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By

Abd El-Rahman Attia
Nutrition and Food Sci. Dept., Fac. of Home Economic, Halwan Univ., Cairo, Egypt.

Ashraf, A. Abdel-Megeid
Nutrition and Food Sci. Dept., Fac. of Home Economic, Halwan Univ., Cairo, Egypt.

Samah, M. Ismael
Home Economic Dept. Fac. of Edu., Ain Shams Univ., Cairo, Egypt

Noorah. A. A. Alsheredah
Home Economic Dept. Fac. of Edu., Ain Shams Univ., Cairo, Egypt

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Abd El-Rahman Attia [*] *Ashraf, A. Abdel-Megeid*[*]
Samah, M. Ismael[**] *Noorah. A. A. Alsheredah*[**]

Abstract

The present work was conducted to study the effect of diets containing different levels from protein with or without oral administration of gum Arabic on rats suffering from chronic renal failure. Two main experimental groups were established. Group 1 (n=7 rats) used as a negative control group fed on basal diet (B.D). The other group (n = 49 rats) fed two weeks on diet containing 2% arginine (W/W) to induce renal failure, then this group was divided into seven subgroups (7rats each). The first subgroup fed on diet containing 2% arginine (arginine diet), as a control positive group. Subgroups (2, 3 and 4) fed on arginine diets containing 5%, 10% and 20% protein, respectively. Subgroups (5, 6 and 7) fed on arginine diets containing the above levels of protein and treated daily with (10% gum Arabic w/v) in the drinking water. Feeding rats on arginine diet decreased the mean value of food intake, body weight gain %, serum HDL-c and serum sodium, while organs weight/body weight %, serum (cholesterol, triglycerides, LDL-c, VLDL-c, uric acid, urea nitrogen, creatinine, potassium, AST and ALT) increased significantly, as compared to the negative control group fed on basal diet. Treating rats which suffer from chronic renal failure with medium and low levels from protein improved these parameters, especially with low level. On the other hand, treating rats which were suffering from chronic renal failure daily with (10% gum Arabic w/v) in the drinking water recorded more effects in improving these parameters, especially when used gum Arabic with low level from protein. The present study suggested that, using the gum Arabic with low protein diet must be implemented for chronic renal failure patients. In the same time nutritional and health educational programs should be organized and directed for public to protect themselves from this disease.

Key words: Arabic Gum; Albino Rats; Arginine; Chronic Renal Failure, Lipid Profile; Kidney Functions – Liver Enzymes.

* **Nutrition and Food Science Dept., Faculty of Home Economics, Helwan University**
** **Home Economic Dept. Fac. of Edu., Ain Shams Univ., Cairo, Egypt**.

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INTRODUCTION :

Acacia gum (gum Arabic) is the dried gummy exudate of the stem and branches of acacia trees (Senegal family, leguminosae). It consists mainly of a calcium salt of polyarabic acid, but also contains magnesium and potassium ions. It is a high-molecular weight polysaccharide, which on hydrolysis yields hexoses, arabinose, galactose, rhamnose, and glucoronic acid. Acacia gum is generally recognized as safe by the United States Food and Drug Administration. It is widely used in the production of foods, such as puddings, frostings, candy, chewing gum, and beverages. It has demulcent properties and is often added to medicines (Phillips, 1998).

Ali et al., (2010) reported that, oral administration of gum Arabic could conceivably alleviate adverse effects of chronic renal failure (CRF). Gum Arabic (GA) is a complex polysaccharide used as suspending agent. It has been widely used by eastern folk medicine practitioners as a restorative agent and is thought to be an excellent curative for renal failure patients.

Abdulhakeem et al., (2002) reported that, Arabic gum (AG) protected the rats from gentamicin (GM)-induced nephrotoxicity, possibly, at least in part through inhibition of the production of oxygen free radicals that cause lipid peroxidation. Gum Arabic is a non-digestible food ingredient that has found many applications in the food and pharmaceutical industries. The gums claimed therapeutic usefulness in hepatic and renal failure awaits further verification in animal models and humans. No significant adverse or toxic actions have been associated with the use of gum Arabic.

High protein diet has been proposed to increase exogenous acid load and to result in a chronic low – grade metabolic acidosis. Nitrogen must be separated from the protein molecule and processed by the liver. The kidney must then filter the excess nitrogen out of the body. The more protein eats the harder liver and kidneys must work to accomplish this task (Locatelli,

* **Nutrition and Food Science Dept., Faculty of Home Economics, Helwan University**
** **Home Economic Dept. Fac. of Edu., Ain Shams Univ., Cairo, Egypt**.

2004). Reducing protein intake in patients with chronic renal failure reduces the occurrence of renal death by about 40%, as compared with larger or unrestricted protein intake Denis et al., (2000). The present work was conducted to study the effect of diets containing different levels from protein with or without oral administration of gum Arabic on rats suffering from chronic renal failure.

