EVALUATION OF NEPHROPROTECTIVE AND ANTI NEPHROTOXIC PROPERTIES OF MUNIPRABHA PLUS TABLET

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Abstract

Background: Chronic renal failure (CRF) refers to an irreversible deterioration in renal function, which develops over a period of years. The conventional approach of management includes dialysis and renal transplantation, which are not affordable by Indian population mainly due to economic reasons. Muniprabha plus is a safe and effective polyherbo-mineral Ayurvedic nephroprotective product designed and developed to treat chronic renal disease. Objective: The experiment was conducted to study the effect of Muniprabha plus tablet against Gentamicin induced Nephrotoxicity in male Sprague dawley rats. Materials and methods: 24 Sprague dawley rats between the range of 200 -300g were selected and acclimatized for a period of 5 days to the laboratory condition. After acclimatization, animals were randomized into four groups (Group I – IV) consisting of six animals per group. Group I and II animals received vehicle (0.5% CMC); group III and IV received Muniprabha plus tablet at 100 and 200 mg/kg b.wt.,p.o., respectively for a period of 14 days. After 1 hr of drug administration, all experimental animals received Gentamicin (100 mg/kg; i.p) intraperitoneally once daily except those from normal control group for 14 days. Weekly drug dosage was adjusted based on the respective week body weight of animals. Result: The result of this study demonstrates that Muniprabha plus tablet has potent nephroprotective action upon Gentamicin-induced renal damage in rats and possessed anti lipid peroxidative and free radical scavenging activities Conclusion: Study indicates that Muniprabha plus is a promising nephroprotective drug

Key word: Nephroprotective, anti-nephrotoxic, Muniprabha plus, Ayurvedic herbomineral product

INTRODUCTION

Incidences of renal disorders are increasing day by day due to faulty food habits and life style, chemicals, toxic synthetic drugs, uncontrolled diabetes mellitus, dyslipidemia and hypertension. Chronic renal failure (CRF) refers to an irreversible deterioration in renal function, which develops over a period of years. The conventional approach of management includes dialysis and renal transplantation, which are not affordable by Indian population mainly due to economic reasons. Therefore, exploration of a safe and alternative therapy is needed, which proves to be helpful in reducing the requirement of dialysis and in postponing the renal transplantation. Acute kidney injury is characterized by the sudden impairment of kidney function resulting in the retention of nitrogenous and other waste products normally cleared by the kidneys. It complicates 5-7% of acute care hospital admissions and up to 30% of admissions to the intensive care unit1. Owing to the limitations of therapeutic agents of modern medicine as nephroprotectives, researchers are exploring the traditional system of medicine for compounds that are already being used by ayurvedic physicians for treating patients having impaired renal function2 Concept of nephroprotective drugs is a contribution of herbal and Ayurvedic field. Development of nephroprotective drug like Muniprabha plus with additional benefits like antioxidant, hypolipidemic effect offers special advantage in the field of nephrology.

OBJECTIVE OF THE STUDY

To study the nephroprotective and antinephrotoxic effect of Muniprabha plus tablet against Gentamicin induced Nephrotoxicity in male Sprague dawley rats.

MATERIALS AND METHODS

Drug: Muniprabha plus tablet is a polyherbo-mineral product in tablet form. It is prepared in Muniyal Ayurveda research center as per the GMP standards under strict quality control. This product is licensed under AYUSH, Government of Karnataka. Its composition is specified in Table 1A and 1B.

The product was subjected to acute oral toxicity study and also it was evaluated for its effect on behavioural aspect and nervous system with an intention to prove the safety. The studies proved that Muniprabha plus is free from toxicity even at a dose of 6000mg/kg weight which was the maximum possible dose.

Ethical clearance: Ethical clearance was obtained from the concerned animal ethical committee (Reference No. IAE/XXXXV/ SRU/ 445/2015)

Animals: 24 Sprague dawley rats with body weight of 200 -300g were selected and acclimatized for a period of 5 days to the laboratory condition.

Grouping: After acclimatization, animals were randomized into four groups (Group I – IV) consisting of six animals per group. Group I and II animals received vehicle (0.5% CMC); group III and IV received Muniprabha plus at 100 and 200 mg/kg b.wt., p.o., respectively for a period of 14 days. After 1 hr of drug administration, all experimental animals received Gentamicin (100 mg/kg; i.p) intraperitoneally once daily except those from normal control group (Group I) for 14 days. Weekly drug dosage was adjusted based body weight of animals on the respective week.

