The postnatal changes of the mean number of adrenaline cells in female and male rats are presented in (Fig. 12) showing that the number in male rats is always less than in the female ones except in those aged six months, but the difference is not statistically significant except in those rats aged three months.

While, the postnatal changes of the mean number of noradrenaline cells is shown in(Fig. 13),and it revealed that also the number of cells in male rats is always less than in the female ones, in all ages but the difference is statistically significant in those aged three months only.

Changes in the Number of Adrenaline Cells
of the Adrenal Medulla
with Age in Female and Male Rats

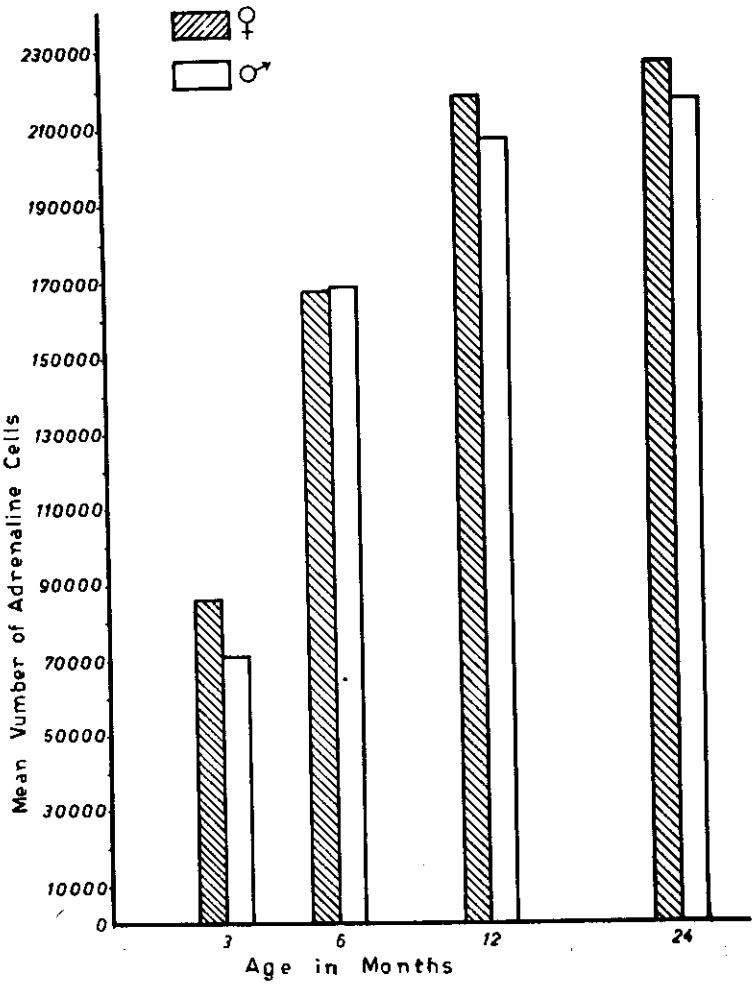


Fig. (12)

Changes in the Number of Noradrenaline Cells
of the Adrenal Medulla
with Age in Female and Male Rats

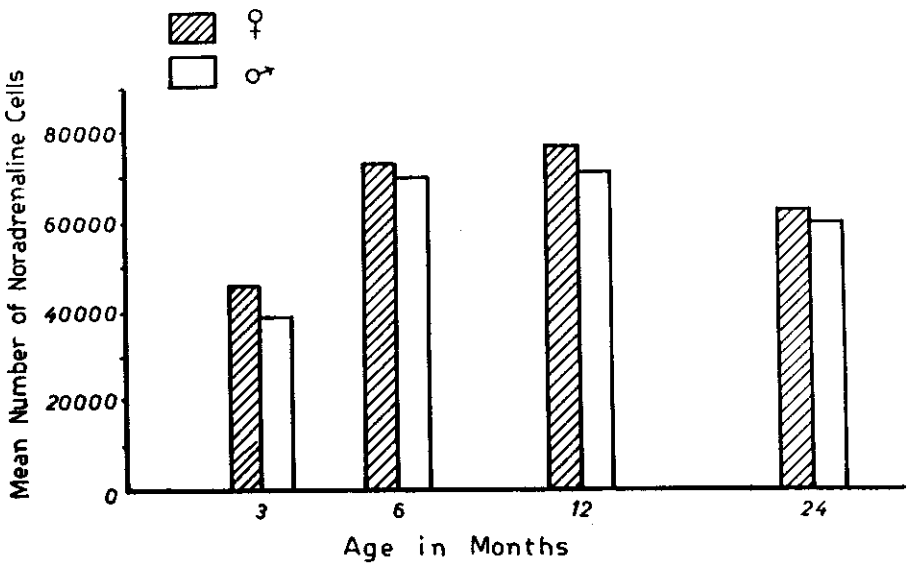


Fig. (13)