MATERIALS AND METHODS:

Materials:

- Acacia gum was obtained from Agriculture Research Center, Cairo, Egypt.
- Casein, vitamins, minerals, cellulose, choline chloride and arginine were purchased from El-Gomhorya Company, Cairo Egypt.
- Fifty six male albino rats of Sprague Dawley strain weighting an average body weight (200 ±10g) were obtained from Laboratory of Animal Colony, Helwan, Egypt.

Methods:

Preparation of samples:

Acacia gum was soaked in boiling water (100ºC) for 15 min. and prepared to be drinking water (10% Arabic Gum w/v) at 20-25ºC and kept in glass bottle for biological evaluation.

Biological assay:

Fifty six male albino rats of Sprague Dawely strain weighting an average 200±10g body weight were housed in well aerated cages under hygienic laboratory conditions in the animal house of Faculty of Home Economics, Helwan University, the rats were fed on basal diet for one week for acclimatization and water was provided ad libitum. After this week, the rats were divided in to two main groups as follow:

The first main group (n = 7 rats) fed on basal diet (prepared according to Reeves et al., 1993), as a control negative group, while the second main group (n = 49 rats) fed two weeks on diet containing 2% arginine (W/W) to induce renal failure according to the method described by (Yokozawa et al., 2003). Then, the second main group divided into seven subgroups (7rats each).

The first subgroup fed on diet containing 2% arginine, as a control positive group. Subgroup (2) fed on low protein diet (diet containing 5%

protein) + 2% arginine. Subgroup (3) fed on medium protein diet (diet containing 10% protein) + 2% arginine. Subgroup (4) fed on high protein diet (diet containing 20% protein) + 2% arginine. Subgroup (5) fed on low protein diet (diet containing 5% protein) + 2% arginine and treated daily with (10% gum Arabic w/v) in the drinking water. Subgroup (6) fed on medium protein diet (diet containing 10% protein) + 2% arginine and treated daily with (10% gum Arabic w/v) in the drinking water. Subgroup (7) fed on high protein diet (diet containing 20% protein) + 2% arginine and treated daily with (10% gum Arabic w/v) in the drinking water. As illustrated in (Table 1).

Table 1: Composition of the diets (g /kg_1) fed to the investigated male albino rats.

Ingredients	Controls		Arginine diet					
	*Control (-ve)	Control (+ve)	Without Arabic Gum			With (10% Arabic Gum w/v) in drinking water		
			5% protein	10% protein	20% protein	5% protein	10% protein	20% protein
Corn starch	662.5	642.5	792.5	742.5	642.5	792.5	742.5	642.5
Casein	200	200	50	100	200	50	100	200
Corn Oil	40	40	40	40	40	40	40	40
Mineral mixture	35	35	35	35	35	35	35	35
Vitamin mixture	10	10	10	10	10	10	10	10
Cellulose	50	50	50	50	50	50	50	50
Choline chloride	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Arginine	---	20	20	20	20	20	20	20

During the experimental period (28 days), the diets consumed and body weights were recorded twice weekly. At the end of the experiment, the animals were fasted overnight, then the rats were anaesthetized and sacrificed, and blood samples were collected from the aorta. blood samples were centrifuged and the serum was separated to estimate some biochemical parameters, serum cholesterol by (Allain et al., 1974), triglycerides by (Fossati and principe 1982), HDL-c by (Lopes-Virella 1977), LDL-c & VLDL-c estimated according to the method of (Assmann, et al. 1984), uric acid by (Fossati et al., (1980), urea nitrogen by (Patton and Crouch, 1977), creatinine by (Bohmer, 1971), Serum AST & ALT by (Reitman and Frankel, 1957), sodium and potassium according to the methods described by (Henry et al., 1974).

Kidneys, heart and liver were removed from each rat, careful dissection, washed with saline solution, dried with filter paper and weighed according to the method described by (Drury and Wallington, 1980). The kidney and liver in each group was examined histopathologicaly, according to (Sheehan and Hrapchak 1980). All data were subjected to statistical analysis according to the procedure reported by Snedecor & Cochran, (1980) and the statistical analysis system program (SAS, 1996) using Student's t-test.

RESULTS AND DISCUSSION:

Effect of diets contains different levels from protein in the presence of Arabic Gum on food intake, body weight gain % and some organs weight/body weight% of rats suffering from chronic renal failure.

The mean values ± standard deviation of food intake (g/day), body weight gain % and liver & kidney weight/body weight% for normal group (-ve control group), chronic renal failure group (+ve control group) and chronic renal failure groups fed on diets containing different levels from protein in the presence or absent of Arabic Gum are illustrated in table (1).

Table (1) Effect of diets containing different levels from protein in the presence of Arabic Gum on food intake and body weight gain % of rats suffering from chronic renal failure.

