Journal of Engineering Sciences
Vol 11, Issue 5,May/2020
ISSN NO:0377-9254

Protective Effect of Poly herbal Preparation Against Gentamicin Induced Nephrotoxicity in Female Rats

Bharati D. Talele and Manojkumar Z. Chopda
Department of Zoology, Moolji Jaitha College, KBC North Maharashtra University, Jalgaon
Corresponding author: bdt72zoo@gmail.com

Abstract
Nephrotoxicity is the renal disorder which can be treated with the help of Medicinal plants. The current study was focused to recover gentamicin induced nephrotoxicity in female rats using mixture of six medicinal plants polyherbal formulation (HM) on the basis of literature survey. Polyherbal (HM) treatment shows significant dose-dependent improvement in the body weight, Hematological and biochemical parameter.

Keyword: Nephrotoxicity, Polyherbal mixture, Nephroprotective,

Introduction

Nephrotoxicity is one of the most common kidney problems and occurs when body is exposed to a drug or toxin. Aminoglycoside antibiotics, especially, gentamicin(Abd*et al.*, 2012). Despite rigorous monitoring, nephrotoxicity appears in 10-25% of therapeutic courses. Gentamicin mainly causes tubular toxicity; it is an aminoglycoside antibiotic used for the treatment of Gram-negative bacterial infections. Overdose of gentamicin causes renal damage(Sana *et al.*, (2015). It may give serious side effects while continuous consuming at higher concentrations. When kidney damage occurs, body unable to rid of excess urine and wastes from the body and blood electrolytes (such as potassium and magnesium) will all become elevated (Ramya, 2011). The use of herbs as nephroprotective is a major avenue in Indian perspectives particularly for treating kidneys damage, which require to be explored more successfully as there are many literatures available on these aspects. Ayurveda, an indigenous system of medicine, offers a vast scope of renal treatment for renal failure. Plants and other natural substances have been used as the rich source of medicine. Also, herbal drugs are more easily accessible. Medicinal plants are having curative properties and therapeutic values due to the presence of various complex phytochemical compounds (Jain and Agrawal, 2008). These traditional medicines are assuming greater importance because of very effective, safer, locally available, and no side effects.In present study an attempt has been made to evaluate the nephroprotective activity of polyherbal formulation against gentamicin induced nephrotoxicity.

Materials and methods

Collection of plants: Following listed plants were collected from North Maharashtra region during June 2009 to September 2009. The plants were identified by the taxonomists of Department of Botany, Moolji Jaitha College, Jalgaon, Maharashtra (India). Selected plants for nephroprotective activity listed are as Botanical Name followed by Family, Vernacular name, Part used; as under,

1. *Bauhinia recemosa*(Lam), Caesalpiniaceae, Aapata, Stem bark
2. *Dolichosbiflorus* (Linn.), Fabaceae,Kulitha, Seed
3. *Sphaeranthus indicus* (Linn), Asteraceae, Gorakhmundi, Flower
4. *Tectonagrandis* (Linn), Verbenaceae, Sag, Seed
5. *Tephrosiapurpurea* (Linn), Fabaceae, Sharpunkha, Leaves
6. *Tribulus terrestris* (Linn), Zygophyllaceae, Gokhru, Fruit

Poly herbal preparation (Herbal Mixture – HM)

Shade dried plant material pulverized using an electrically operated grinder. Equal quantities of the respective herbal powders were blended and then mixed with 1% Carboxy Methyl Cellulose for preparing the doses. The doses were prepared fresh daily, beforeadministration;the rats were dosed at approximately the same time each day.

Animals (Wistar rat)

Animals for the study were obtained from the National Biosciences, Pune. The animals were acclimatized to laboratory conditions (temperature: 22^0C - 24^0C, humidity: 65 - 70% and 12 h light and 12 h dark rhythm) prior to the start of the experiment in the CPCSEA registered (1062/CPCSEA/2007) Animal House of the

Department of Zoology, Moolji Jaitha College, Jalgaon and the protocol for experiment was approved from the Institutional Animal Ethics Committee (protocol numberIAEC/04/CPCSEA/MJ/09-10).

Methodology

Study plan: Animal experimentation

Eight to twelve-week-old, either sex (weighing between 200-300 gm) Wistar rats were divided into following 6 groups.

Group 1: Control - Treated with Saline
Group 2: CMC - Treated with 1 % Carboxy methyl cellulose
Group 3: GAG - Induced Nephrotoxicity, with gentamicin at 80 mg/kg b.w.
Group 4: Herbal mixture I - Treated with HM250 mg/kg b.w.
Group 5: Herbal mixture II - Treated with HM 500 mg/kg b.w.
Group 6: Herbal mixture III - Treated with HM1000 mg/kg b.w.