Assessment parameters: Clinical signs of toxicity, morbidity and mortality were observed daily till the day of necropsy. Body weight was recorded once before dosing and on day 7 and 14. Urine output and urine biochemistry were analyzed on day 7 and 14 by individually housing the animals in metabolic cages. Biochemical parameters and electrolytes in serum were also assessed.

References:

1. Hao X et al. New Eng J Med 2009; 361:2457-66

2. Basu D et al. J Ayurveda Integr Med 2008; 29:110-6
change and gross pathology of liver and renal tissues were observed.

OBSERVATIONS AND RESULTS

No treatment related death and clinical signs of toxicity were observed between the experimental groups. Significant decrease in body weight was observed on day 14 in Group II. Group III and Group IV animals were found prevented from loss of body weight in comparison with Group II.

No change in colour, pH, and Specific gravity, excretion of blood, nitrites, bilirubin, and ketones in urine were noted between Group I, Group II, III and IV animals. Traces of glucose, micro albumin, protein, albumin, urobilinogen and leucocytes were observed in urine of group II, III and IV at day 14.

Group II animals also showed significant elevation in urea, creatinine, uric acid, alkaline phosphatase, gamma glutamyl transferase were observed at day 14 in urine and blood when compared to Group I. Group III and IV (Muniprabha plus, 100 and 200 mg/kg) significantly attenuates these levels a dose dependent manner.[Table 2]

No significant change in serum electrolytes such as potassium, sodium were observed between the treated groups when compared to Group I. pH also remained unchanged. Significant elevation in Calcium was observed in Group II which was significantly attenuated by Group IV to normal range.[Table 3]

Lipid peroxidation was significantly (p<0.05) augmented by gentamicin administration with concomitant decrease in antioxidants like Super oxide dismutase, reduced Glutathione and Glutathione peroxidase in Group II. Group III and IV animals showed reversal of these alterations in a dose dependent manner. [Table 4]

Gentamicin has not shown any gross pathological changes between the groups. However, histopathology of renal tissues reveals mild to moderate degree of lesions such as tubular degeneration, tubular cell necrosis etc, in Group II animals which confirms the induction of nephrotoxicity in rats. Remarkable decrease in severity and incidence of lesions in renal tissues was observed in Group IV animals (Muniprabha plus treated at 200mg/kg b.wt) when compared to animals of Gentamicin treated group and concurrent control.

Histology of kidneys of animals treated with Muniprabha plus treated at 100 and 200mg/kg b.wt reveals decrease in severity of inflammation in group II animals [Figure 1].

