RESULTS

In the present studies, the effects of different concentrations of protein in diet and also the effects of calcium channel blocker (verapamil) on progression of experimental chronic renal failure in rats were studied. The present studies were classified into the following groups :

* Group I. (control experiments) :

This group included 10 rats. Sham operation were done by exposing & decapsulating the left and right kidney respectively in two stages operation. They were fed normal protein diet and followed for 12 weeks after sham operation.

* Group II. (effects of different concentrations of protein in diet on progression of chronic renal failure) :

This group included 35 rats and it was subdivided into three subgroups :

Group IIa : It included 12 rats. They were fed normal protein diet containing 16 % protein.

Group IIb : It included 11 rats. They were fed high protein diet containing 32 % protein.

Group IIc : It included 12 rats. They were fed low protein diet containing 8 % protein.

In all the rats chronic renal failure was induced by the cryosurgery method.

* Group III (effects of verapamil injection on progression of chronic renal failure) :

This group included 12 rats. After induction of chronic

renal failure by cryosurgery, the rats were injected subcutaneously with verapamil in a dose of 0.1 ug/gm b.wt. twice daily.

* Group I. Control group :

The results are shown in table 1, 2, 3 and 4. In normal rats (before sham operation), table (1) shows that body weight ranged between 195 - 220 gm and the mean value was 207.2 ± 7.8 gm. Two weeks after sham operation, there was weight gain. The weight of the rats ranged between 205 - 228 gm and the mean value was 214.45 ± 6.38 gm showing significant increase compared with results before sham operation ($P < 0.02$). The increase in body weight progressed, thus, 4 weeks after sham operation, the weight of the rats ranged between 209 - 228 gm and with a mean value 218.63 ± 5.084 gm, showing significant increase compared with the results before sham operation ($P < 0.001$). Six weeks after sham operation, the significant gain in body weight continued, it ranged between 213 - 231 gm and the mean value was 221.9 ± 5.258 gm ($P < 0.001$). Eight weeks after sham operation, the weight of the rats as shown in table (1) ranged between 216 - 233 gm and the mean value was 224.88 ± 5.06 gm, still showing a significant increase compared with the results before sham operation ($P < 0.001$). Ten weeks after sham operation, the weight of the rats ranged between 218 - 235 gm and the mean value was 225.4 ± 5.547 gm showing significant increase compared with the results before sham operation ($P < 0.001$). Twelve weeks

after sham operation, the body weight range was 220 - 237 gm and the mean value was 228.25 ± 4.89 gm, showing also significant increase compared with the results before sham operation ($P < 0.001$).

The results of changes in blood urea are seen in table (2). It can be seen that before sham operation, blood urea ranged between 45.4 - 50 mg % with a mean value 47.48 ± 1.71 mg %. Two weeks after sham operation, the blood urea ranged from 46 - 50 mg % and the mean value was 48.35 ± 1.56 mg %, showing no change compared with the values before sham operation ($P > 0.05$). The results four weeks after sham operation showed that, the blood urea level ranged between 46 - 50 mg % and the mean value was 48.35 ± 1.56 mg % still showing no significant change compared with the value before sham operation ($P > 0.05$). As observed from table (2), six weeks after sham operation, the blood urea level ranged between 46.5 - 50 mg % and the mean value was 48.05 ± 1.41 mg % showing no significant change compared with the values before sham operation ($P > 0.05$). The blood urea level after 8, 10 and 12 weeks as shown in table (2) ranged between 46.5 - 50, 46.5 - 50 and 48 - 50 mg % and the mean value were 48.7 ± 1.43, 49.0 ± 1.25 and 48.93 ± 0.904 mg % respectively, no significant difference from the preoperative value were noticed.

The serum creatinine level before sham operation as shown in table (3) ranged between 0.9 - 1.0 mg % and the

mean value was 0.95 ± 0.04 mg %. Similar to the blood urea, the sham operation did not significantly affect the serum creatinine level. As shown in table (3), the serum creatinine level after 2, 4, 6, 8, 10 and 12 weeks was 0.96 ± 0.06, 0.98 ± 0.08, 0.99 ± 0.08, 0.98 ± 0.09, 1.0 ± 0.09 and 0.987 ± 0.08 mg % respectively.

The blood PH value in rats subjected to sham operation before the sham operation as shown in table (4), ranged between 7.36 - 7.4 with a mean value 7.38 ± 0.02. Similar to the other parameters investigated namely blood urea and serum creatinine, no significant effect of the sham operation was noticed. The PH after 2, 4, 6, 8, 10, and 12 weeks was of a mean value 7.38 ± 0.02, 7.38 ± 0.02, 7.38 ± 0.01, 7.38 ± 0.02, 7.38 ± 0.02 and 7.38 ± 0.02 respectively.

The survival rate 2, 4, 6, 8, 10 and 12 weeks after sham operation was 100 %, 100 %, 90 %, 80 %, 70 % and 70 % respectively.

* Group II. (Effects of different concentration of protein in diet on progression of chronic renal failure) :

Group IIa : (Effects of normal protein diet on progression of chronic renal failure):

The results are shown in table 5, 6, 7 and 8. It can be seen that the body weight, 2 weeks after induction of chronic renal failure and feeding normal protein diet ranged between 195 - 240 gm and the mean value was 216 ± 14.69 showing no significant change compared with the corresponding value in the control group (P > 0.05). Four

weeks after induction of chronic renal failure as seen from table (5), the body weight in rats fed normal protein diet (16 gm %) ranged between 186 - 225 gm with a mean value 202 ± 13.2 gm showing a significant decrease compared with the control value ($P < 0.001$). The significant decrease in the body weight compared with the control group progressed till the end of the experiment (after 12 weeks). Thus as shown from table (5), the body weight 6 weeks after induction of chronic renal failure ranged between 180 - 215 gm with a mean value 200 ± 12.31 gm ($P < 0.001$). After 8 weeks, the range was 176 - 201 gm and the mean value was 187.5 ± 10.21 gm ($P < 0.001$). The corresponding range of body weight after 10 and 12 weeks as seen from table (5) was 172 - 196 gm and 170 - 192 gm respectively with the mean values 182 ± 10.51 gm and 180.8 ± 10.15 gm respectively. Still these values are significantly less than the corresponding values of the control group ($P < 0.001$).

The results of the blood urea level in the rats subjected to induced chronic renal failure and fed normal protein diet are shown in table (6). It can be seen that there was a significant progressive increase compared with the corresponding values in control group (table 2). 2 weeks after the operation, the blood urea level ranged between 54.6 - 68.75 mg %, the mean value as noted from table (6) was 59.58 ± 5.52 mg % ($P < 0.001$). After 4 weeks, blood urea ranged between 65.5 - 82.25 mg % with a mean value 76.18 ±

5.38 mg % ($P < 0.001$). After 6 weeks,the range become 74 - 91 mg % and the mean blood urea level was 85.02 $\pm$ 5.3 mg % ($P < 0.001$). As seen from table (6), the ranges of the blood urea level after 8, 10 and 12 weeks were 83.5 - 99 mg %, 92.5 - 108.25 mg % and 101 - 118.5 mg % respectively. The corresponding mean value was 94 $\pm$ 6.75, 102.83 $\pm$ 6.36 and 112.15 $\pm$ 6.73 mg % respectively. All values show a significant increase compared with the corresponding values in the control group ($P < 0.001$).

The serum creatinine level, in the rats subjected to induced chronic renal failure and fed normal protein diet is shown in table (7). A significant progressive increase in the serum creatinine level compared with the corresponding values of the control group (2, 4, 6, 8, 10 and 12 weeks after operation) was observed ($P < 0.001$). Thus two weeks after the operation, serum creatinine level ranged between 1.5 - 2.2 mg % with a mean value 1.93 $\pm$ 0.35 mg %. After four weeks, the range of serum creatinine level was 2 - 3 mg % with a mean value 2.46 $\pm$ 0.4 mg %. The serum creatinine level 6 weeks after the operation ranged between 2.8 - 3.6 mg % and the mean value was 3.18 $\pm$ 0.28 mg %. The range after 8 weeks was 3.7 - 4.4 mg %, the mean value being 4.05 $\pm$ 0.26 mg %. After 10 and 12 weeks, the range of serum creatinine level as seen from table (7) was 5.2 - 5.8 mg % and 6 - 6.5 mg %. The corresponding mean values were 5.53 $\pm$ 0.24 mg % and 6.18 $\pm$ 0.24 mg % respectively.

As observed from table (8), PH of the blood of rats sujected to induced renal failure and fed normal protein diet did not show any significant change compared with the corresponding PH in the control group. The PH value after 2, 4, 6, 8, 10 and 12 weeks was 7.38 ± 0.01, 7.38 ± 0.01, 7.38 ± 0.01, 7.38 ± 0.01, 7.38 ± 0.02, 7.38 ± 0.02 and 7.38 ± 0.01 respectively.

The survival rate in rats fed normal protein diet 4, 6, 8, 10 and 12 weeks after induction of chronic renal failure was 83 %, 66 %, 50 %, 42 % and 33 % respectively compared with the number of rats 2 weeks after the operation.

Group IIb : Effects of high protein diet 32 gm % on progression of chronic renal failure in rats.