Postnatal Changes of the Number of Adrenaline and Noradrenaline Cells in the Adrenal Medulla in Female Rats

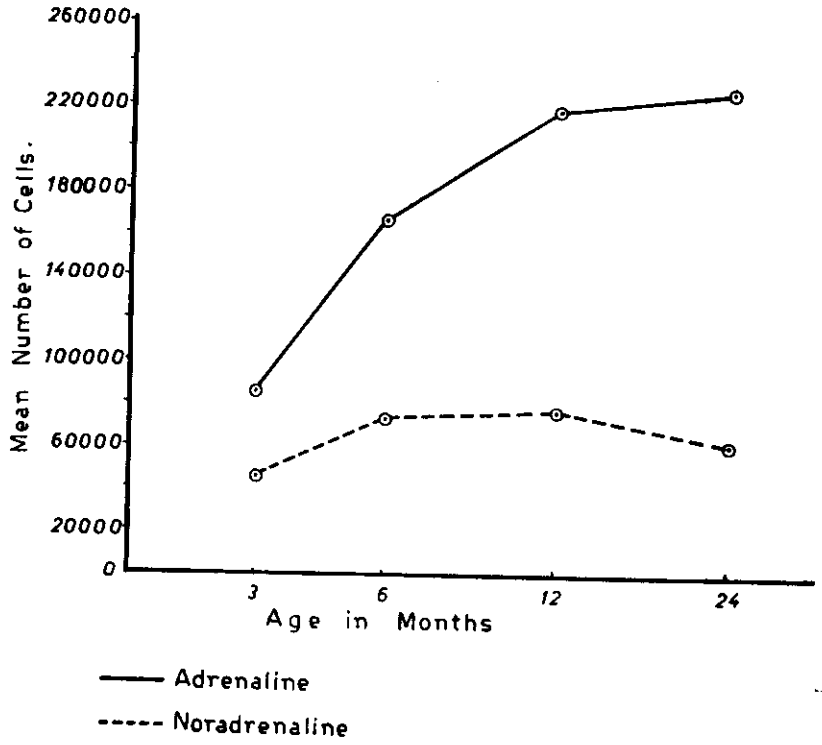


Fig. (14)

Postnatal Changes of the Number of Adrenaline and Noradrenaline Cells in the Adrenal Medulla of Male Rats

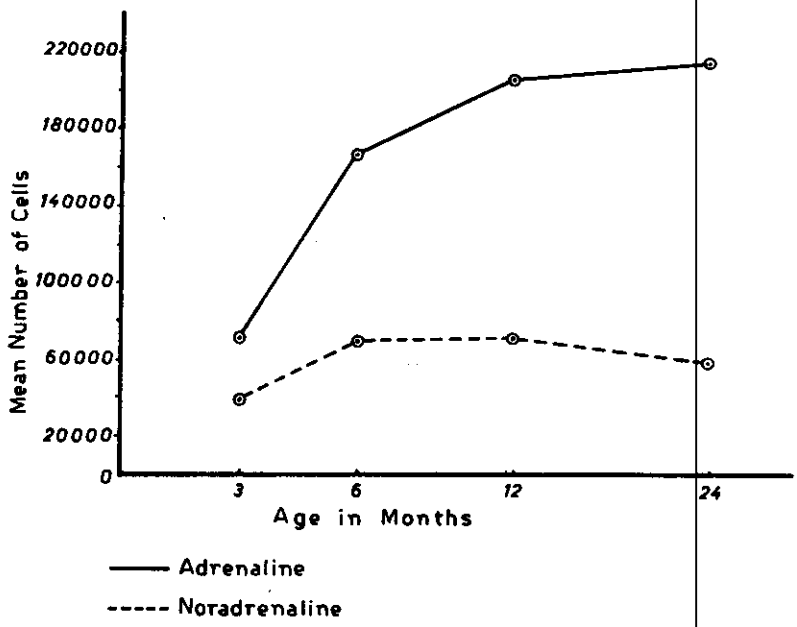


Fig. (15)