Table 1A: Composition of Muniprabha plus tablet: each 500 mg. of tablet contains

| Sanskrit Name       | Part Used      | Botanical/Scientific Name            | Quantity | Quantity |
|---------------------|----------------|--------------------------------------|----------|----------|
| Karpura             | crystals       | Cinnamomum camphora                 | 10 mg    | 10 mg    |
| Vacha               | dry root       | Acorus calamus                      | 10 mg    | 10 mg    |
| Musta               | dry root       | Cyperus rotundus                    | 10 mg    | 10 mg    |
| Bhainimba           | dry plant      | Andrographis paniculata             | 10 mg    | 10 mg    |
| Anura               | dry stem       | Tinospora cordifolia                | 10 mg    | 10 mg    |
| Devadaru            | dry heartwood  | Cedrus deodara                      | 10 mg    | 10 mg    |
| Haridra             | dry rhizome    | Curcuma longa                       | 10 mg    | 10 mg    |
| Ativisha            | dry root       | Aconitum heterophyllum              | 10 mg    | 10 mg    |
| Darvi               | dry root       | Berberis aristata                  | 10 mg    | 10 mg    |
| Pippalimula         | dry root       | Piper longum                        | 10 mg    | 10 mg    |
| Chitraka            | dry root-pure  | Plumbago rosea                      | 10 mg    | 10 mg    |
| Dhanayaka           | dry fruit      | Coriandrum sativum                  | 10 mg    | 10 mg    |
| Amalaki             | dry fruit      | Emblica officinalis                 | 10 mg    | 10 mg    |
| Hareetaki           | dry fruit      | Terminalia chebula                  | 10 mg    | 10 mg    |
| Vibhakta            | dry fruit      | Terminalia bellerica                | 10 mg    | 10 mg    |
| Chavya              | dry stem       | Piper chaba                         | 10 mg    | 10 mg    |
| Vidanga             | dry fruit      | Embelia ribes                       | 10 mg    | 10 mg    |
| Gajagnipalli        | dry root       | Scindapsus officinalis              | 10 mg    | 10 mg    |
| Pappali             | dry fruit      | Piper longum                        | 10 mg    | 10 mg    |
| Maricha             | dry fruit      | Piper purpure                       | 10 mg    | 10 mg    |
| Shanthi             | dry rhizome    | Zingiber officinale                 | 10 mg    | 10 mg    |
| Makshika            | Incinerated ore| Incinerated Copper pyrite            | 10 mg    | 10 mg    |
| Yavakshara          | – alkali       | Alkali of Hordeum vulgare           | 10 mg    | 10 mg    |
| Sarjakshara         | alkali         | Barilla                             | 10 mg    | 10 mg    |
| Sandhava            | salt           | Rock salt                           | 10 mg    | 10 mg    |
| Souvachala Lavana   | salt           | Sonch salt                          | 10 mg    | 10 mg    |
| Bida Lavana         | salt           | Black salt                          | 10 mg    | 10 mg    |
| Trivrit dry root    | dry root       | Opechelina turpethum                | 5 mg     | 5 mg     |
| Danti               | dry root       | Balisperum montanum                 | 5 mg     | 5 mg     |
| Patraka             | dry leaves     | Cinnamomum tamala                   | 5 mg     | 5 mg     |
| Tvak                | dry stem bark  | Cinnamomum zeylanica                | 5 mg     | 5 mg     |
| Ela                 | dry root       | Elettaria cardamomum                | 5 mg     | 5 mg     |
| Vamsahalochana      | secretion      | Bamboo manna                        | 5 mg     | 5 mg     |
| Punarnava           | Dry root       | Boerhavia diffusa                  | 5 mg     | 5 mg     |
| Kushta              | Dry root       | Sausurea lappa                      | 5 mg     | 5 mg     |
| Kanchanara          | Dry stem bark  | Bauhinia variegata                  | 5 mg     | 5 mg     |
| Katjaa              | Dry stem bark  | Holarrhena antidysenteria           | 5 mg     | 5 mg     |
| Sita                | Extract        | Saccharum officinarum- rock sugar   | 20 mg    | 20 mg    |
| Mandura Bhasma      | Incinerated iron rust | Ferri oxidum precipitatum fuscum | 20 mg    | 20 mg    |
| Loha Bhasna          | Incinerated metal | Incinerated iron               | 10 mg    | 10 mg    |
| Shilajatu           | – fossil resin | Asphaltum punjabicanum             | 40 mg    | 40 mg    |
| Shuddha Guggulu     | – oleo-gum-resin | Commpophora mukul          | 40 mg    | 40 mg    |
| Excipient           | gum            | Gum acacia                          | 50 mg    | 50 mg    |
Table 1B: For grinding

| Decoction of following herbs | Amount |
|------------------------------|--------|
| 1. Musta dry root | 1 part |
| 2. Pippali dried fruit | 1 part |
| 3. Sariva dry root | 1 part |
| 4. Kanchanara dried stem bark | 1 part |
| 5. Parpata dried whole plant | 1 part |
| 6. Ulshaera dry root | 1 part |
| 7. Amalaki dry fruit | 1 part |
| 8. Haretakki dry fruit | 1 part |
| 9. Vibhitaki dry fruit | 1 part |
| 10. Punarnava dry root | 1 part |

Jala 176 parts
Avashesha (Reduced to) 1/8 part of water

Table 2: Effect of muniprabha plus tablet on renal function test in nephrotoxicity induced rats

| Treatment | Animal No | Creatinine (mg/dl) | Urea (mg/dl) | Uric acid (mg/dl) | Globulin (g/dl) |
|-----------|-----------|--------------------|--------------|------------------|-----------------|
| 0.5% CMC  |           |                    |              |                  |                 |
| 1         | 0.64      | 33.00              | 1.15         | 3.10             |                 |
| 2         | 0.64      | 42.00              | 1.85         | 2.91             |                 |
| 3         | 0.63      | 29.00              | 1.42         | 3.02             |                 |
| 4         | 0.88      | 31.00              | 1.21         | 2.88             |                 |
| 5         | 0.74      | 34.00              | 1.83         | 3.61             |                 |
| 6         | 0.69      | 35.00              | 1.75         | 2.84             |                 |
| Mean± SEM | 0.70±0.04 | 34.00±1.83         | 1.54±0.13    | 3.06±0.12        |                 |