Table (9) shows the body weight in grams in this group of rats. It can be seen that 2 weeks after induction of the chronic renal failure, the body weight ranged between 192 - 230 gm, the mean value was 206.33 ± 10.85 gm. This value shows no change compared with the corresponding value of the control group. However, starting from the value after 4 weeks onward, a significant progressive decrease in the body weight was observed. As observed from table (9), the body weight in this group of rats ranged between 187 - 290 gm, the mean value was 197.5 ± 7.53 gm ($P < 0.001$). 6 weeks after the operation, the range become 186 - 202 gm, the mean value was 189.25 ± 7.99 ($P < 0.001$). After 8 weeks the corresponding range was 183 - 192 gm and the mean value was

187 ± 3.03 gm. As seen from table (9), the body weight 10 weeks after the operation ranged between 181 - 188 gm, the mean value was 183 ± 3.36 ($P < 0.001$). After 12 weeks, the corresponding range was 179 - 184 gm with a mean value 180.75 ± 2.21 gm ($P < 0.001$).

The blood urea level in this group of rats as shown from table (10) shows a significant increase ($P < 0.001$). The increase started 2 weeks after induction of chronic renal failure and it progressed till the end of the experiment after 12 weeks. As showed from table (10), the blood urea 2 weeks after the operation ranged between 58.5 - 76.5 mg % with a mean value 66.69 ± 5.59 mg %. After 4 weeks, the range of blood urea was 70.5 - 88.5 mg % and the mean value was 77.67 ± 5.06 mg %. The corresponding range after 6 weeks was 83.0 - 98.25 mg %, the mean value was 89.31 ± 6.06 mg %. As also observed from table (10), the blood urea level after 8, 10 and 12 weeks ranged between 92.5 - 101.5 mg %, 102.5 - 108.25 mg % and 110.5 - 116.5 mg % respectively. The corresponding mean values were 95.5 ± 3.54 mg %, 104.93 ± 2.9 mg % and 112.5 ± 2.82 mg% respectively.

Table (11) shows the effects of feeding rats suffering of chronic renal failure high protein diet on serum creatinine level. It can be seen that, similar to the blood urea level a progressive significant increase in serum creatinine compared with the corresponding value of the control group was noticed ($P < 0.001$). 2 weeks after the operation, serum creatinine ranged between 1.8 - 2.6 mg %,

the mean value was 2.15 ± 0.32 mg %. 4 weeks after the operation, the range became 2.4 - 3.2 mg %, the mean value being 2.73 ± 0.31 mg %. 6 weeks after the operation serum creatinine level as noticed from table (11) ranged between 3 - 4.1 mg %, the mean value was 3.45 ± 0.43 mg %. After 8 weeks, the range of serum creatinine was 4.1 - 4.8 mg % and the mean value was 4.45 ± 0.25 mg %. After 10 weeks, the range was 5.2 - 5.8 mg %, the mean value was 5.4 ± 0.28 mg %. 12 weeks after the operation, the range of the serum creatinine in this group of rats was 6 - 6.7 mg % and the mean value was 6.22 ± 0.33 mg %.

As seen from table (12), no effect of high protein diet on the blood PH was noticed. Thus 2, 4, 6, 8, 10 and 12 weeks after induction of chronic renal failure, the blood PH was of the mean values: 7.38 ± 0.01, 7.38 ± 0.02, 7.38 ± 0.02, 7.38 ± 0.02, 7.38 ± 0.02 and 7.38 ± 0.02 respectively.

The survival rate in rats fed high protein diet 4, 6, 8, 10 and 12 weeks after induction of chronic renal failure was 82 %, 64 %, 45 %, 27 % and 27 % respectively compared with the number of rats 2 weeks after the operation. The survival rate values in this group were lower compared with the corresponding values in rat group fed normal protein diet.

Group IIc : (The effects of low protein diet on the progression of chronic renal failure in rats).

Table (13) shows the changes in body weight of rats subjected to induced chronic renal failure and fed low

protein diet (8 gm %). It can be seen that 2 weeks after induction of chronic renal failure the body weight ranged between 194 - 240 mg. The mean value was 208.41 ± 14.39 gm. The body weight of rats in this group showed progressive significant decrease ($P < 0.001$) all through the time interval of the experiment (12 weeks). Thus as seen from table (13), the body weight after 4 weeks ranged between 184 - 225 gm, the mean value being 197 ± 12.4 gm. After 6 weeks, the range of body weight was 176 - 215 gm, the mean value was 184.63 ± 11.04 gm. As seen from table (13), 8 weeks after induction of chronic renal failure, the body weight ranged between 170 - 210 mg with a mean value 178 ± 11.45 gm. After 10 weeks the corresponding range was 168 - 202 gm. The mean value was 175.3 ± 10.17 gm. At the end of the experiment (after 12 weeks), the range of body weight was 162 - 198 gm and the mean value was 171.22 ± 10.79 gm.

The results of the blood urea level in this group of rats (fed low protein diet) are shown in table (14). It can be seen that the blood urea level showed a progressive significant increase compared with the corresponding value in the control group ($P < 0.001$). The increase started 2 weeks after the operation, where the blood urea level ranged between 55.5 - 66 mg % with a mean value 61.14 ± 3.39 mg %. This significant rise in blood urea level progressed all through the time interval of the experiment (12 weeks). Thus after 4 weeks (table 14), the blood urea level ranged

between 57.5 - 68 mg %, the mean value was 63.42 ± 3.32 mg %. The corresponding range after 6 weeks was 61.5 - 70.25 mg % and the mean value was 66.9 ± 3.02 mg %. The ranges of the blood urea level after 8, 10 and 12 weeks were 66.5 - 76.5 mg %, 72 - 81.5 mg % and 84.5 - 92.5 mg % respectively. The mean values of the blood urea level as noticed from table (14), 8, 10 and 12 weeks after the operation were 72.03 ± 3.18, 76.75 ± 3.01 and 87.81 ± 2.49 mg % respectively. It is to be recalled that all these values are significantly higher than the corresponding value in the control group (table 2) ($P < 0.001$).

The effect of feeding rats with chronic renal failure a low protein diet on serum creatinine level are shown in table (15). Similar to the blood urea level, serum creatinine level showed a significant ($P < 0.001$) progressive rise which starts 2 weeks after the operation (range 1.4 - 2.4 mg % and mean value 1.8 ± 0.22 mg %). After 4 weeks, the range became 1.7 - 2.4 mg % and the mean value was 2.04 ± 0.24 mg %. After 6 weeks, serum creatinine ranged between 2.1 - 2.6 mg % and the mean value was 2.35 ± 0.19 mg %. The serum creatinine level after 8 weeks as noticed from table (15) ranged between 2.4 - 3.5 mg % with a mean value 2.82 ± 0.36 mg %. After 10 and 12 weeks, the serum creatinine level ranged between 2.8 - 3.4 mg % and 3.5 - 3.8 mg % respectively. The corresponding mean values were 3.08 ± 0.16 and 3.68 ± 0.1 mg %.

Similar to the other groups of rats investigated (IIa and IIb) no change in blood PH was observed, in this group of rats fed low protein diet, the blood PH as seen from table (16) 2, 4, 6, 8, 10 and 12 weeks after the operation were 7.38 ± 0.02, 7.38 ± 0.01, 7.38 ± 0.01, 7.38 ± 0.01, 7.38 ± 0.01 and 7.38 ± 0.02 respectively.

The survival rate in rats fed low protein diet 4, 6, 8, 10 and 12 weeks after induction of chronic renal failure was 92 %, 83 %, 83 %, 75 % and 67 % respectively compared with the number of rats 2 weeks after the operation. The survival rate values in this group were higher than the corresponding values in rat group fed normal protein diet.

* Group III: Effects of the calcium channel blocker (verapamil) on the progress of induced chronic renal failure in rats.

The body weight in rats suffering from induced chronic renal failure and injected verapamil at a dose 0.1 ug/gm b.wt. twice/day is shown in table (17). No change in body weight as compared with the control was observed after 2 weeks (the range was 195 - 240 gm and the mean value was 210 ± 12.66 gm). Similar to the other groups of induced renal failure, a significant decrease in the body weight was observed after 4 weeks (the range was 188 - 232 and the mean value was 202 ± 13.02 gm) and progressed through the 6, 8, 10 and 12 weeks of the experiment ($P < 0.001$). As noticed from table 17, the body weight after 6 weeks ranged between 186 - 230 gm, the mean value was 202.63 ± 13.95 gm. After 8 weeks as seen from

table 17, the body weight of rats with induced chronic renal failure and injected verapamil ranged between 188 - 228 gm, the mean value was 204.1 ± 12.88 gm. The corresponding ranges after 10 and 12 weeks were 190 - 226 gm and 188 - 220 gm, the mean values 204.5 ± 12.14 and 200.22 ± 10.08 gm respectively ($P < 0.001$).