Changes of the Adrenal Medullary Volume
with Age in Female and Male Rats

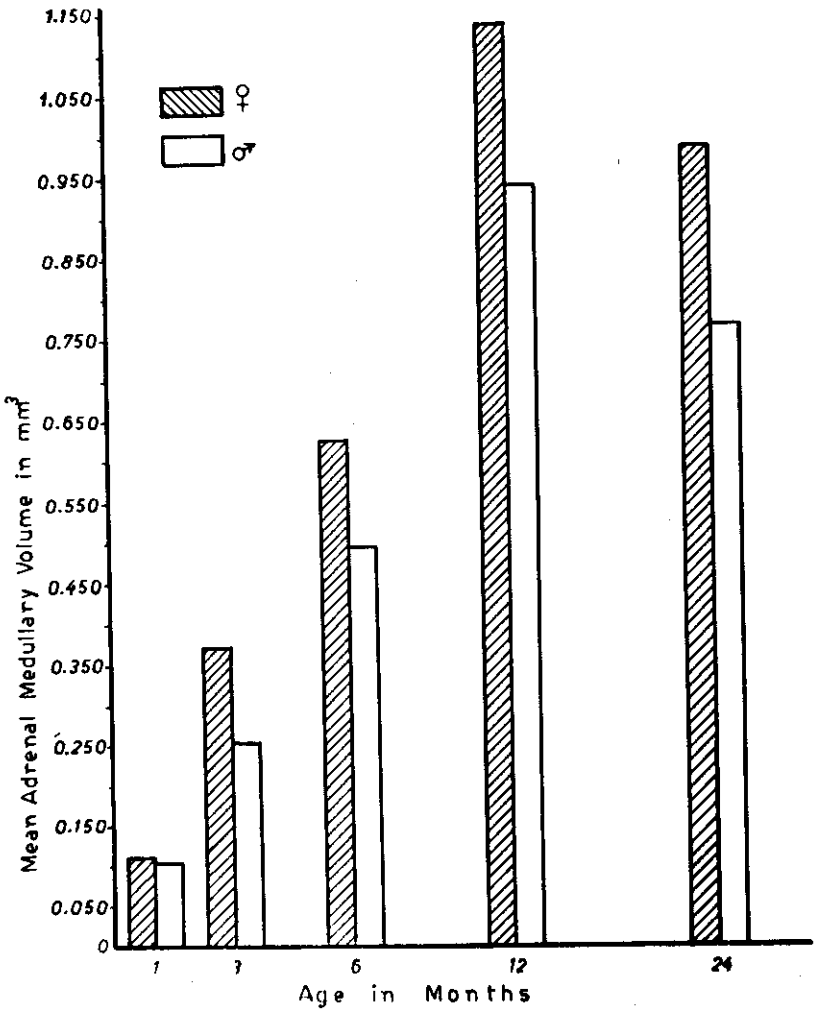


Fig. (16)