Parameters / Groups	Food intake (g/day/rat)	Body weight gain%	Organs weight / body weigh %	
			Liver	Kidney
Control (-ve)	16.531	26.270 ± 3.198 a	2.861± 0.105 g	0.571 ± 0.051 d
Control (+ve)	13.650	7.475 ± 1.422 d	3.750 ± 0.110 a	0.902 ± 0.131 a
5% protein	14.211	11.272 ± 1.588 bc	3.322 ± 0.120 c d	0.682 ± 0.060 c
10% protein	14.815	12.818 ± 1.799 bc	3.452 ± 0.084 b c	0.763 ± 0.059 b
20% protein	15.600	12.985 ± 1.675 bc	3.622 ± 0.085 a b	0.840 ± 0.072 a b
5% protein + AG	15.722	8.216 ± 1.087 d	2.900 ± 0.063 f g	0.586 ±0.038 d
10% protein + AG	15.902	10.151 ± 1.662 c	3.052 ± 0.138 e f	0.616 ± 0.049 c d
20% protein + AG	16.211	13.722 ± 0.610 b	3.109 ± 0.135 d e	± 0.053 cd

- Values are expressed as mean ± SD.
- AG: Arabic Gum Significant at $p<0.05$ using one way ANOVA test.
-Values which have different letters in each column differ significantly, while those with have similar or partially are not significant.

The mean value of food intake decreased in chronic renal failure (CRF) group fed on diet containing 2% arginine, as compared to normal group fed on basal diet (B.D) negative group. Chronic renal failure groups which fed on diets containing different levels from protein (5%, 10% and

20%) and treated or non-treated daily with (10% Arabic Gum w/v) in the drinking water increased the mean value of food intake, as compared to the positive control group. The highest increase in the mean value of food intake recorded for the group fed on diet containing 20% protein and treated daily with (10% Arabic Gum w/v), followed by the group fed on diet containing 10% protein and treated daily with (10% Arabic Gum w/v).

The data presented in the table (1) showed that, there was a significant decrease ($p<0.05$) in the mean value of BWG% for the positive control group fed on diet containing 2% arginine, as compared to the negative control group fed on basal diet. All treated groups fed on diets containing (5%, 10% and 20% protein) showed significant increase in BWG%, as compared to the positive control group. On the other hand, non-significant change in BWG% was observed between the groups fed on different levels from protein. Chronic renal failure groups fed on diets containing (10% and 20% protein) and treated or daily with (10% Arabic Gum w/v) in the drinking water caused significant increase $p<0.05$ BWG%, while feeding group of rats on diet containing 5% protein and treated with Arabic Gum showed non-significant differences in BWG%, as compared to the positive control group. Body weight gain % of chronic renal failure groups which treated with Arabic Gum increased gradually with increasing the levels of protein in the diet.

Fed rats on diet containing 2% (w/w) arginine (20g/kg diet) led to significant increase $p<0.05$ in liver and kidney weights / body weight %, as compared to healthy rats. All treated groups which fed on (diet containing some levels from protein) showed significant decrease $p<0.05$ in liver and kidney weights / body weight % of chronic renal failure groups, as compared to the positive control group. Treating chronic renal failure group with diet containing low level from protein decreased the liver and kidney weights / body weight % significantly, as compared to the group which treated with diet containing 20% protein. The results showed that, treating chronic renal failure groups with Arabic Gum solution showed significant decrease in liver and kidney weights / body weight %, as compared to non-treated groups. The best results in liver and kidney weights / body weight % recorded for chronic renal failure fed on low protein diet and treated daily with Arabic Gum, because this group showed non-significant changes in liver & kidney weights/body weight %, as compared to the negative control group.

Effect of diets contains different levels from protein in the presence of Arabic Gum on lipid profile of rats suffering from chronic renal failure.

The different investigated groups of rats were fed on the tested diets including three levels of the investigated protein in the presence of Arabic Gum to look forward towards the generation efficiency of blood lipids. Subsequently, different groups of rats during the whole period of experiment were estimated as presented in Table (2). The control group (+ve) which was suffering from chronic renal failure has shown a highly significant increase $p< 0.05$ in the mean value of serum cholesterol (150.409 ± 6.697 mg/dl), compared with those of the negative control group (88.309 ± 5.429 mg/dl). Feeding rats on Arginine diet (control +ve group) increased total serum cholesterol by about 70.321%, than that of basal diet (control – ve group). Feeding chronic renal failure groups on diet containing different levels from protein (5%, 10% and 20%) and treated daily with (10% Arabic Gum w/v) in the drinking water caused a significant decrease $p<0.05$ in serum cholesterol, as compared to the positive control group. The best results in serum cholesterol recorded for the group fed on diet containing 5% protein and treated daily with (10% Arabic Gum w/v) in the drinking water, this treatment decreased serum cholesterol by about 31.496% than that of the control +ve group.

Table 2: Effect of diets contains different levels from protein in the presence of Arabic Gum on lipid profile of rats suffering from chronic renal failure.