Table (18) shows the changes in blood urea level in this group of rats. As noticed, there was a significant progressive increase in the blood urea level ($P < 0.001$) which started after 2 weeks from induction of chronic renal failure (range 54 -70.5 mg % and mean value 59.65±4.88 mg %) and progressed all through the 12 weeks of the experiment. As seen from table (18), the blood urea after 4 weeks ranged between 58.6 - 74.5 mg % and the mean value was 66.08 ± 5.36 mg %. After 6 weeks, the range was 62.5 - 78 mg % with a mean value 71.05 ± 5.05 mg %. The range of blood urea after 8 weeks was 66-81.5 mg % and the mean value was 75.1 ± 5.18 mg %. The blood urea after 10 weeks ranged between 73 - 86.5 mg % with a mean value 80.1 ± 5.48 mg %. At the end of the experiment after 12 weeks as noticed from table 18, the blood urea level ranged between 85 - 98.5 mg % and the mean value was 91.5 ± 5.18 mg %.

The results of the changes in the serum creatinine level in rats with induced chronic renal failure and recieving the calcium channel blocker verapamil are seen in table (19). Similar to the other groups of rats with induced chronic renal failure and similar to the blood urea level,

serum creatinine showed a significant ($P < 0.001$) increase which started after 2 weeks and progressed till the end of the experiment (after 12 weeks). 2 weeks after the operation, serum creatinine ranged between 1.4 - 2.2 mg %, the mean value was 1.69 $\pm$ 0.26 mg %. After 4 weeks it ranged between 1.7 - 2.4 mg % with a mean value 1.92 $\pm$ 0.23 mg %. After 6 weeks, the range of serum creatinine level became 2.0 - 2.7 mg % with a mean value 2.26 $\pm$ 0.2 mg %. The serum creatinine level 8 weeks after the operation in the rats recieving verapamil as noticed from table (19) ranged between 2.4 - 3.0 mg % and the mean value was 2.62 $\pm$ 0.18 mg %. After 10 weeks the range was 2.8 - 3.4 mg %, the mean value was 3.09 $\pm$ 0.16 mg % At the end of the experiment (after 12 weeks), serum creatinine ranged between 3.2 - 3.6 mg % with a mean value 3.47 $\pm$ 0.14 mg %.

Table (20) shows the PH of the blood of rats with induced chronic renal failure and treated with verapamil. No change in the PH of the blood was noticed. Thus, the PH 2, 4, 6, 8, 10 and 12 weeks after induction of chronic renal failure was of a mean value : 7.38 $\pm$ 0.01, 7.38 $\pm$ 0.02, 7.38 $\pm$ 0.02, 7.38 $\pm$ 0.02, 7.38 $\pm$ 0.02 and 7.38 $\pm$ 0.02 respectively.

The survival rate in rats fed normal protein diet and treated with verapamil 4, 6, 8, 10 and 12 weeks after induction of chronic renal failure was 92 %, 83 % , 75 %, 75 % and 67 % respectively compared with the number of rats

2 weeks after the operation. The survival rate values in this group were higher than the corresponding values in rat group fed normal protein diet and not treated with verapamil.

Table (25) and figure (1) compare the body weight of rats of control group and all the studied rat groups. It can be seen that there was significant weight loss in all the studied groups compared with control group throughout the time of experiment (12 W) ($P < 0.001$). There was no significant change in body weight of rat group fed high protein diet compared with those fed normal protein diet except at 2 W and 6 W after the operation where there was significant weight loss ($P < 0.05$). The table, also, showed that there was no significant difference in body weight between rats fed low protein diet and those fed normal diet except at 12 weeks after the operation where there was significant weight loss in rats fed low protein diet ($P < 0.01$). It can be seen, also, that there was significant increase in body weight in rats treated with verapamil 8 weeks, 10 weeks and 12 weeks after the operation compared with rats fed normal protein diet but not treated with verapamil ($P < 0.02$, <0.01 and < 0.01 respectively). The percentage decrease in body weight after 12 weeks compared with 2 weeks value was 16.3 %, 12.4 %, 17.8 % and 4.6 % in rats fed normal protein diet, high protein diet, low protein diet and those fed normal protein diet and was treated with verapamil respectively.

Comparison of blood urea level in all the studied rat groups is shown in table (26) and figure(2). It can be seen that there was significant rise in blood urea in all the studied groups compared with control group throughout the time of experiment ($P < 0.001$). There was no significant diffenece between rats fed high and normal protein diet except 2 weeks after the operation where there was significant increase in blood urea level in rats fed high protein diet ($P < 0.001$). From table (26) it can be seen also that, there was significant decrease in blood urea level in rat group fed low protein diet and those treated with verapamil compared with the values in rats fed normal protein diet throughout the time of the experiment ($P < 0.001$). The percentage increase in blood urea after 12 weeks compared with 2 weeks value was 89 %, 69 %, 43.6 % and 53 % in rats fed normal protein diet, high protein diet, low protein diet and rats treated with verapamil respectively.

Table (27) and figure (3) compares serum creatinine level in all the studied rat groups. It can be seen that, there was significant rise in serum creatinine in all the studied groups compared with the values in control group and the rise was continued throughout the time of experiment ($P < 0.001$). The table also showed that, there was no significant change in serum creatinine level between rats fed normal and high protein diet except 8 weeks after operation where there was significant increase in serum

creatinine level in rats fed high protein diet compared with those fed normal protein diet ($P < 0.01$). It can be seen also that, there was significant decrease in serum creatinine level in rats fed low protein diet and those treated with verapamil compared with the values of rats fed normal protein diet throughout the time of the experiment ($P < 0.001$). The percentage increase in serum creatinine level after 12 weeks compared with 2 weeks value was 220 %, 189 %, 104 % and 105% in rats fed normal protein diet, high protein diet, low protein diet and those rats treated with verapamil respectively.

The survival rate 12 weeks after the operation in rats fed normal protein diet, high protein diet, low protein diet and those treated with verapmil was 33 %, 27 %, 67 % and 67 % respectively compared with the number of rats two weeks after operation as shown in table (29).

Table (1)

Body weight (gm) in control group before and after sham operation

No	Before Sham operation	time after sham operation					
		2w	4w	6w	8w	10w	12w
1	203	210	218	222	224	226	228
2	212	218	223	227	230	218	220
3	209	216	219	---	---	---	---
4	195	205	209	213	216	---	---
5	210	216	221	224	226	228	229
6	200	210	216	219	221	223	226
7	205	212	218	221	223	225	227
8	203	210	215	218	228	231	232
9	220	228	223	226	233	235	237
10	215	224	228	231	---	---	---
R.	195-220	205-228	209-228	213-231	216-233	218-235	220-237
M.	207.2	214.45	218.63	221.9	224.88	225.4	228.25
SD.	± 7.18	± 6.38	± 5.084	± 5.258	± 5.06	± 5.547	± 4.89
P		*<0.02	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

* P Statistically significant compared with the values before sham operation.

Table (2)

Blood urea level (mg%) in control group before and after sham operation

No	Before Sham operation	time after sham operation					
		2w	4w	6w	8w	10w	12w
1	45.4	46	46	46.5	46.5	46.5	48.5
2	45.4	46.5	46.5	46.5	46.5	50	50
3	46	47	47	---	---	---	---
4	48	48	48	48.5	50	---	---
5	50	50	50	50	50	50	50
6	50	50	50	50	50	50	48.5
7	47	48	48	48.5	48.5	48.5	48
8	48.5	50	50	50	48.5	48.5	48.5
9	46	48	48	48.5	50	50	50
10	48.5	50	50	50	---	---	---
R.	45.4-50	46-50	46-50	46.5-50	46.5-50	46.5-50	48-50
M.	47.48	48.35	48.35	48.05	48.7	49	48.93
SD.	± 1.71	± 1.56	± 1.56	± 1.41	± 1.43	± 1.25	± 0.904
P		>0.05	>0.05	>0.05	>0.05	*<0.05	*<0.05

* p Statistically significant compared with the values before sham operation.

Table (3)

Serum creatinine level (mg%) in control group before and after sham operation

No	Before Sham operation	time after sham operation					
		2w	4w	6w	8w	10w	12w
1	0.9	0.9	0.9	0.9	0.9	0.9	0.9
2	0.9	0.9	0.9	0.9	0.9	1.0	1.0
3	1.0	0.9	0.9	---	---	---	---
4	1.0	1.0	1.0	1.0	1.0	---	---
5	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6	0.9	1.0	1.1	1.1	1.1	1.1	1.0
7	0.95	0.9	0.9	0.9	0.9	0.9	0.9
8	0.98	0.95	0.98	0.98	1.1	1.1	1.1
9	0.9	1.0	1.1	1.1	1.1	1.1	1.1
10	1.0	1.1	1.1	1.1	---	---	---
R.	0.9-1.0	0.9-1.1	0.9-1.1	0.9-1.1	0.9-1.1	0.9-1.1	0.9-1.1
M.	0.95	0.96	0.98	0.99	0.98	1.0	0.987
SD.	± 0.04	± 0.06	± 0.08	± 0.08	± 0.09	± 0.09	± 0.08
P		>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Table (4)

Blood PH value in control group before and after sham operation

No	Before Sham operation	time after sham operation					
		2w	4w	6w	8w	10w	12w
1	7.4	7.38	7.4	7.38	7.38	7.38	7.38
2	7.4	7.36	7.38	7.4	7.4	7.4	7.4
3	7.35	7.4	7.4	---	---	---	---
4	7.4	7.38	7.35	7.4	7.38	---	---
5	7.38	7.4	7.38	7.36	7.4	7.36	7.4
6	7.36	7.35	7.4	7.35	7.35	7.35	7.4
7	7.4	7.4	7.36	7.4	7.4	7.4	7.38
8	7.38	7.4	7.4	7.4	7.36	7.4	7.4
9	7.4	7.38	7.38	7.38	7.4	7.38	7.35
10	7.38	7.4	7.4	7.4	---	---	---
R.	7.36-7.4	7.35-7.4	7.35-7.4	7.35-7.4	7.36-7.4	7.35-7.4	7.38-7.4
M.	7.38	7.38	7.38	7.38	7.38	7.38	7.38
SD.	± 0.02	± 0.02	± 0.02	± 0.01	± 0.02	± 0.02	± 0.02
P		>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Table (5)

Body weight (gm) of rats fed normal protein diet (16 % protein) after induction of chronic renal failure.