Blood Collection

On 15th day, blood samples from each group of animals were collected for serum biochemistry. The animals were mildly anesthetized using anesthetic ether before blood collection. Blood was collected from the retro-orbital sinus using heparinised capillaries (Remi, Mumbai).

Body weight and feed consumption

Body weight and feed consumption and observed for clinical signs of animals were recorded daily throughout the experimental period.

Statistical analysis

Statistical analysis of the data was performed by computing Analysis of variance (ANOVA) and Dunnett's multiple comparison tests following the methods described by Chopda *et al*., (2011).

Results and Discussion

At the 14th day of experiment the body weight (gm) decreased markedly in female group treated with gentamicin alone as compared to control group of animals. At 0 day - 229.30 ±7.01, 7th day - 205.80 ±1.53,and 14th day - 187.70 ±3.67control group(0day236.30 ± 2.07),(7thdays248.80± 1.01)and (14th252.20 ± 3.76). On treatment with herbal mixture at 1000mg/kg b.w.an improvement in body weightat(0 day 241.20 ± 1.44),(7th day 218.20 ± 2.27)and (14th day 248.50± 7.38)gm body weight.

A significant reduction in feed consumption, compared to the control, was recorded in experimental group treated with gentamicin alone group (6.73 ± 0.12,7.26 ± 0.11,7.58 ± 0.79gm on 0, 7th and 14th day respectively). In gentamicin + herbal mixture at a dose 250 and 500 mg/kg b.w. were significantly increased 7.800 ± 0.05,8.35 ± 0.15,8.31 ± 0.09gm on 0, 7th and 14th day respectively ($p<0.001$)as compared to gentamicin treated group. Whereas, in the group treated with gentamicin + herbal mixture at a dose 1000 mg/kg b.w.the feed consumption is increased in animal was 8.333 ± 0.12gm, 9.31 ± 0.070gm, 10.88 ± 0.10gm which was parallel to that of the control group of animals 10.53 ± 0.06,12.40 ± 0.25,11.72 ± 0.10gmon 0, 7th and 14th day respectively.

Table 3 Body weight of ♀ rats of various days of treatment

Day / Group	0	7	14
Control	236.30 ± 2.07	248.80 ± 1.01	252.20 ± 3.76
CMC	237.30 ± 1.96	250.00 ± 0.89	254.50 ± 4.04
GAG	229.30 ± 7.01	205.80 ±1.53***	187.70 ±3.67***
HM– I	236.00 ± 3.26	213.00 ± 0.96	207.30 ± 2.49
HM– II	238.20 ± 3.19	212.80 ± 2.50	206.00 ± 1.43
HM – III	241.20 ± 1.44	218.20 ± 2.27	248.50± 7.38

HM – I = 250 mg/kg, HM – II = 500 mg/kg, HM – III = 1000 mg/kg
Values are expressed as Mean ± S.E, (n=6) ***p<0.001

Table 4 Feed consumption in ♀ rats of various days of treatment

Day / Group	7	14	21
Control	10.53 ± 0.06	12.40 ± 0.25	11.72 ± 0.10
CMC	11.15 ± 0.45	12.40 ± 0.25	11.72 ± 0.16
GAG	6.73 ± 0.12	7.26 ± 0.11	7.58 ± 0.79
HM – I	7.31 ± 0.03	8.13 ± 0.12*	7.96 ± 0.18
HM – II	7.800 ± 0.05**	8.35 ± 0.15**	8.31 ± 0.09**
HM– III	8.33 ± 0.12***	9.31 ± 0.070***	10.88 ± 0.10***

HM – I = 250 mg/kg, HM – II = 500 mg/kg**,** HM – III = 1000 mg/kg
Values are expressed as Mean ± S.E, (n=6) *P<0.05, **P<0.01, ***P<0.001

Table 5 Hematological values in the ♀ rats after 14 days of drug treatment

Group	HB (g/dl)	WBC (10^3/µL)	RBC (10^6/µl)	PCV (%)
Control	12.83±0.21	6.23±0.16	6.40±0.04	34.67±0.34
CMC	11.58±0.41	6.22±0.02	7.53±0.07	34.40±0.68
GAG	10.58±0.25	7.09±0.31	5.15±0.08	32.10±0.63
HM – I	11.60±0.30	6.33±0.28	5.45±0.17	30.33±0.53
HM– II	11.90±0.32*	6.28±0.19	5.40±0.15	32.45 ±0.93
HM– III	12.32±0.23**	6.24±0.17*	5.68±0.02**	35.13±0.29**