Treatments	(mg/dl)				
	Cholesterol	Triglycerides	HDL-c	LDL-c	VLDL-c
Control (-ve)	88.309 g ± 5.429	45.226 g ± 3.096	45.876 a ± 2.663	33.389 h ± 2.228	9.045 g ± 0.619
Control (+ve)	150.409 b ± 6.697	90.745 b ± 3.249	29.137 e ± 2.774	103.123 b ± 3.576	18.149 b ± 0.649
5% protein	126.517 d ± 4.346	70.004 d ± 3.658	38.819 c ± 1.916	73.697 e ± 2.362	14.000 d ± 0.732
10% protein	137.831 c ± 1.811	77.899 c ± 2.859	32.960 d ± 2.803	89.291 c ± 2.357	15.579 c ± 0.572
20% protein	159.338 a ± 4.709	103.339 a ± 2.785	26.632 e ± 2.512	112.038 a ± 2.419	20.668 a ± 0.557
5% protein +AG	103.036 f ± 5.183	60.056 f ± 2.917	41.585 b ± 1.774	49.440 g ± 3.053	12.011 f ± 0.583
10% protein+AG	112.096 e ± 4.603	64.675 e ± 2.523	38.673 c ± 2.056	60.488 f ± 2.482	12.935 e ± 0.505
20% protein+AG	127.076 d ± 4.427	68.373 d ± 4.160	33.182 d ± 2.443	80.219 d ± 1.278	13.675 d ± 0.832

- AG: Arabic Gum - CRF: Chronic Renal Failure - Values are expressed as mean ± SD.

-Values which have different letters in each column differ significantly, while those with have similar or partially are not significant. - Significant at $p<0.05$ using one way ANOVA test.

The results in Table (2) indicated that, serum triglyceride increased gradually by increasing the levels of protein in the diet. On the other hand, the mean values of serum triglyceride decreased significantly $p< 0.05$ in chronic renal failure groups which treated with Arabic Gum, comparing with non treated groups with Arabic Gum. The highest decrease in triglyceride between all treated groups recorded for the group fed on low protein diet treated with Arabic Gum, followed medium level. These treatments decreased serum triglyceride 33.818 and 28.728%, respectively.

Treating chronic renal failure groups with diets containing (5% and 10% protein) resulted in significant increase $p<0.05$ in serum HDL-c, while chronic renal failure group which treated with (20% protein) showed non-significant difference in this parameter, as compared to the positive control group. The other treated groups with different levels from protein with Arabic gum increased the mean values of serum HDL-c, as compared to the positive control group.

The best results in serum HDL-c, LDL-c recorded for the group fed on low protein diet (5%) and treated daily with (10% Arabic Gum w/v in the drinking water), followed by the group fed on medium level (10%). The highest decrease in serum VLDL-c between all treated groups recorded for the group fed on low protein diet and treated daily with Arabic Gum, followed by the group fed on the medium protein diet and treated daily with Arabic Gum 33.82% and 28.728%, respectively.

Such results agree with those obtained by Mee and Gee (1997) they mentioned that the decrease was confined to LDL and VLDL cholesterol only, with no effect on HDL and triglycerides. Sicart and Sablé-Amplis (1987) noticed that, in 6 weeks the significant cholesterol-lowering effect. Total cholesterol dropped by 10% and LDL by 14%, with no significant change in either HDL or triglyceride concentration.

Correlation between histological changes in the kidney and its functions

It is well recognized that urea is a major uremic toxin and plays an important role in human diseases. It is usually accepted that levels above 50mmol/liter induce anorexia. Furthermore, the level of blood urea is used for the clinical evaluation renal function, and it is considered as an indicator for the accumulation of all the nitrogen waste products producing from the degradation of protein Kely& Mitch(1983) and Amin (1993). While Al-Mosawai, (2004) reported that, Gum Arabic is commonly prescribed for

chronic renal failure in patients in Sudan; it results in decreased uraemia and reduces the frequency of dialysis, hence improving the quality of life.

From the results given in Table (3), it could be noticed that administration of 2% L- arginine for 30 days produced a significant increase $p< 0.05$ in serum uric acid, as compared to negative control group (4.374 ± 0.147 mg/dl vs. 1.587 ± 0.112 mg/dl), respectively. Also it could be observed an improvement of serum uric acid at the end of experimental period after administration of diet containing low level from protein (5% protein), while the administrated of diet containing (10% & 20% protein) did not improve this parameter, as compared to the positive control group.

Table 3: Effect of diets contains different levels from protein in the presence of Arabic Gum on kidney function, serum sodium and potassium of rats suffering from chronic renal failure.

Treatments	mg/dl			mmol/l	
	Uric acid	Urea nitrogen	Creatinine	Na	K
Control (-ve)	1.587 f ± 0.112	30.157 h ± 1.912	0.577 f ± 0.045	137.732 a ± 7.327	3.500 d ± 0.206
Control (+ve)	4.374 b ± 0.147	173.328 b ± 4.001	4.162 b ± 0.313	90.894 e ± 4.074	10.055 a ± 0.814
5% protein	3.268 c ± 0.169	139.323 d ± 5.300	3.244 c ± 0.189	104.128 d ± 4.281	7.874 b ± 0.579
10% protein	4.194 b ± 0.457	166.963 c ± 4.779	3.979 b ± 0.183	100.120 d ± 3.456	8.182 b ± 0.587
20% protein	5.923 a ± 0.229	191.168 a ± 4.691	4.528 a ± 0.333	85.344 f ± 4.312	10.435 a ± 0.562
5% protein +AG	2.255 e ± 0.154	88.838 g ± 5.419	2.109 e ± 0.108	118.519 b ± 4.015	6.500 c ± 0.528
10% protein+AG	2.889 d ± 0.250	96.272 f ± 5.883	2.704 d ± 0.139	113.826 b c ±3.321	6.761 c ± 0.572
20% protein+AG	3.429 c ± 0.259	112.004 e ± 4.263	3.182 c ± 0.152	109.213 c ± 2.935	7.911 b ± 0.288