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	206	193	198	189	179	171
2	230	---	---	---	---	---
3	220	205	198	---	---	---
4	240	220	210	201	196	192
5	195	186	180	176	---	---
6	236	216	206	200	194	186
7	200	200	---	---	---	---
8	235	225	215	---	---	---
9	210	203	192	183	172	170
10	206	189	---	---	---	---
11	215	206	196	188	180	---
12	220	---	---	---	---	---
R.	195-240	186-225	180-215	176-201	172-196	170-192
M.	216	202.9	200	187.5	182	180.8
SD.	±14.69	± 13.2	± 12.31	± 10.21	± 10.51	± 10.15
P	>0.05	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

* P Statistically significant compared with control group.

Table (6)

Blood urea (mg%) in rats fed normal protein diet (16 % protein) after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	88.75	80.0	88.25	96.5	103.5	112.5
2	69.0	---	---	---	---	---
3	66.0	78.0	86.5	---	---	---
4	55.5	65.5	74.0	83.5	92.5	101.0
5	60.6	76.25	86.5	96.5	---	---
6	62.1	82.25	86.5	99.0	108.25	116.25
7	62.0	80.25	---	---	---	---
8	56.4	78.25	91.0	98.5	106.5	118.5
9	55.0	72.5	87.5	---	---	---
10	55.0	76.5	---	---	---	---
11	54.6	68.0	78.5	85.0	98.0	---
12	54.6	---	---	---	---	---
R.	54.6-68.75	65.5-82.25	74-91	83.5-99	92.5-108.25	101-118.5
M.	59.58	76.18	85.02	94	102.83	112.15
SD.	± 5.52	± 5.38	± 5.30	± 6.75	± 6.36	± 6.73
P	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

* P Statistically significant compared with control group.

Table (7)

Serum creatinine (mg %) in rats fed normal protein diet (16 % protein) after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	1.6	2.1	3.1	4.1	5.2	6.0
2	2.0	---	---	---	---	---
3	2.0	2.4	3.5	---	---	---
4	1.6	2.0	2.8	3.7	5.4	6.0
5	2.8	2.9	3.0	4.0	---	---
6	1.5	2.1	3.4	4.4	5.8	6.4
7	2.1	2.5	---	---	---	---
8	1.9	2.8	3.6	4.0	5.6	6.5
9	2.0	2.3	3.0	---	---	---
10	2.2	3.0	---	---	---	---
11	1.8	2.0	2.9	3.8	5.4	---
12	1.5	---	---	---	---	---
R.	1.5-2.2	2.0-3.0	2.8-3.6	3.7-4.4	5.2-5.8	6-6.5
M.	1.93	2.46	3.18	4.05	5.53	6.18
SD.	± 0.35	± 0.4	± 0.28	± 0.26	± 0.24	± 0.24
P	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

* P Statistically significant compared with control group.

Table (8)

Blood PH in rats fed normal protein diet (16 gm % protein) after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	7.4	7.4	7.38	7.35	7.35	7.36
2	7.38	---	---	---	---	---
3	7.39	7.35	7.4	---	---	---
4	7.4	7.4	7.4	7.36	7.3	7.38
5	7.36	7.39	7.36	7.4	---	---
6	7.38	7.4	7.38	7.4	7.4	7.4
7	7.39	7.35	---	---	---	---
8	7.4	7.38	7.36	---	---	---
9	7.38	7.4	7.4	7.36	7.4	7.4
10	7.38	7.4	---	---	---	---
11	7.4	7.38	7.4	7.4	7.4	---
12	7.36	---	---	---	---	---
R.	7.36-7.4	7.35-7.4	7.36-7.4	7.35-7.4	7.35-7.4	7.36-7.4
M.	7.38	7.38	7.38	7.38	7.38	7.38
SD.	± 0.01	± 0.01	± 0.01	± 0.02	± 0.02	± 0.01
P	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Table (9)

Body weight (gm) of rats fed high protein diet (32 gm % protein) after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	202	194	186	183	181	180
2	212	204	197	192	188	184
3	208	200	191	187	182	179
4	197	188	---	---	---	---
5	192	187	179	---	---	---
6	230	---	---	---	---	---
7	206	198	190	185	---	---
8	195	200	190	---	---	---
9	208	211	202	188	---	---
10	198	---	---	---	---	---
11	220	200	---	---	---	---
R.	192-230	187-200	186-202	183-192	181-188	179-184
M.	206.33	197.5	189.25	187	183	180.75
SD.	±10.85	±7.53	±7.99	±3.03	±3.36	± 2.21
P	>0.05	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

* P Statistically significant compared with control group.

Table (10)

Blood urea (mg%) in rats fed high protein diet (32 gm % protein) after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	58.5	70.5	83.0	92.5	102.5	110.5
2	64.5	76.5	88.5	96.25	106.5	112.5
3	70.1	82.25	90.5	101.5	108.25	116.5
4	66.5	78.5	----	----	----	----
5	72.5	88.5	98.25	----	----	----
6	73.5	----	----	----	----	----
7	60.5	72.5	86.5	97.0	----	----
8	76.5	78.5	86.5	----	----	----
9	66.5	76.5	83.0	95.5	----	----
10	64.5	----	----	----	----	----
11	60.25	74.5	----	----	----	----
R.	58.5-76.5	70.5-88.5	83-98.25	92.5-101.5	102.5-108.25	110.5-116.5
M.	66.69	77.67	89.31	95.5	104.93	112.5
SD.	± 5.59	± 5.06	± 6.06	± 3.54	± 2.9	± 2.82
P	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

* P Statistically significant compared with control group.

Table (11)

Serum creatinine (mg %) in rats fed high protein diet (32 gm % protein) after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	1.8	2.4	3.1	4.1	5.2	6.0
2	1.8	2.4	3.0	4.3	5.4	6.2
3	2.5	3.1	4.1	4.6	5.8	6.7
4	1.8	2.5	---	---	---	---
5	2.5	2.8	3.3	---	---	---
6	2.5	---	---	---	---	---
7	1.8	2.5	3.2	4.8	---	---
8	2.6	3.2	3.6	---	---	---
9	2.2	3.1	3.2	4.3	---	---
10	2.3	---	---	---	---	---
11	1.9	2.5	---	---	---	---
R.	1.8-2.6	2.4-3.2	3.0-4.1	4.1-4.8	5.2-5.8	6-6.7
M.	2.15	2.73	3.45	4.45	5.4	6.22
SD.	± 0.32	± 0.31	± 0.43	± 0.25	± 0.28	± 0.33
P	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

* P Statistically significant compared with control group.

Table (12)

Blood PH in rats fed high protein diet (32 gm % protein) after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	7.4	7.4	7.4	7.4	7.4	7.4
2	7.4	7.4	7.4	7.4	7.36	7.38
3	7.35	7.35	7.38	7.35	7.38	7.36
4	7.38	7.38	---	---	---	---
5	7.4	7.4	7.4	---	---	---
6	7.4	---	---	---	---	---
7	7.35	7.35	7.35	7.38	---	---
8	7.38	7.35	7.35	---	---	---
9	7.4	7.38	7.4	7.4	---	---
10	7.4	---	---	---	---	---
11	7.4	7.4	---	---	---	---
R.	7.35-7.4	7.35-7.4	7.35-7.4	7.35-7.4	7.36-7.4	7.36-7.4
M.	7.38	7.38	7.38	7.38	7.38	7.38
SD.	± 0.01	± 0.02	± 0.02	± 0.02	± 0.02	± 0.02
P	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Table (13)
Body weight (gm) of rats fed low protein diet (8% protein) after induction of chronic renal failure

no	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	206	194	188	182	178	172
2	198	186	178	172	168	162
3	210	198	188	182	178	172
4	206	194	186	180	174	170
5	196	184	178	172	168	---
6	230	215	---	---	---	---
7	240	225	215	210	202	198
8	220	206	186	180	174	170
9	194	189	176	170	---	---
10	200	---	---	---	---	---
11	201	190	178	172	168	162
12	209	192	180	174	169	165
R.	194-240	184-225	176-215	170-210	168-202	162-198
M.	208.41	197	184.63	178	175.3	171.22
SD.	±14.39	±12.4	±11.04	±11.45	±10.17	±10.79
P.	>0.05	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

*P Statistically significant compared with control group

Table (14)

Blood urea (mg%) in rats fed low protein diet (8 gm % protein) after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	56.5	59.5	63.5	68.5	74.0	85.5
2	58.5	60.5	64.5	69.5	74.0	86.0
3	60.25	63.4	67.25	71.5	76.5	88.0
4	58.5	60.5	64.5	70.1	75.8	86.5
5	64.5	67.25	70.25	75.25	80.25	----
6	66.0	68.0	----	----	----	----
7	55.5	57.5	61.5	66.5	72.0	84.5
8	60.5	62.5	66.5	71.25	76.5	88.6
9	65.0	65.5	69.5	74.5	----	----
10	63.0	----	----	----	----	----
11	62.5	65.0	69.0	74.25	80.0	90.1
12	63.0	66.0	70.0	76.5	81.5	92.5
R.	55.5-66	57.5-68	61.5-70.25	66.5-76.5	72-81.5	84.5-92.5
M.	61.14	63.42	66.9	72.03	76.75	87.81
SD.	±3.39	±3.32	±3.02	±3.18	±3.01	±2.49
P	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

* P Statistically significant compared with control group.