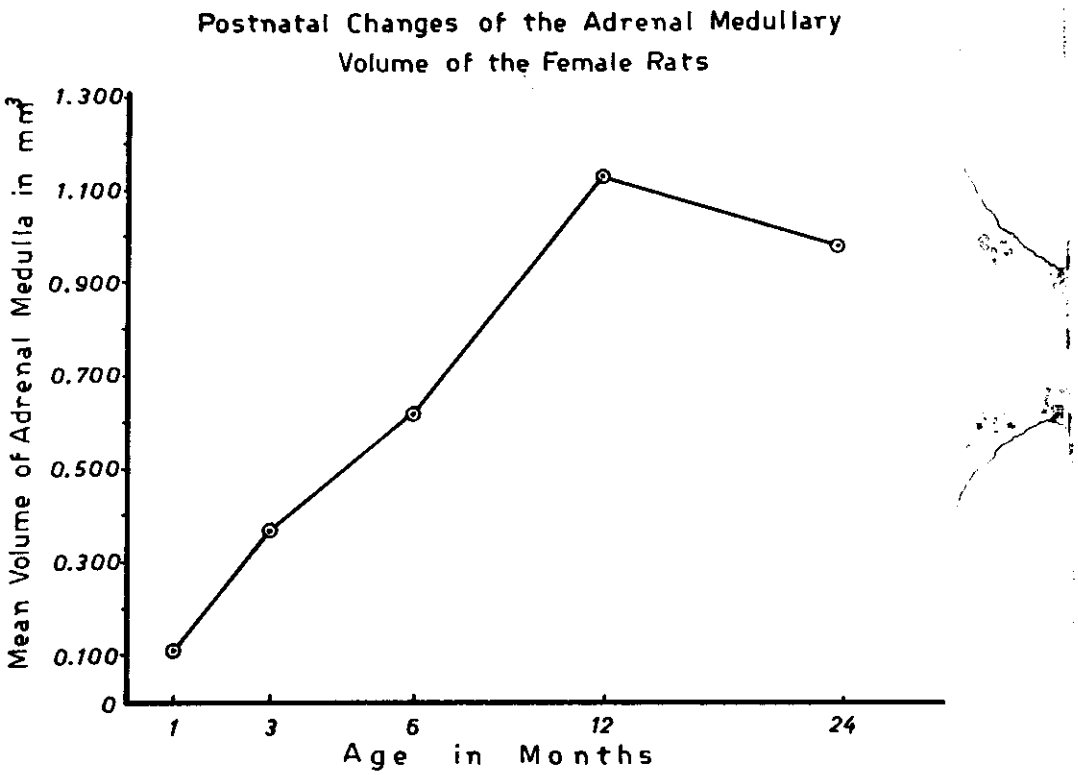

Postnatal Changes of the Adrenal Medullary Volume of the Female Rats
Mean Volume of Adrenal Medulla in mm³
1.300
1.100
0.900
0.700
0.500
0.300
0.100
0
1
3
6
12
24
Age in Months

Fig. (17)

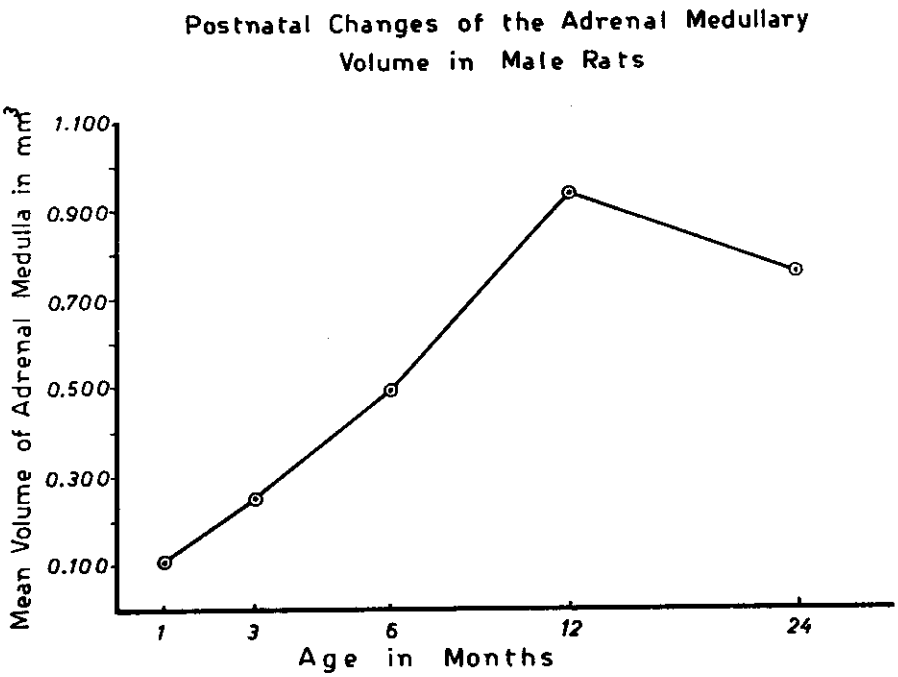

Postnatal Changes of the Adrenal Medullary Volume in Male Rats
Mean Volume of Adrenal Medulla in mm³
1.100
0.900
0.700
0.500
0.300
0.100
1
3
6
12
24
Age in Months

Fig. (18)

(Figs. 14 & 15) show the changes of the mean number of adrenaline and noradrenaline cells in female and male rats respectively, and it shows that the number of adrenaline cells is always increasing till it reaches its maximum number at the senile age, but the noradrenaline cells reaches its maximum number at the age of one year, then declines in the senile rats, in both sexes.