- Na: Sodium. – K: Potassium. - AG: Arabic Gum - CRF: Chronic Renal Failure - Values are expressed as mean ± SD. - Significant at $p<0.05$ using one way ANOVA test. -Values which have different letters in each column differ significantly, while those with have similar or partially are not significant.

The highest decrease in serum uric acid recorded for the group fed on low protein diet and treated with (10% Arabic Gum w/v) in the drinking water was 33.950%, comparing with the positive control group. Feeding chronic renal failure groups on diets containing different levels from protein and treated daily with Arabic Gum decreased the mean value of urea nitrogen significantly, as compared to the positive control group. The best results in serum urea nitrogen recorded for the group fed on low protein diet (5% protein), because this treatment showed significant decrease in this parameter, as compared to other treated groups. In this respect Frey, (2007)

who published that the serum urea nitrogen is a substance that is formed in the liver when the body breaks down protein. In healthy people, most urea nitrogen is filtered out by the kidneys and leaves the body in the urine. If the patient's kidneys are not functioning properly or if the body is using large amounts of protein, the serum urea nitrogen level will rise.

The mean value of serum creatinine in the positive control group was 4.162 ± 0.313 mg/dl, while the respective value of the negative control group was 0.577 ± 0.045 mg/dl. The mean value of serum creatinine in the group (fed on low protein diet and treated with Arabic Gum) achieved the best results. This group recorded significant decrease in this parameter, as compared to other treated group. From obtained results, it can be noticed that, feeding rats on diet containing 2% arginine led to significant increase in serum uric acid, urea nitrogen and creatinine, as compared to healthy rats. Bliss et al. (1996) investigated that supplementation with gum Arabic fiber increases fecal nitrogen excretion and lowers serum urea nitrogen concentration in chronic renal failure patients consuming a low-protein diet. Younes et al., (1999) indicate that under these dietary conditions, the addition of oligosaccharides (gum Arabic) to the diet induced a 20 to 30% decrease in blood urea and renal and renal nitrogen excretion relative to the control, indicating a potential for oligosaccharide diet therapy in chronic renal disease.

Nasir et al., (2008) concluded that, treatment with GA resulted in moderate but significant increases of creatinine clearance and altered electrolyte excretion, i.e., effects favorable in renal insufficiency. Al-Mosawi (2004) reported that acacia gum supplementation of a low-protein diet in children with end-stage renal disease. the author concluded that, dietary supplementation with acacia gum may be an alternative to renal replacement therapy to improve the quality of life and reduce or eliminate the need for dialysis in children with ESRD in some developing countries. Ali et al., (2008) studied the effect of gum Arabic (Acacia Senegal) oral treatment on the metabolic profile of chronic renal failure (CRF) patients and found that, serum uric acid, urea nitrogen and creatinines showed significantly decreased in the groups of gum Arabic and conclude that oral administration of gum Arabic could conceivably alleviate adverse effects of CRF.

In Fig (1) the histology changes were noticed in kidney in different treatment diet. (Ali, et al.;2010) mention that, GA (6% and 12% in drinking water for four consecutive weeks) significantly ameliorated the adverse

biochemical alterations indicative of renal failure, abated the decrease in body weight and reduced the glomerular, tubular and interstitial lesions induced by adenine. This study provides evidence that GA attenuated renal dysfunction in this model of CRF, suggesting a promising potential for it in protecting against renal failure progression.