Table (15)

Serum creatinine (mg %) in rats fed low protein diet (8 gm % protein) after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	1.6	1.8	2.1	2.4	2.8	3.5
2	1.6	1.8	2.2	2.6	3.0	3.6
3	1.8	2.1	2.3	2.7	3.1	3.8
4	1.6	1.9	2.2	2.6	3.0	3.7
5	2.0	2.3	2.6	3.0	3.4	---
6	2.1	2.4	---	---	---	---
7	1.4	1.7	2.5	2.8	3.2	3.8
8	1.8	2.0	2.3	2.7	3.1	3.7
9	2.1	2.3	2.6	3.5	---	---
10	2.0	---	---	---	---	---
11	1.8	2.1	2.4	2.8	3.2	3.8
12	1.6	1.8	2.1	2.5	2.9	3.6
R.	1.4-2.1	1.7-2.4	2.1-2.6	2.4-3.5	2.8-3.4	3.5-3.8
M.	1.8	2.04	2.35	2.82	3.08	3.68
SD.	±0.22	±0.24	±0.19	±0.36	±0.16	±0.1
P	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

* P Statistically significant compared with control group.

Table (16)

Blood PH in rats fed low protein diet (8 gm % protein) after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	7.4	7.4	7.4	7.4	7.4	7.4
2	7.38	7.4	7.4	7.4	7.4	7.4
3	7.35	7.35	7.35	7.35	7.35	7.35
4	7.4	7.38	7.38	7.38	7.38	7.38
5	7.4	7.4	7.4	7.4	7.4	---
6	7.36	7.35	---	---	---	---
7	7.4	7.38	7.35	7.38	7.4	7.4
8	7.4	7.4	7.38	7.4	7.38	7.4
9	7.38	7.38	7.38	7.38	---	---
10	7.35	---	---	---	---	---
11	7.4	7.4	7.4	7.4	7.4	7.35
12	7.4	7.4	7.4	7.4	7.4	7.4
R.	7.35-7.4	7.35-7.4	7.35-7.4	7.35-7.4	7.35-7.4	7.35-7.4
M.	7.38	7.38	7.38	7.38	7.38	7.38
SD.	±0.02	±0.01	±0.01	±0.01	±0.01	±0.02
P	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Table (17)

Body weight (gm) of rats fed normal diet and recieved verapamil injection after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	208	200	213	212	202	200
2	218	211	204	203	208	206
3	240	232	230	228	226	220
4	198	190	194	196	194	192
5	230	218	---	---	---	---
6	195	188	190	200	202	201
7	205	200	194	188	190	188
8	210	---	---	---	---	---
9	200	188	186	---	---	---
10	212	202	220	220	222	---
11	210	200	203	204	206	204
12	202	193	202	203	205	203
R.	195-240	188-232	186-23	188-228	190-226	188-220
	210	202	202.63	204.1	204.5	200.22
SD.	±12.66	±13.02	±13.95	±12.88	±12.14	±10.08
P.	>0.05	*<0.01	*<0.01	*<0.001	*<0.001	*<0.001

* P. Statistically significant compared with control group

Table (18)

Blood urea (mg%) in rats fed normal protein diet and recieved verapamil injection after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	66.5	70.2	74	78.5	85.5	95.5
2	70.5	74.5	78	81.5	88	98.5
3	62.5	68.5	72.5	76.5	84.5	95.5
4	58.5	64.5	68.5	73.5	79.5	86.5
5	60.5	65	---	---	---	---
6	57.5	62	69.5	69.5	75.5	88.25
7	62.0	71.5	74.5	78.5	86.5	97.5
8	56.5	---	---	---	---	---
9	57.5	72	75.5	---	---	---
10	54.0	58.5	65	79	76	---
11	55.0	61.25	62.5	66	73	85
12	60.5	66.5	66	69.5	76.5	88.5
R.	54-70.5	58.5-74.5	62.5-78	66-81.5	73-86.5	85-98.5
M.	59.65	66.08	71.05	75.1	80.1	91.5
SD.	±4.88	±5.36	±5.05	±5.18	±5.48	±5.18
P.	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

* P. Statistically significant compared with control group

Table (19)

Serum creatinine level (mg%) of rats fed normal protein diet and recieved verapamil injection after induction of chronic renal failure

time after induction of chronic renal failure						
No	2w	4w	6w	8w	10w	12w
1	1.6	1.8	2.2	2.6	3.1	3.5
2	1.7	2.0	2.4	2.8	3.2	3.6
3	1.8	2.1	2.5	3.0	3.4	3.6
4	1.6	1.9	2.3	2.7	3.1	3.4
5	2.2	2.4	----	----	----	----
6	1.6	1.8	2.7	2.6	3.0	3.2
7	2.1	1.7	2.2	2.4	2.8	3.5
8	1.5	----	----	----	----	----
9	1.6	1.8	2.0	----	----	----
10	1.4	1.7	2.2	2.6	3.1	----
11	1.5	1.8	2.1	2.4	2.9	3.3
12	2.0	2.3	2.1	2.5	3.2	3.6
R.	1.4-2.2	1.7-2.4	2.0-2.7	2.4-3.0	2.8-3.4	3.2-3.6
M.	1.69	1.92	2.26	2.62	3.09	3.47
SD.	±0.26	±0.23	±0.20	±0.18	±0.16	±0.14
P.	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001	*<0.001

* p. Statistically significant compared with control group

Table (20)

Blood PH in rats fed normal protein diet and recieved verapamil injection after induction of chronic renal failure

No	time after induction of chronic renal failure					
	2w	4w	6w	8w	10w	12w
1	7.4	7.4	7.4	7.4	7.4	7.4
2	7.38	7.4	7.4	7.4	7.4	7.38
3	7.35	7.35	7.35	7.38	7.35	7.38
4	7.36	7.38	7.38	7.35	7.38	7.35
5	7.4	7.4	---	---	---	---
6	7.4	7.35	7.4	7.36	7.4	7.36
7	7.38	7.38	7.35	7.38	7.38	7.4
8	7.35	---	---	---	---	---
9	7.4	7.4	7.38	---	---	---
10	7.4	7.4	7.4	7.4	7.4	---
11	7.38	7.38	7.4	7.4	7.4	7.38
12	7.4	7.4	7.4	7.38	7.38	7.4
R.	7.35-7.4	7.35-7.4	7.35-7.4	7.35-7.4	7.35-7.4	7.35-7.4
M.	7.38	7.38	7.38	7.38	7.38	7.38
SD.	±0.01	±0.02	±0.02	±0.02	±0.02	±0.02
P.	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Table (21)

Body weight (gm), blood urea (mg%), serum creatinine (mg%) and blood PH values in rats subjected to chronic renal failure and fed normal protein diet

time after operation	No.of rats		B. Wt.	Bl. U.	Se. C.	Bl. PH.
2w	12	M	216	59.28	1.95	7.38
		SD	±14.69	±5.52	±0.35	±0.01
4w	10	M	202.9	76.18	2.46	7.38
		SD	±13.2	±5.38	±0.4	±0.01
		P	.<0.02	.<0.001	.<0.01	>0.05
6w	8	M	200	85.02	3.18	7.38
		SD	±12.31	±5.3	±0.28	±0.02
		P	>0.05	£<0.001	£<0.001	>0.05
8w	6	M	187.5	94	4.05	7.38
		SD	±10.51	±6.75	±0.26	±0.02
		P	@<0.05	@<0.02	@<0.001	>0.05
10w	5	M	182	102.83	5.53	7.38
		SD	±10.51	±6.36	±0.24	±0.02
		P	>0.05	^<0.05	^<0.001	>0.05
12w	4	M	180.8	112.15	6.18	7.38
		SD	±10.15	±6.73	±0.24	±0.01
		P	>0.05	>0.05	*<0.001	>0.05

.P, £P, @P, ^P and *P Stitistically significant copmared with results 2,4,6,8 and 10 weeks respectively.