(Fig. 16) shows the postnatal changes of the volume of adrenal medulla in female and male rats and it reveals that the male adrenal medullary volume is always smaller than in the female rats.

(Figs. 17 & 18) show that the adrenal medullary volume is always increasing with age, in female and male rats till it reaches its maximum size at the age of one year then declines again in the senile rats.

Rats subjected to unilateral adrenalectomy :

A. Cell Counts :

The number of adrenaline cells in the operated five females rats ranged from 62700 to 101700 with a mean of 89400 (S.D. = ± 5744.6 & S.E. = ± 2567) as shown in(Table 27). While, the corresponding number of adrenaline cells

Table 27: The number of adrenaline cells in adrenal medullae of female and male rats subjected to unilateral adrenalectomy.

Gland's number	Number of adrenaline cells	Gland's number	Number of adrenaline cells
♀ M_2	62 700	♂ M_5	108 300
♀ M_6	101 700	♂ M_8	94 100
♀ M_7	100 200	♂ M_1	95 300
♀ M_3	92 700	♂ M_4	99 300
♀ M_9	82 700	♂ M_{12}	113 400

Mean number of A cells in ♀	S.D.	S.E.	Mean number of A cells in ♂	S.D.	S.E
89 400	5744.6	2567	102 080	8432.1	3768.3

in the operated five male rats, ranged from 94100 to 108300 with a mean of 102080 (S.D. = ± 8432.1 & S.E. = ± 3768.3) as shown in(Table 27).

This apparent increase of the number of adrenaline cells in the operated male rats than the female ones proved to be of no statistical significance (P = 0.05).

However, the number of noradrenaline cells in the operated five female rats ranged from 21300 to 40100 with a mean of 31140 (S.D. = ± 7355.3 & S.E. = ± 3286.3) as shown in(Table 28). While, the corresponding number of noradrenaline cells in the operated five male rats ranged from 30500 to 45700 with a mean of 36380 (S.D. = ± 6090.9 & S.E. = ± 2725.9) as shown in(Table 28).

This apparent increase of the number of noradrenaline cells in the male rats than the female ones proved to be of no statistical significance (P = 0.05).

B) Medullary volume :

The planimetric measurements of the adrenal medullary volumes of the operated five female rats, ranged from 0.419 to 0.521 mm^3 with a mean of 0.483 mm^3

Table 28: The number of noradrenaline cells in the adrenal medullae of female and male rats subjected to unilateral adrenalectomy.

Gland's number	Number of noradrenaline cells	Gland's number	Number of noradrenaline cells
♀ M_2	40 100	♂ M_1	36 800
♀ M_3	26 900	♂ M_4	37 600
♀ M_6	21 300	♂ M_5	31 300
♀ M_7	31 700	♂ M_8	45 700
♀ M_9	35 700	♂ M_{12}	30 500

Mean number of NA cells in ♀	S.D.	S.E.	Mean number of NA cells in ♂	S.D.	S.E.
31 140	7355.3	3286.3	36 380	6090.9	2725.9

S.D. = Standard deviation

S.E. = Standard error.

(S.D. = ± 0.046 & S.E. = ± 0.02) as shown in(Table 29) and(Fig. 19). While, the adrenal medullary volumes of the operated five males ranged from 0.573 to 0.663 mm^3 with a mean of 0.618 mm^3 (S.D. = ± 0.040 & S.E. = ± 0.018) as shown in(Table 29)and(Fig. 20).

This apparent increase of the volume of adrenal medulla of operated males rats than the operated females, proved to be statistically highly significant (P = 0.01).

Comparison of the results of the operated rats to the control ones :

I. Cell Counts :

A. Female :

The number of adrenaline cells in the studied eight control female rats ranged from 70200 to 108200 with a mean of 86075. While, the corresponding number of adrenaline cells in the operated five female rats ranged from 62700 to 101700 with a mean of 89400, as shown in(Tables 2 & 27)and(Fig. 21).