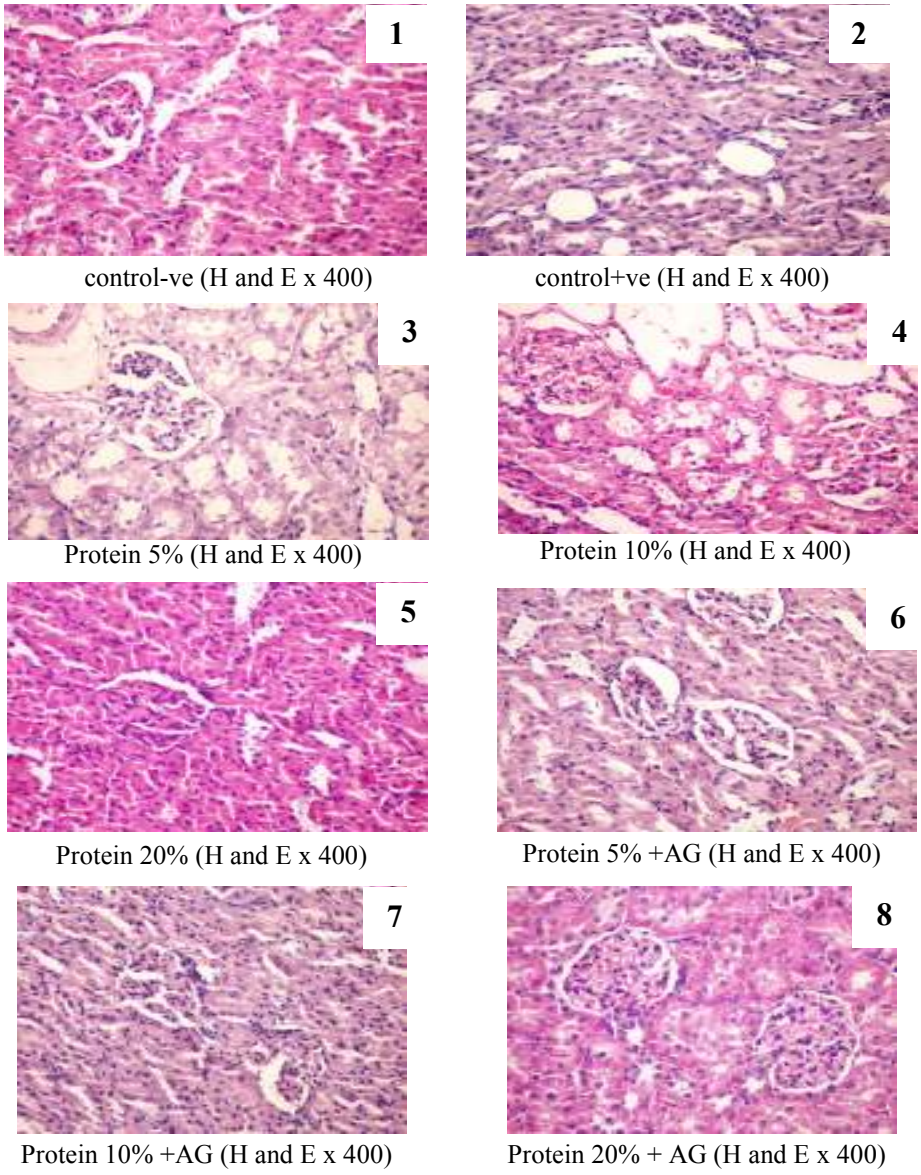

Fig. 1: Histopathological changes in kidneys.

1) control -ve rat revealed the normal histological structure of renal parenchyma; 2) control +ve rat showed cystic ohilation of some renal tubules; 3) hypertrophy of glomerular tufts; 4) showed vascular degeneration of renal tubular epithelium; 5,6,7) no histopathological changes, 8) showed vascular degeneration of epithelial liming some renal tubules.

From the obtained results in Table (3) it could be deduced that chronic administration of L-arginine due to abnormal changes in serum sodium and potassium levels. With regard to serum sodium levels, it could be observed that through the experimental period there were a significant decrease ($P<0.05$) in serum sodium of rats with chronic renal failure, as compared to the negative control. There were significant increases in serum sodium levels in all treated groups, except group of rats fed on diet containing 20% protein, as compared to the positive control group. Feeding chronic renal failure group on diet containing 5% protein and treated daily with Arabic Gum increased serum sodium by about 30%, than that of the positive control group.

On the other hand feeding rats which suffer from chronic renal failure with diets containing (5%, 10% and 20% protein) and treated them with Arabic Gum led to decrease serum potassium significantly $p<0.05$, as compared to the positive control group. The highest decrease in serum potassium recorded for the groups fed on high protein diets with or without treatment by Arabic Gum. These result was agree with Giebisch (2007) who observed that a serum potassium level is apparent even among people with chronic renal failure insufficiency.

Correlation between histological changes in the liver and its function:

Effect of feeding rats on diets containing different levels from protein (5%, 10% and 20%) with treated or non-treated with Arabic Gum on the liver enzymes aspartate amino transferase (AST) and alanine amino transferase (ALT) in serum of rats suffering from chronic renal failure was illustrated in Table (4). Feeding rats on arginine diet increased serum AST and ALT enzymes 57.767% and 176.168%, respectively. In this respect, Abd-ELFattah et al., (2006) revealed that the high levels of AST &ALT in serum are indicators for liver dysfunction. This significant increasing may be attributed mainly to the hepatotoxic effect of arginine.

As shown in this Table, feeding groups of rats which were suffering from chronic renal failure on diets containing 5% and 10% protein recorded

a significant decrease $p<0.05$ in these enzymes, while feeding chronic renal failure rats on diet containing (20% protein) increased AST and ALT enzymes, as compared to the positive control group.

Feeding rats which suffer from chronic renal failure on diets containing different levels from protein (5%, 10% and 20%) and treated with (10% Arabic Gum w/v) led to significant decrease $p<0.05$ in AST & ALT enzymes, as compared with positive control group. The highest decrease in AST & ALT enzymes recorded for the groups fed on low protein diet and treated them with (10% Arabic Gum w/v) in the drinking water, followed by the group fed on medium protein diet with the same treatment.