Table (22)

Body weight (gm), blood urea (mg%), serum creatinine (mg%) and blood PH values in rats subjected to chronic renal failure and fed high protein diet

time after operation	No of rats		B. Wt.	Bl. Ur.	Se. Cr.	Bl. PH.
2w	11	M	206.33	66.69	2.15	7.38
		SD	±10.35	±5.59	±0.32	±0.01
4W	9	M	197.5	77.67	2.73	7.38
		SD	±7.53	±5.06	±0.31	±0.02
		P	.<0.02	.<0.001	.<0.001	>0.05
6w	7	M	189.25	89.31	3.45	7.38
		SD	±7.99	±6.06	±0.43	±0.02
		P	£<0.05	£<0.001	£<0.001	>0.05
8w	5	M	187	95.5	4.45	7.38
		SD	±3.03	±3.54	±0.25	±0.02
		P	>0.05	@<0.02	@<0.001	>0.05
10w	3	M	183	104.93	5.4	7.38
		SD	±3.36	±2.9	±0.28	±0.02
		P	>0.05	<0.001	^<0.001	>0.05
12w	3	M	180.75	112.5	6.22	7.38
		SD	±2.21	±2.82	±0.33	±0.02
		P	>0.05	*<0.02	*<0.05	>0.05

.P, £P, @P, ^P and *P Stitistically significant compared with results 2,4,6,8 and 10 weeks respectively.

Table (23)

Body weight (gm), blood urea (mg%), serum creatinine (mg%) and blood PH values in rats subjected to chronic renal failure and fed low protein diet

time after operation	No of rats		B. Wt.	Bl. U.	Ser. C.	Bl. PH.
2w	12	M	208.41	61.14	1.8	7.38
		SD	±14.3	±3.39	±0.22	±0.02
4w	11	M	197	63.42	2.04	7.38
		SD	±12.4	±3.32	±0.24	±0.01
		P	.<0.02	>0.05	.<0.02	>0.05
6w	10	M	184.63	66.63	2.35	7.38
		SD	±11.04	±3.18	±0.19	±0.01
		P	£<0.02	£<0.02	£<0.001	>0.05
8w	10	M	178	72.03	2.82	7.38
		SD	±11.45	±3.18	±0.36	±0.01
		P	>0.05	@<0.001	@<0.01	>0.05
10w	9	M	175.3	76.75	3.08	7.38
		SD	±10.17	±3.01	±0.16	±0.01
		P	>0.05	^<0.001	^<0.001	>0.05
12w	8	M	171.22	87.81	3.68	7.38
		SD	±10.79	±2.49	±0.1	±0.02
		P	>0.05	*<0.001	*<0.001	>0.05

.P, £P, @P, ^P and *P Stitistically significant compared with results 2,4,6,8 and 10 weeks respectively.

Table (24)

Body weight (gm), blood urea (mg%), serum creatinine (mg%) and blood PH values in rats subjected to chronic renal failure and fed normal protein diet with verapamil injection

time after operation	No of rats		Bo. W.	Bl. U.	Se. C.	Bl.PH.
2w	12	M	210	59.65	1.69	7.38
		SD	±12.66	±4.88	±0.26	±0.01
4w	11	M	202	66.08	1.92	7.38
		SD	±13.02	±5.36	±0.23	±0.02
		P	>0.05	.<0.01	.<0.02	>0.05
6w	10	M	202.63	71.05	2.26	7.38
		SD	±13.95	±5.05	±0.18	±0.02
		P	>0.05	£<0.02	£<0.001	>0.05
8w	9	M	204.1	75.1	2.62	7.38
		SD	±12.88	±5.18	±0.18	±0.02
		P	>0.05	>0.05	@<0.001	>0.05
10w	9	M	204.5	80.1	3.09	7.38
		SD	±12.14	±5.48	±0.16	±0.02
		P	>0.05	^<0.05	^<0.001	>0.05
12w	8	M	200.22	91.5	3.47	7.38
		SD	±10.08	±5.18	±0.14	±0.02
		P	0.05	*<0.001	*<0.001	>0.05

.P, £P, @P, ^P and *P Stitistically significant compared with results 2,4,6,8 and 10 weeks respectively.

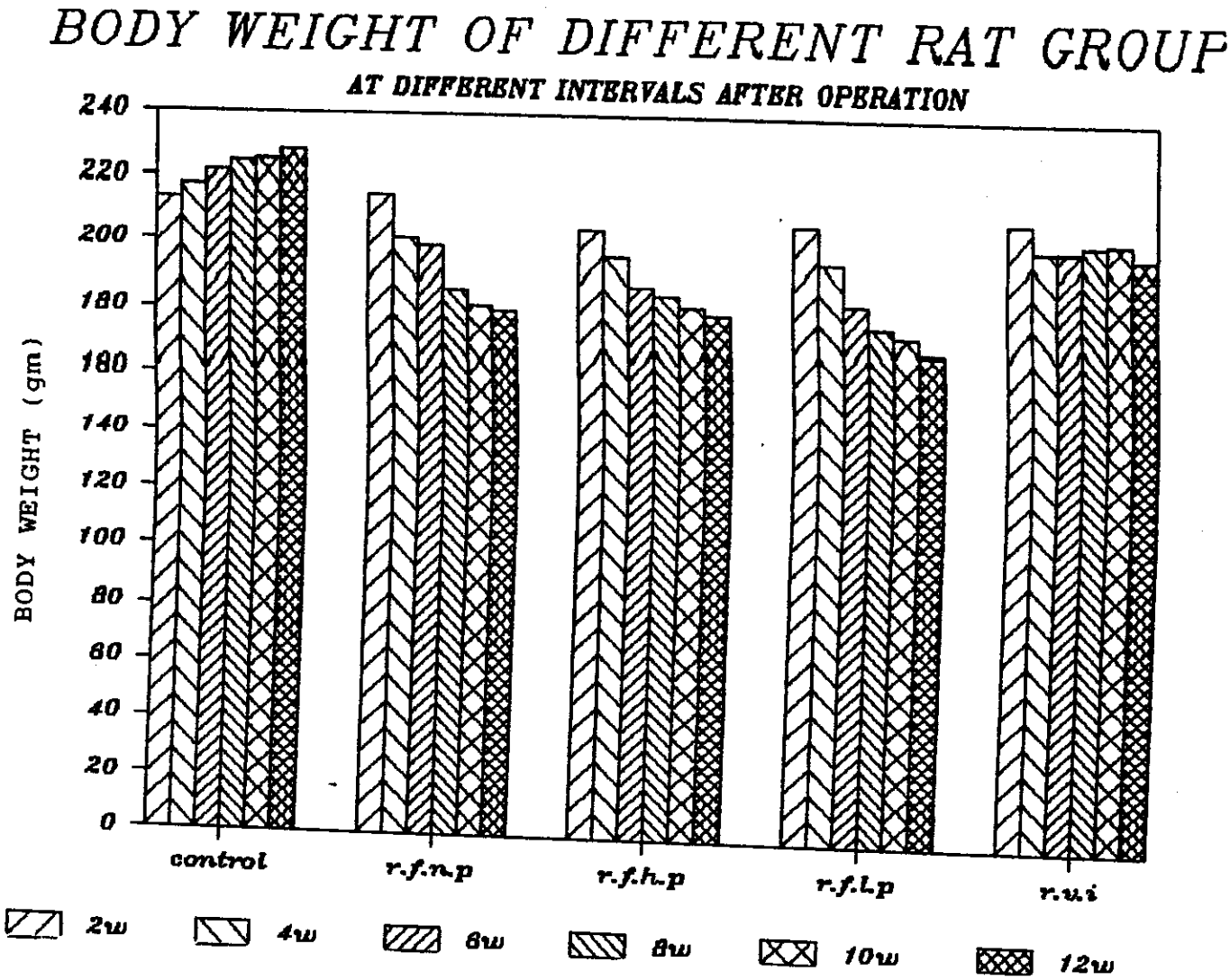
Table (25)

Comparison of body weight in control group and in rats subjected to chronic renal failure and fed normal protein diet, high protein diet, low protein diet and those fed normal protein diet with verapamil injection

	time after operation and sham operation of control gp.					
Rat group	2 W	4 W	6 W	8 W	10 W	12 W
Control group M	214.45	218.63	221.9	224.88	225.4	228.25
SD	±6.38	±5.084	±5.258	±5.06	±5.55	±4.89
N	10	10	9	8	7	7
				-		
rat fed normal M	216	202.9	200	187.5	182	180.8
protein diet SD	±14.69	±13.2	±12.31	±10.51	±10.51	±10.15
N	12	10	8	6	5	4
P	>0.05	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001
rats fed high M	206.33	197.5	189.25	187	183	180.75
protein diet SD	±10.85	±7.53	±7.99	±3.03	±3.36	±2.21
N	11	9	7	5	3	3
.P	>0.1	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001
£p	£<0.05	>0.05	£<0.05	>0.05	>0.05	>0.05
rats fed low M	208.41	197	184.63	178	204.05	171.22
protein diet SD	±14.39	±12.4	±11.04	±11.45	±12.14	±10.79
N	12	11	10	10	9	8
.P	>0.05	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001
£P	>0.05	>0.05	>0.05	>0.05	£<0.001	£<0.01
rats fed norma M	210	202	202.63	204.1	204.5	200.22
protein diet SD	±12.66	±13.02	±13.95	±12.88	±12.14	±10.08
with verapamil N	12	11	10	9	9	8
injection .P	>0.05	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001
£P	>0.05	>0.05	>0.05	£<0.02	£<0.001	£<0.01

.p = Statistically significant compared with control group.
£p = Statistically significant compared with rats fed normal protein diet.