This apparent increase of the number of adrenaline cells in the operated fem-

Table 29: The volume adrenal medullae of female and male rats subjected to unilateral adrenalectomy.

Gland's number	Volume of adrenal medulla (mm^3)	Gland's number	Volume of adrenal medulla (mm^3)
♀ M_2	0.419	♂ M_1	0.632
♀ M_3	0.516	♂ M_4	0.663
♀ M_6	0.509	♂ M_5	0.579
♀ M_7	0.521	♂ M_8	0.642
♀ M_9	0.450	♂ M_{12}	0.573

Mean Volume of ♀ adrenal medulla	S.D.	S.E.	Mean Volume of ♂ adrenal medulla	S.D.	S.E.
0.483 mm^3	0.046	0.020	0.618 mm^3	0.040	0.018

S.D. = Standard deviation

S.E. = Standard error.

Fig. (19) : Section in adrenal gland of female rat unilaterally adrenalectomized, showing larger volume of medulla in comparison to the control. (X 35)

Fig. (20) : Section in adrenal gland of male rat unilaterally adrenalectomized, showing larger volume of medulla than the operated female. (X 35).

Comparison of the Number of Adrenaline Cells
in the Adrenal Medulla of
Normal Female and Male Rats (Aged 3 Months)
and those subjected to Unilateral Adrenalectomy

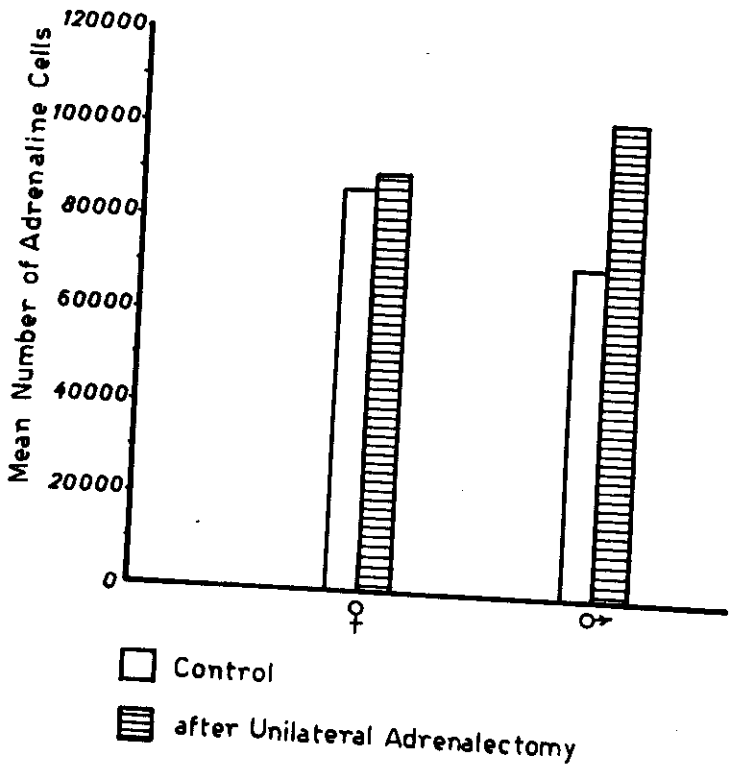


Fig. (21)

non significant (P = 0.05). However, the number of noradrenaline cells in the studied eight control female rats, ranged from 32200 to 55700 with a mean of 46463. While, the corresponding number of noradrenaline cells in the operated five females rats ranged from 21300 to 40100 with a mean of 31140 as shown in (Tables 3 & 28) and (Fig. 22).

This apparent decrease of the number of noradrenaline cells in the operated females than the control ones, proved to be statistically highly significant (P = 0.01).

B. Male :

The number of adrenaline cells in the studied five control male rats ranged from 67500 to 75100 with a mean of 71440. While the corresponding number of adrenaline cells in the operated five male rats ranged from 94100 to 108300 with a mean of 102080, as shown in (Tables 4 & 27) and(Fig. 21).

This apparent increase of the number of adrenaline cells in the operated male rats than the control ones, proved to be statistically highly significant (P = 0.01).