Gentamicin (100mg/kg) i.p

| Treatment | Animal No | Creatinine (mg/dl) | Urea (mg/dl) | Uric acid (mg/dl) | Globulin (g/dl) |
|-----------|-----------|--------------------|--------------|------------------|-----------------|
| 7         | 0.99      | 44.00              | 1.43         | 3.67             |                 |
| 8         | 0.84      | 39.00              | 1.84         | 2.83             |                 |
| 9         | 1.00      | 67.00              | 2.48         | 3.25             |                 |
| 10        | 0.93      | 60.00              | 2.02         | 3.37             |                 |
| 11        | 0.87      | 46.00              | 1.46         | 3.31             |                 |
| 12        | 0.80      | 45.00              | 2.35         | 2.91             |                 |
| Mean± SEM | 0.91±0.03** | 50.17±4.42** | 1.93±0.18** | 3.22±0.13        |                 |

Muniprabha plus (100mg/Kg)

| Treatment | Animal No | Creatinine (mg/dl) | Urea (mg/dl) | Uric acid (mg/dl) | Globulin (g/dl) |
|-----------|-----------|--------------------|--------------|------------------|-----------------|
| 13        | 0.90      | 41.00              | 2.30         | 3.13             |                 |
| 14        | 1.02      | 52.00              | 2.57         | 3.79             |                 |
| 15        | 0.81      | 43.00              | 1.03         | 3.11             |                 |
| 16        | 0.71      | 27.00              | 1.45         | 2.82             |                 |
| 17        | 0.88      | 40.00              | 1.29         | 3.00             |                 |
| 18        | 0.76      | 37.00              | 1.60         | 2.96             |                 |
| Mean± SEM | 0.85±0.05 | 40.00±3.33         | 1.71±0.25    | 3.13±0.14        |                 |

Muniprabha plus (200mg/Kg)

| Treatment | Animal No | Creatinine (mg/dl) | Urea (mg/dl) | Uric acid (mg/dl) | Globulin (g/dl) |
|-----------|-----------|--------------------|--------------|------------------|-----------------|
| 19        | 0.77      | 44.00              | 1.63         | 3.06             |                 |
| 20        | 0.65      | 35.00              | 0.84         | 3.70             |                 |
| 21        | 1.10      | 43.00              | 1.18         | 3.93             |                 |
| 22        | 0.88      | 43.00              | 1.08         | 3.42             |                 |
| 23        | 0.87      | 42.00              | 1.24         | 3.33             |                 |
| 24        | 0.71      | 39.00              | 1.74         | 2.89             |                 |
| Mean± SEM | 0.83±0.07 | 41.00±1.39         | 1.29±0.14**  | 3.39±0.16        |                 |

The results are expressed in Individual as well as Mean ± SEM (n =6); Statistical analysis was done using graph pad prism 5.0 version and Tukey post hoc test was performed. # p<0.05, ##p<0.01 compared with Normal control: p < 0.05 (*) & 0.01 (**) compared with Gentamicin (100mg/kg) i.p.
The results are expressed in Individual as well as Mean ± SEM (n = 6); Statistical analysis was done using graph pad prism 5.0 version and Tukey post hoc test was performed. *p<0.05, **p<0.01 compared with Normal control: p < 0.05 (*) & 0.01 (**) compared with Gentamicin (100mg/kg) i.p