Figure (1) ..



r.f.n.p = rats fed normal protein diet
r.f.h.p = rats fed high protein diet
r.f.l.p = rats fed low protein diet
r.v.i =rats injected with verapamil

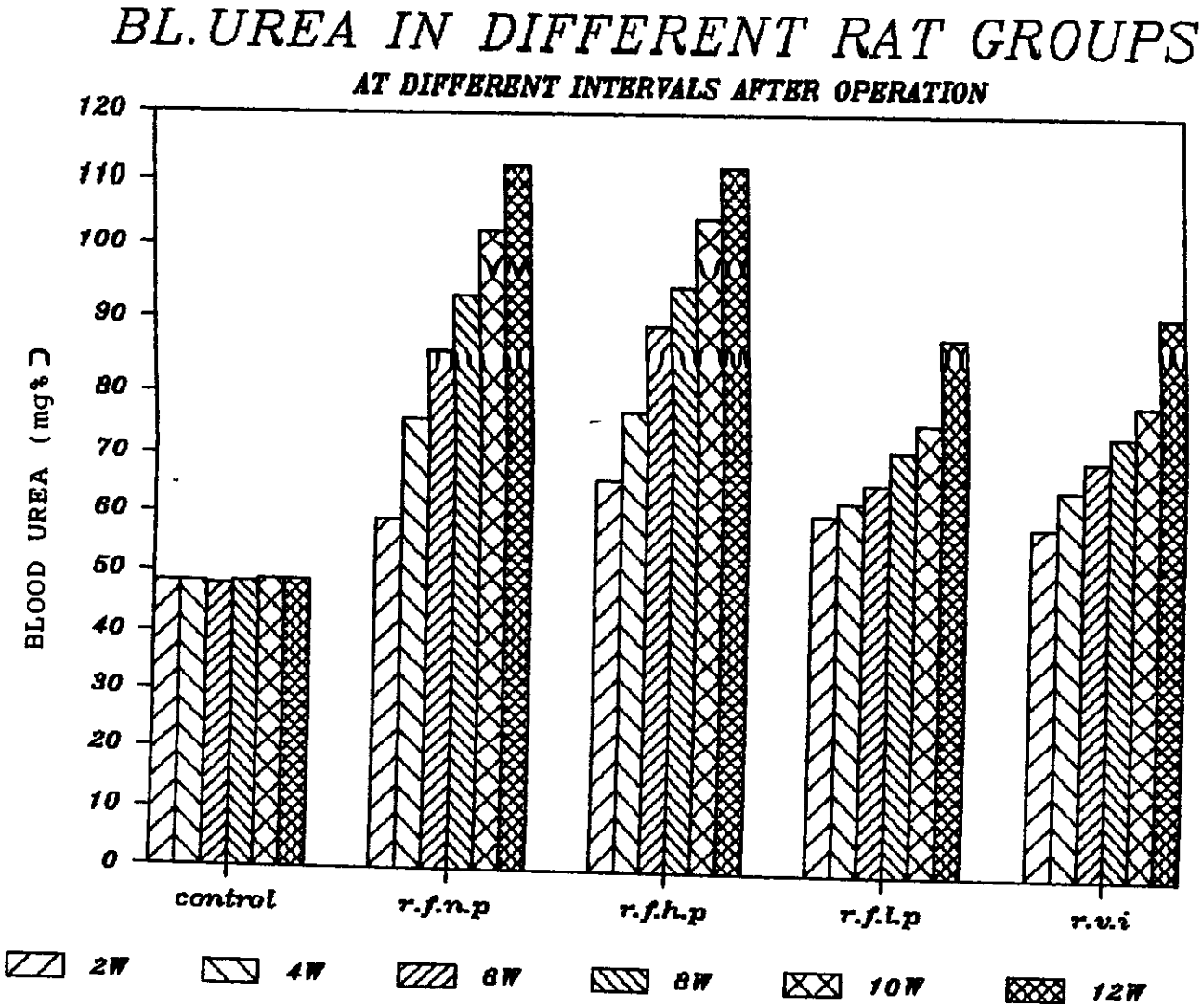
Table (26)

Comparison of blood urea level in control group and in rats subjected to chronic renal failure and fed normal protein diet, high protein diet, low protein diet and those fed normal protein diet with verapamil injection

	time after operation and sham operation in control gp.						
Rat group		2 W	4 W	6 W	8 W	10 W	12 W
Control group	M	48.35	48.35	48.05	48.7	49	48.93
	SD	±1.56	±1.56	±1.41	±1.43	±1.25	±0.904
	N	10	10	9	8	7	7
rat fed normal protein diet	M	59.28	76.18	85.02	94	102.83	112.15
	SD	±5.52	±5.38	±5.3	±6.75	±6.36	±6.73
	N	12	10	8	6	5	4
	.P	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001
rats fed high protein diet	M	66.69	77.67	89.31	95.5	104.93	112.5
	SD	±5.59	±5.06	±6.06	±3.54	±2.9	±2.82
	N	11	9	7	5	3	3
	.P	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001
	£P	£<0.001	>0.05	>0.05	>0.05	>0.05	>0.05
rats fed low protein diet	M	61.14	63.42	66.63	72.03	76.75	87.81
	SD	±3.39	±3.32	±3.18	±3.18	±3.01	±2.49
	N	12	11	10	10	9	8
	.P	>0.05	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001
	£P	>0.05	£<0.001	£<0.001	£<0.001	£<0.001	£<0.001
rats fed normal protein diet with verapamil injection	M	59.65	66.08	71.05	75.1	80.1	91.5
	SD	±4.88	±5.36	±5.05	±5.18	±5.48	±5.18
	N	12	11	10	9	9	8
	.P	>0.05	.<0.01	.<0.01	.<0.001	.<0.001	.<0.001
	£P	>0.05	£<0.001	£<0.001	£<0.001	£<0.001	£<0.001

.p = Statistically significant compared with control group.
£p = Statistically significant compared with rats fed normal protein diet.

Figure (2).



r.f.n.p = rats fed normal protein diet
r.f.h.p = rats fed high protein diet
r.f.l.p = rats fed low protein diet
r.v.i =rats injected with verapamil

Table (27)

Comparison of serum creatinine level in control group and in rats subjected to chronic renal failure and fed normal protein diet, high protein diet, low protein diet and those fed normal protein diet with verapamil injection

		time after operation and sham operation of control gp.					
Rat group		2 W	4 W	6 W	8 W	10 W	12 W
Control group	M	0.96	0.98	0.99	0.98	1.0	0.99
	SD	±0.06	±0.08	±0.08	±0.09	±0.09	±0.083
	N	10	10	9	8	7	7
rat fed normal protein diet	M	1.93	2.46	3.18	4.05	5.53	6.18
	SD	±0.35	±0.4	±0.28	±0.26	±0.24	±0.24
	N	12	10	8	6	5	4
	.P	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001
rats fed high protein diet	M	2.15	2.73	3.45	4.45	5.4	6.22
	SD	±0.32	±0.31	±0.43	±0.25	±0.28	±0.33
	N	11	9	7	5	3	3
	.P	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001
	£P	>0.05	>0.05	>0.05	£<0.01	> 0.05	>0.05
rats fed low protein di	M	1.8	2.04	2.35	2.82	3.08	3.68
	SD	±0.22	±0.24	±0.19	±0.36	±0.16	±0.1
	N	12	11	10	10	9	8
	.P	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001
	£P	>0.05	£<0.001	£<0.001	£<0.001	£<0.001	£<0.001
rats fed normal protein diet with verapamil injection	M	1.69	1.92	2.26	2.62	3.09	3.47
	SD	±0.26	±0.23	±0.2	±0.18	±0.16	±0.14
	N	12	11	10	9	9	8
	.P	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001	.<0.001
	£P	>0.05	£<0.001	£<0.001	£<0.001	£<0.001	£<0.001

.p = Statistically significant compared with control group.
£p. = Statistically significant compared with rats fed normal protein diet.

Figure (3).