Gmal al-Din et al (2003)Arabic gum is effective in protecting mice against acetaminophen-induced hepatotoxicity. This protection may involve the reduction of oxidative stress.

In experimental rats, the histology changes were noticed in liver in different treatment diet Fig (2).

Table 4: Effect of diets containing different levels from protein in the presence of Arabic Gum on liver enzymes of rats suffering from CRF.

Treatments	U/L	
	AST	ALT
Control (-ve)	61.064 ± 2.018 e	21.161 ± 1.336e
Control (+ve)	96.339 ± 4.282 a	58.440 ± 3.495 a
5% protein	88.376 ± 3.3167 b c	49.254 ± 3.181 cd
10% protein	89.825 ± 3.072 b	51.855 ± 3.549 b c
20% protein	98.502 ± 5.349 a	57.252 ± 4.260 a
5% protein + AG	76.519 ± 3.187 d	47.185 ± 1.452d
10% protein + AG	85. 055 ± 3.091 c	49.636 ± 2.123 bcd
20% protein + AG	88.603 ± 1.625 b c	52.841 ± 2.819 b

- **AST**: aspartate amino transferase – **ALT**: alanine amino transferase.

- **AG**: Arabic Gum - **CRF**: Chronic Renal Failure - Values are expressed as mean ± SD. - Significant at $p<0.05$ using one way ANOVA test. -Values which have different letters in each column differ significantly, while those with have similar or partially are not significant.

These results are in broad agreement with Mariusz et al. (1996) who found that chronic renal failure is associated with multiple disturbances in other organs as liver as down regulation of the mRNA of the liver enzymes.

On the other side, Akmal (2000) found that chronic renal failure associated with an impairment of liver functions. Yokozawa et al., (2003) confirmed that excess L-arginine lead to impairment in liver functions.

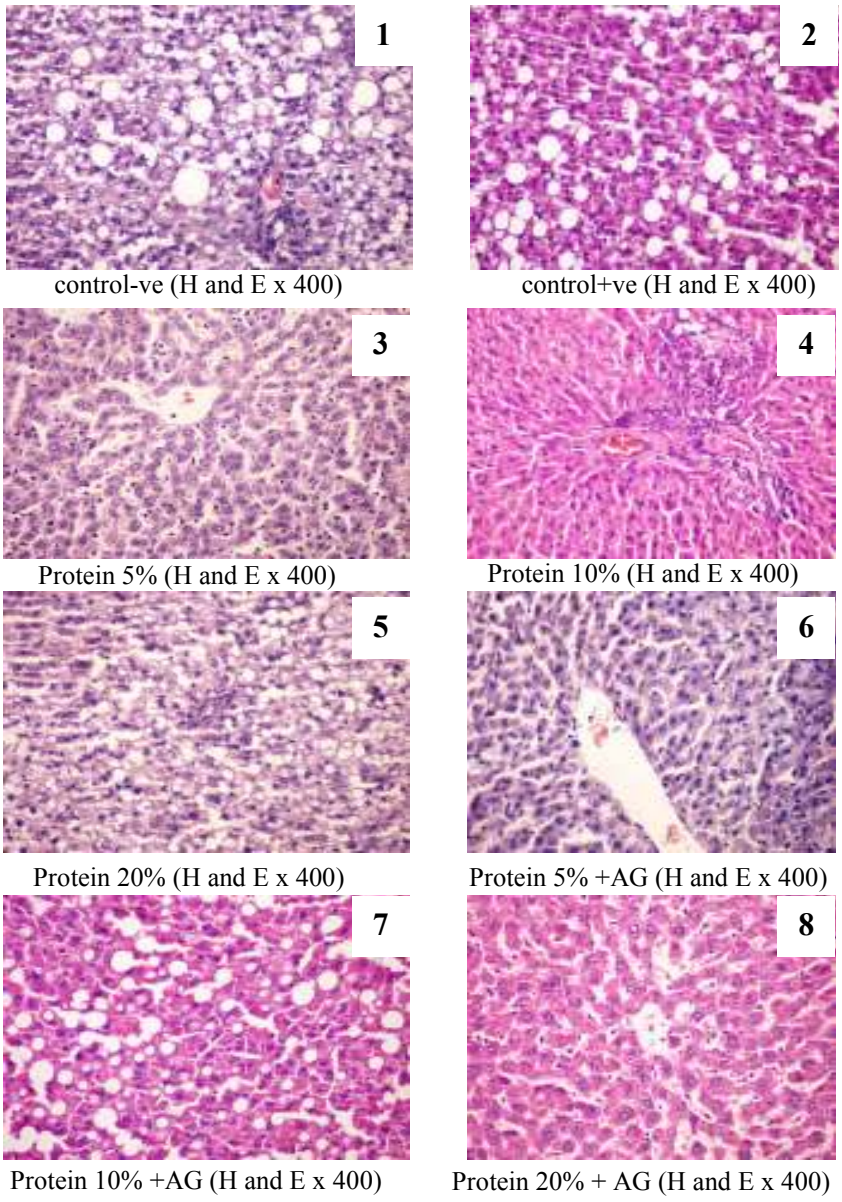

Fig. 2: Histopathological changes in liver.