Hm – I = 250 mg/kg, Hm – II = 500 mg/kg**,** Hm – III = 1000 mg/kg
Values are expressed as Mean ± S.E. (n=5). *P<0.05, **P<0.01, ***P<0.001

Table 6 Biochemical parameters in female rats treated with Gentamicin and gentamicin + herbal mixture – Day 15

Group	BUN	CRE	PRO
Control	16.90±0.58	0.84±0.01	6.28±0.01
CMC	16.82±0.48	0.83±0.01	6.23±0.007
GAG	160.7±0.62	3.79±0.01	5.89±0.20
GM + HM– I	157.9±0.77	3.52±0.16	6.03±0.007
GM +HM – II	148.8±0.48	1.82±0.15	6.12±0.005
GM + HM– III	91.86±2.29	0.96±0.005	6.23±0.003

GAG = Gentamicin alone group -80 mg/kg, CMC – 1% Carboxy Methyl Cellulose GM + HM – I = 250 mg/kg, GM + HM – II = 500 mg/kg**,** GM + HM – III = 1000 mg/kg**,** Values are expressed as Mean ± S.D. BUN- Blood urea nitrogen. CRE - Creatinine; PRO- Protein

Hematological values in the ♀ rats after 14th day of drug treatment

The values for RBC, Hb and PCV were significantly decreased in females administrated with gentamicin at a dose 80 mg/kg alone treated group of animals (5.15 ± 0.08x10^6/µl; 10.58 ± 0.25g/dl**)** and 32.10 ± 0.63% respectively) as compared with control group of animals (6.40 ± 0.04 10^6/µl); 12.83 ± 0.21 g/dl and 34.67± 0.34% respectively). The changes in RBC (06.68 ± 0.02$10^6$/µl), Hb (12.32 ± 0.23g/dl) and PCV (35.13 ± 00.29%) were revert significantly on co-administration of the herbal mixture at the dose 1000 mg/kg b.w.when compared with GAG group.

Changes in biochemical values of ♀ rat after 14th day of drug treatment

An increase in BUN, and creatinine, 160.7 ± 0.62 mg/dl, and 3.79 ± 0.01 mg/dl in gentamicin treated group compared to the control 16.90 ± 0.58 mg/dl and 0.84 ± 0.01 mg/dl confirming the nephrotoxicity induced by gentamicin. BUN 91.86 ± 2.29mg/dl, CRE 0.96 ± 0.005mg/dl were reach to normal level in herbal mixture treated group at the dose 1000 mg/kg b.w. while the level of protein decreased in GAG group of animals 5.89 ± 0.20g/dl compared to control group of animals.6.28 ± 0.01g/dl reached to normal level in herbal mixture treated group at the dose 1000 mg/kg b.w 6.23 ± 0.003g/dl.

Conclusion

Promising results were obtained from the pharmacologicalstudy of the nephroprotectiveeffects of different parts of herbal preparationare ofeffective reduction in elevatedhaematologicaland biochemical parameters and improvement in the renal cells were good indicators for nephroprotective activity.

References

1. Nehad R. Elyazji and Ismail Abdel-Aziz Some hematological and physiological changes associated with gentamicin and/or novalgin injection in rabbitsJPCBS 2013, 3(1), 172-18.1
2. Abd,M.A., El-Ghany, A.M. Ramadan and S.F.Ghozy, Nutraceutical effects of curcuma, ginger, celery, yeast and honey onside effects of gentamicin induced nephrotoxicity in rats 2012, 16 (5): 646-655.
3. Ramya Pydi, Rajalakshmi I, Indumathy S, Kavimani S., Nephroprotective Medicinal Plants - A Review, International Journal of Universal Pharmacy and Life Sciences, 2011 (2):266-281.
4. Jain P. K. and Agrawal R. K., Antioxidant and free radical scavenging properties of developed mono- and polyherbal Formulations. Asian J. Exp. Sci., 2008; 22(3): 213-220.
5. Sana Javed, Junaid Ali Khan, Tanweer Khaliq, Ijaz Javed and Rao Zahid Abbas Experimental Evaluation of Nephroprotective Potential of *Calotropis procera*(Ait) Flowers against Gentamicin-Induced Toxicity in Albino Rabbits. Pak Vet J,2015, 35(2): 222-226.
6. Chopda, M. Z., Nemade, N. V., Mahajan R. T., Wound healing activity of root of Ziziphus jujuba Mill in rat model, World Journal of Pharmacy and Pharmaceutical Sciences 3 (9), 830-836.