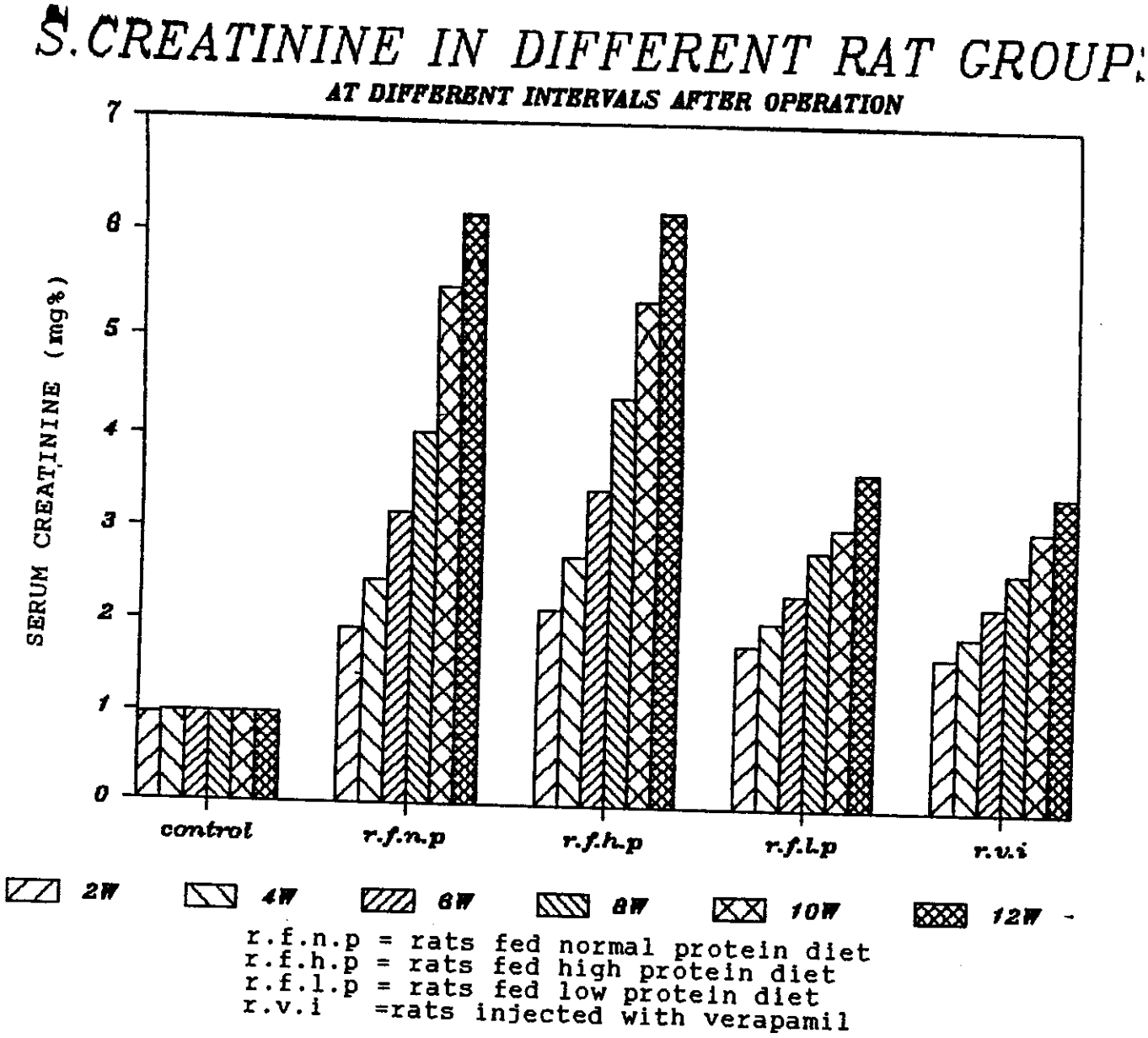

S.CREATININE IN DIFFERENT RAT GROUP
AT DIFFERENT INTERVALS AFTER OPERATION
SERUM CREATININE (mg%)
0
1
2
3
4
5
6
7
control
r.f.n.p
r.f.h.p
r.f.l.p
r.v.i
2W
4W
6W
8W
10W
12W
r.f.n.p = rats fed normal protein diet
r.f.h.p = rats fed high protein diet
r.f.l.p = rats fed low protein diet
r.v.i =rats injected with verapamil

Table (28)

Comparison of blood PH value in control group and in rats subjected to chronic renal failure and fed normal protein diet, high protein diet, low protein diet and those fed normal protein diet with verapamil injection

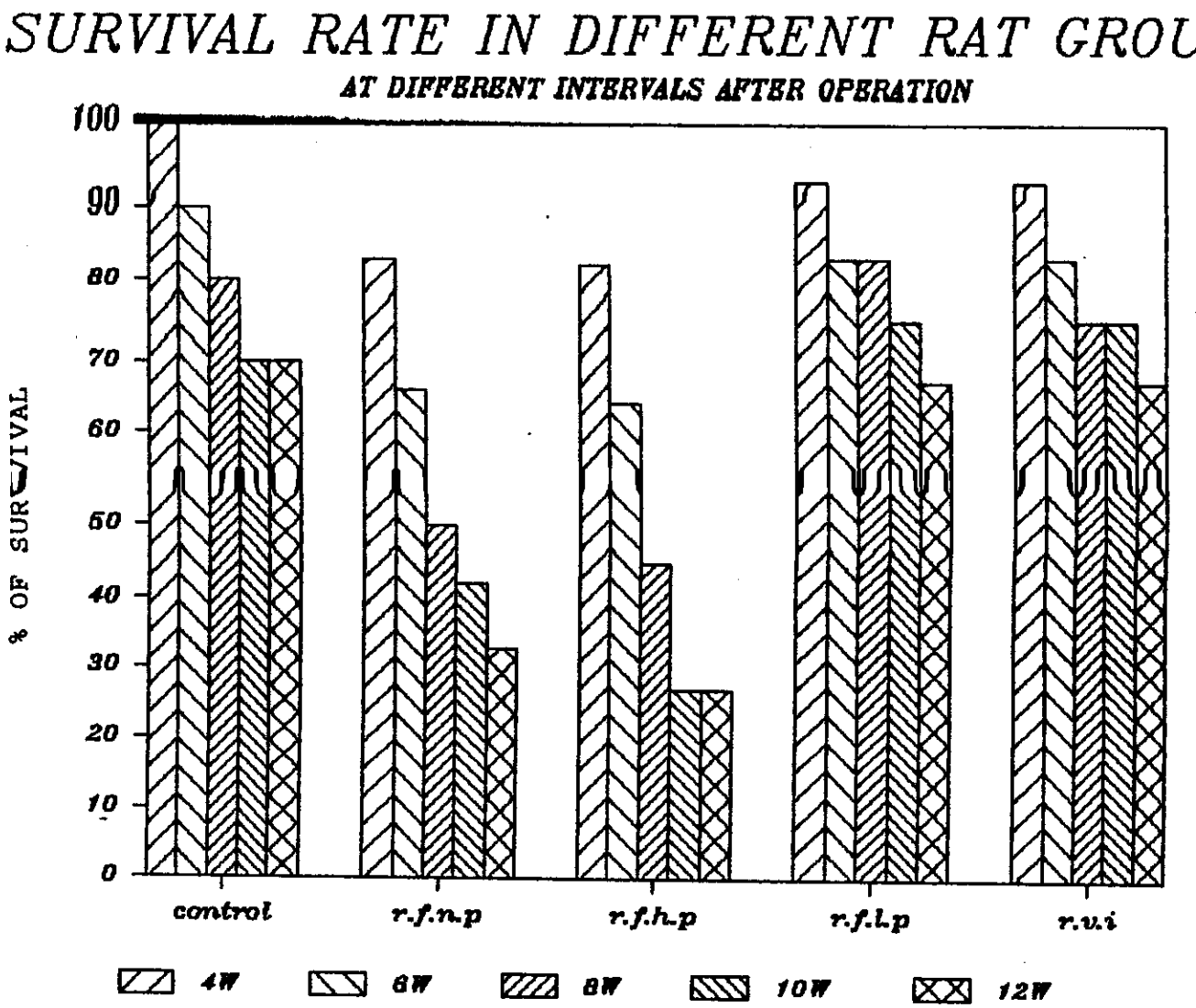
time after operation and sham operation of control gp.							
Rat group		2 W	4 W	6 W	8 W	10 W	12 W
Control group	M	7.38	7.38	7.38	7.38	7.38	7.38
	SD	±0.02	±0.02	±0.01	±0.02	±0.02	±0.02
	N	10	10	9	8	7	7
rat fed normal protein diet	M	7.38	7.38	7.38	7.38	7.38	7.38
	SD	±0.01	±0.01	±0.01	±0.02	±0.02	±0.01
	N	12	10	8	6	5	4
	P	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
rats fed high protein diet	M	7.38	7.38	7.38	7.38	7.38	7.38
	SD	±0.01	±0.02	±0.02	±0.02	±0.02	±0.01
	N	12	9	7	5	3	3
	P	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
rats fed low protein diet	M	7.38	7.38	7.38	7.38	7.38	7.38
	SD	±0.02	±0.01	±0.01	±0.01	±0.01	±0.01
	N	12	11	10	10	9	8
	P	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
rats fed normal protein diet with verapamil injection	M	7.38	7.38	7.38	7.38	7.38	7.38
	SD	±0.01	±0.02	±0.02	±0.02	±0.02	±0.02
	N	12	11	10	9	9	8
	P	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Table (29)

The survival rate of different rat groups at different time intervals compared with the No. of rats 2 W. after induction of chronic renal failure

Rat group	Survival rate				
	4 W	6 W	8 W	10 W	12 W
I. Control group	100 %	90 %	80 %	70 %	70 %
IIa. Rats fed normal protein diet	83 %	66 %	50 %	42 %	33 %
IIb. Rats fed high protein diet	82 %	64 %	45 %	27 %	27 %
IIc. Rats fed low protein diet	92 %	83 %	83 %	75 %	67 %
III. Rats treated with verapamil	92 %	83 %	75 %	75 %	67 %

Figure (4).



r.f.n.p = rats fed normal protein diet
r.f.h.p = rats fed high protein diet
r.f.l.p = rats fed low protein diet
r.v.i =rats injected with verapamil