1) control -ve rat revealed the normal histological structure of renal parenchyma; 2,3) control +ve revealed fatty change of hepatocytes; 4) showed kupffer cells activation and presence of small vascular in the cytoplasm of some hepatocytes; 5) revealed small vascular in the cytoplasm of hepatocytes as well as portal infiltration with leucocytes; 6) showed cytoplasmic vacuolization of hypatocytes; 7) revealed kupffer cells activation and small vacuoles in the cytoplasm of hepatocytes; 8) revealed no histopathological changes.

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تأثير المعاملة بالصمغ العربي علي الفئران المصابة بالفشل الكلوى المزمن دراسة بيولوجية

عبد الرحمن محمد عطيه [*] أشرف عبد العزيز عبد المجيد [*]

سماح محمد إسماعيل [**] نورا عبد الله عبد العزيز [**]

الملخص العـربى

صممت هذه الدراسة لمعرفة تأثير الوجبات المحتوية علي مستويات مختلفة من البروتين مع أو بدون تناول الصمغ العربي عن طريق الفم علي الفئران المصابة بالفشل الكلو المزمن. استخدمت في هذه الدراسة مجموعتان رئيسيتان. المجموعة الرئيسية الأولي (٧ فئران) تم استخدامها كمجموعة ضابطة سالبة (غير مصابة) تم تغذيتها علي غذاء أساسي. المجموعة الئيسية الأخرى (٤٩ فأر) تم تغذيتهم علي غذاء يحتوى علي ٢٪ أرجينين (وزن / وزن) لإحداث الفشل الكلوى، تم تقسيم هذه المجموعة الي سبعة محموعات فرعية (٧ فئران لكل منهم). المجموعة الفرعية الأولي تم تغذيتها علي غذاء يحتوى علي ٢٪ أرجينين (وجبة أرجينين) وأستخدمت كمجموعة ضابطة موجبة (مصابة). المجموعات الفرعية الثانية والثالثة والرابعة تم تغذيتهم علي وجبات الارجينين المحتوية علي ٥٪ و ١٠٪ و ٢٠٪ بروتين، علي التوالي. المجموعات الفرعية الخامسة و السادسة و السابعة تم تغذيتهم علي وجبات الأرجينين المحتوية علي نفس نسب البروتين السابقة كما تم معاملتهم بالصمغ العربي [١٠ ٪ صمغ عربي مذاب في ماء الشرب (وزن / حجم)] . تغذية الفئران علي وجبة تحتوى علي ٢٪ أرجينين احدثت تناقص في المتناول من الطعام و النسبة المئوية للزيادة في الوزن، و كولسترول الليبوبروتينان عالية الكثافة في السيرم و أيضا الصوديوم، في حين حدث زيادة معنوية في النسبة المئوية لوزن الأعضاء ومستويات (الكولسترول و الجلسريدات الثلاثية و كولسترول الليبوبروتينات منفخضة الكثافة و كولسترول الليبوبروتينات منخفضة الكثافة جدا و حامض اليوريك و نيتروجين اليوريا والكرياتينين والبوتاسيوم وانزيمات الكبد في سيرم دم الفئران)، مقارنة بالمجموعة السالبة التى تم تغذيتها علي غذاء أساسي.

معاملة الفئران المصابة بالفشل الكلوى المزمن بالمستويات المتوسطة والمنخفضة من البروتين ادت الي حدوث تحسن في هذه التقديرات، وخاصة مع المستوى المنخفض من البروتين. من ناحية أخرى، أظهرت النتائج أن معاملة الفئران المصابة بالفشل الكلوى المزمن يوميا بالصمغ العربي [١٠ ٪

* قسم التغذية وعلوم الأطعمة - كلية الأقتصاد المنزلى - جامعة حلوان – القاهرة – جمهورية مصر العربية

** قسم الإقتصاد المنزلى - كلية التربية - جامعة عين شمس – القاهرة- مصر

صمغ عربي مذاب في ماء الشرب (وزن / حجم)] سجلت تحسن أكثر لهذه التقديرات، وخاصة عند إستخدام الصمغ العربي مع المستوى المنخفض من البروتين.

اقترحت الدراسة أن استخدام الصمغ العربي مع اتباع نظام غذائي منخفض البروتين يجب أن تنفذ لمرضى الفشل الكلوي المزمن. وينبغي في الوقت نفسه أن تنظم البرامج التعليمية الصحية والغذائية الموجهة للجمهور لحماية أنفسهم من هذا المرض.

الكلمات المفتاحية: الصمغ العربي – فئران البينوا – أرجينين - الفشل الكلوى المزمن – صورة الدهن – وظائف الكلي – انزيمات الكبد.