Comparison of the Number of Noradrenaline Cells
in the Adrenal Medulla of
Normal Female and Male Rats (Aged 3 Months)
and those subjected to Unilateral Adrenalectomy

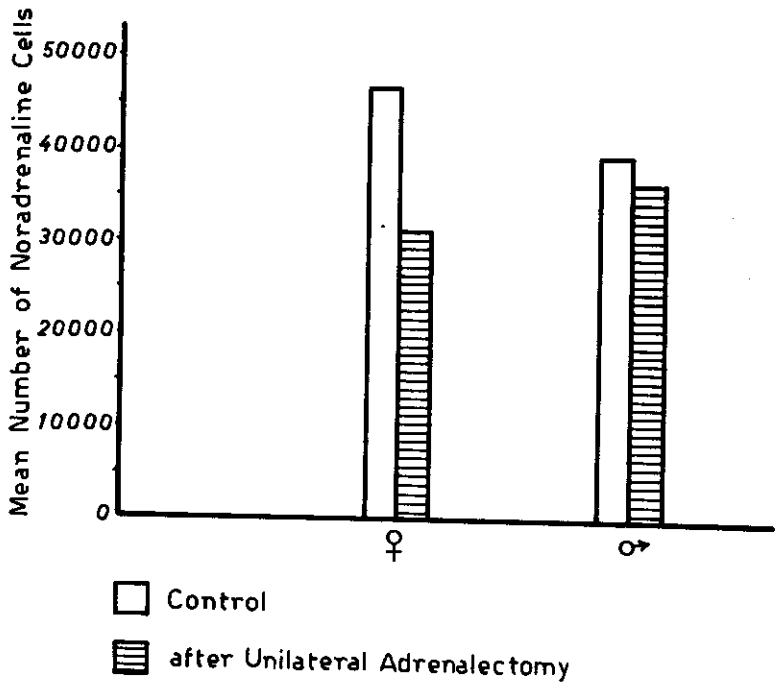


Fig. (22)

However, the number of noradrenaline cells in the studied five control male rats ranged from 36400 to 42400 with a mean of 38960. While, the corresponding number of noradrenaline cells in the operated five male rats ranged from 30500 to 45700 with a mean of 36380 as shown in (Tables 5 & 28) and (Fig. 22).

This apparent decrease of the number of noradrenaline cells in the operated male rats than in the control ones proved to be statistically non significant (P = 0.05).

Medullary volume :

Female : The volumes of adrenal medullae of the studied eight control female rats, ranged from 0.155 to 0.496 with a mean of 0.370 mm^3. While, the corresponding adrenal medullary volumes in the five operated female rats, ranged from 0.419 to 0.521 mm^3 with a mean of 0.483 mm^3 as shown in (Tables 6 & 29) and (Fig. 23) .

This apparent increase of the volume of adrenal medullae in female rats after unilateral adrenalectomy proved to be statistically significant (P = 0.05).

Comparison of the Adrenal Medullary Volume of Normal Female and Male Rats (Aged 3 Months) and those subjected to Unilateral Adrenalectomy