Table 3: Effect of muniprabha plus treatment on serum electrolytes in nephrotoxicity induced rats

| Treatment         | Animal No | K mmol/L | Na mmol/L | Cl mmol/L | nCa mmol/L | tCa mmol/L | pH     |
|-------------------|-----------|----------|-----------|-----------|------------|------------|--------|
| 0.5% CMC 1        | 12.27     | 144.61   | 101.56    | 3.3       | 6.65       | 7.91       |
| 2                 | 12.67     | 146.68   | 102.34    | 1.7       | 3.4        | 7.94       |
| 3                 | 14.01     | 147.27   | 105.49    | 2.25      | 4.55       | 7.95       |
| 4                 | 11.83     | 147.27   | 107.10    | 2.5       | 5.1        | 7.92       |
| 5                 | 11.89     | 145.79   | 103.11    | 2.7       | 4.85       | 7.89       |
| 6                 | 12.99     | 147.87   | 106.70    | 0.65      | 1.35       | 7.91       |
| Gentamicin (100mg/kg)i.p |     | 12.39     | 146.38   | 102.34    | 5.75       | 11.50      | 7.92 |
| Mean± SEM         | 12.61±0.33| 146.58±0.49| 104.38±0.96| 2.18±0.37 | 4.30±0.73 | 7.92±0.01  |

Table 4: Effect of muniprabha plus treatment on renal stress marker in nephrotoxicity induced rats

| Treatment                        | Animal No | GSH (mg/g) | GPx (mg/mg pt) | TBARS (mg/g) | SOD U/mg pt | Catalase mm/mg pt |
|----------------------------------|-----------|------------|----------------|--------------|-------------|------------------|
| 0.5% CMC 1                       | 1         | 1.06       | 13.72          | 0.73         | 19.02       | 146.54           |
| 2                                | 1.53      | 14.80      | 0.69           | 10.84        | 326.90      |                  |
| 3                                | 1.65      | 13.26      | 0.61           | 17.75        | 189.92      |                  |
| Gentamicin (100mg/kg)i.p 7       | 0.83      | 5.79       | 0.79           | 9.02         | 179.44      |                  |
| 8                                | 1.90      | 7.12       | 0.90           | 10.34        | 225.04      |                  |
| 9                                | 0.16      | 6.82       | 0.93           | 14.22        | 280.37      |                  |
| 10                               | 1.78      | 11.42      | 0.73           | 12.90        | 287.86      |                  |
| 11                               | 0.94      | 7.24       | 0.87           | 22.26        | 339.18      |                  |
| 12                               | 0.17      | 3.06       | 0.88           | 15.12        | 127.34      |                  |
| Mean± SEM                        | 0.96±0.31**| 6.91±1.10**| 0.85±0.03*    | 13.97±1.91**| 239.87±31.80|                  |

The results are expressed in Individual as well as Mean ± SEM (n = 6); Statistical analysis was done using graph pad prism 5.0 version and Tukey post hoc test was performed. *p<0.05, **p<0.01 compared with Normal control: p < 0.05 (*) & 0.01 (**) compared with Gentamicin (100mg/kg) i.p
Group I

Normal parenchyma, PCT, DCT and glomeruli (H&E, X100)

Normal parenchyma, PCT, DCT and glomeruli (H&E, X200)

Inflammatory cells infiltration, minimal (H&E, X100)

Tubular dilatation, cortex, minimal (H&E, X100)

Group II

Tubular cell necrosis (black arrow), minimal; Tubular dilatation (arrow head), moderate; Tubular cell vacuolation (yellow arrow), minimal; Inflammatory cells infiltration (green arrow), moderate and Proteinaceous fluid in lumen (star), minimal (H&E, X400)

Tubular cell necrosis, minimal; Tubular dilatation, moderate; Tubular cell vacuolation, minimal; Inflammatory cells infiltration, moderate and Proteinaceous fluid in lumen, minimal (H&E, X200)

Tubular cell necrosis, minimal; Tubular dilatation, moderate; Tubular cell vacuolation, minimal; Inflammatory cells infiltration, moderate and Proteinaceous fluid in lumen, minimal (H&E, X100)

Figure 1: Histopathology illustrations of kidneys
Antioxidant activity shown that due to its antioxidant properties, structural and functional damage induced by gentamicin possibly the antioxidant mechanism principles might be responsible for the observed effect via its antioxidant activity. The nephrotoxicity was reversed by the roots of *Guduchi* (*Tinospora cordifolia*) proved to possess nephroprotective activity: Following are a few example activities of major ingredients of *Muniprabha plus*.