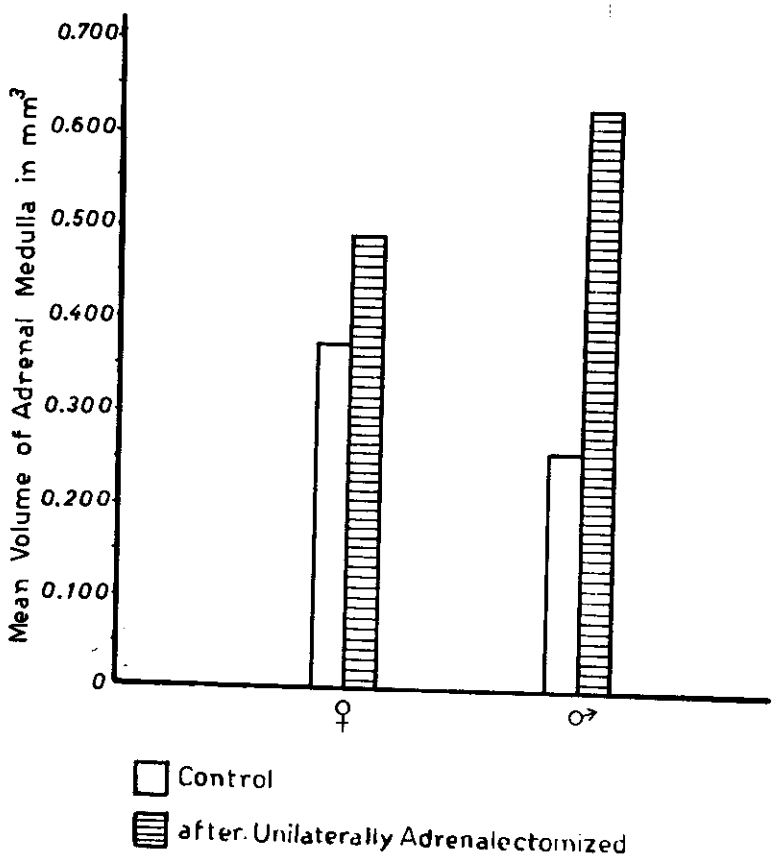


Fig. (23)

Male : The volumes of adrenal medullae of the studied five control male rats, ranged from 0.209 to 0.349 mm^3 with a mean of 0.253 mm^3. While, the corresponding volumes in the five operated male rats, ranged from 0.573 to 0.663 with a mean of 0.618 mm^3 as shown in(Tables 6 & 29) and (Fig. 23) .

This apparent increase of the volume of adrenal medullae of the operated male rats proved to be statistically highly significant (P = 0.01).

Comparison of the total number of adrenomedullary cells in the operated and control rats :

Female : The mean number of adrenomedullary cells in the control rats is 132538 while after unilateral adrenalectomy reaches 120540(Fig. 24). But, this decrease of the number of cells proved to be statistically non significant (P = 0.05).

Male : The mean number of adrenomedullary cells in the control male rats is 110400 while after unilateral adrenalectomy reaches 138460(Fig. 24). This increase of the number of cells in the operated males rats proved statistically highly significant (P = 0.01).

Comparison of the Mean Total Number
of Adrenomedullary Cells in
Normal Female and Male Rats (Aged 3 Months)
and those subjected to Unilateral Adrenalectomy

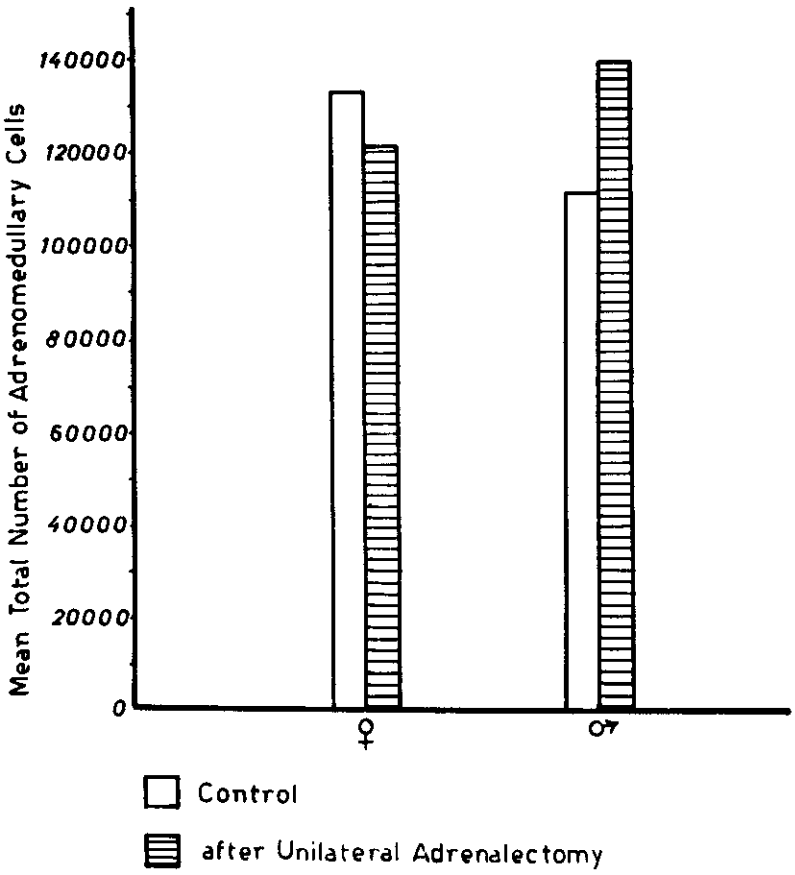


Fig. (24)