**DISCUSSION**

Gentamicin (GM) is an aminoglycoside antibiotic used in Gram-negative infections. It has shown 15–30% nephrotoxicity as a common side effect that manifests as non oliguric renal failure with a slow rise in serum creatinine and hypopsmolar urinary output after several days of treatment. Gentamicin induced nephrotoxicity is the 2nd category of acute renal failure (ARF). It is an intra-renal/intrinsic ARF (Acute Renal Failure) and accounts for 69% of all cases of ARF. It occurs due to damage to the parenchyma of kidney. Acute tubular necrosis is a more common form of intrinsic ARF. Gentamicin binds to the receptors located on the apical membrane of proximal tubular cells. It is postulated that GM (Gentamicin) being a cationic drug binds to the anionic phospholipositides located on the apical membrane. The binding of drug receptor is followed by pinocytosis of the drug-receptor complex to a secondary lysosome. Within the lysosome, GM might interfere with the catabolism of receptor by directly inhibiting phospholipase C, by modifying substrate-enzyme affinity or by raising the intralysosomal pH above the effective range of enzyme. Inhibition of the activity of lysosomal phospholipase C leads to the accumulation of phosphatidylinositol rich myeloid bodies within lysosomes leading to phospholipidosis. Thus, there is significant reduction in whole kidney adenosine triphosphate levels, adenosine diphosphate-dependant, and dinitrophenol uncoupled respiration ultimately results in renal damages.

*Muniprabha* plus as a whole formulation might have exhibited its nephroprotective and anti nephrotoxic properties by its action on kidney at various levels. Ingredients of *Muniprabha* plus have multiple modes of action like antioxidant and free radical scavenging activity, cytoprotective activity, anti-inflammatory and diuretic effects. Combined effect of these ingredients might have helped in making the test drug as effective nephroprotective agent.

**Nephroprotective activities of major ingredients of Muniprabha plus**

Following are a few examples of ingredients which have been proved to possess nephroprotective activity:

**Guduchi (Tinospora cordifolia):** Cisplatin induced nephrotoxicity was reversed by the roots of *T. cordifolia*, probably via its antioxidant activity. The ethanol fraction conferred maximum protection suggests that semipolar antioxidant principles might be responsible for the observed effect.

**Punarnava (Boerhavia diffusa):** A study has established the nephroprotective potential of Punarnava with special relevance to the antioxidant mechanism. *B. diffusa* exerted protection against structural and functional damage induced by gentamicin possibly due to its antioxidant properties. Also, modern literature has shown that *B. diffusa* contains a large number of compounds such as flavonoids, alkaloids (punarnavine), steroids, triterpenoids, lipids, lignins, carbohydrates, proteins, and glycoproteins. Flavonoids, alkaloids, glycosides, and sterols have established antioxidant activity.

**Haridra (Curcuma longa):** Post treated rats with carvedilol and aqueous and methanolic extracts of *Curcuma longa* for 15 days significantly increased body weight, decreased cisplatin induced abnormalities and mortality and decreased all the kidney marker such as serum urea nitrogen (SUN), serum creatinine (SCr), total proteins (TP), and uric acid (UA) increased by cisplatin, however, no appreciable improvement in hematological parameters were observed when compared with cisplatin control. The results are indicative of nephroprotective effects of carvedilol as well as aqueous and methanolic extracts of *Curcuma longa*.

**Amalaki (Emblica officinalis):** In a study it was found that 200mg/kg dose of *Emblica officinalis* significantly inhibited the elevation of biochemical parameters i.e. serum creatinine, blood urea nitrogen and oxidant stress marker (malondialdehyde) and increases the reduced levels of antioxidant markers (GSH and SOD) in cisplatin induced nephrotoxicity model. The immunohistochemical analysis reveals increased expression of various apoptotic and inflammatory biomarkers i.e. caspase-3, interleukin-1 (IL-1) and interleukin 6 (IL-6) in cisplatin group, which were significantly lowered by *Emblica officinalis* (200mg/kg). Cisplatin treated rats have shown acute tubular necrosis and infiltration of inflammatory cells in rat kidney which was reversed after treatment with *Emblica officinalis*. In-silico studies revealed that ellagic acid is responsible for its nephroprotective effect.

**Hareetaki (Terminalia chebula):** It contains therapeutically active constituents like Palmitic stearic oleiclinoleic, Astrigent, tannic acid. A study has shown that *Terminalia chebula* reduced the serum concentrations of urea nitrogen, creatinine, methyl guanidine and guanidinosuccinic acid significantly.

**CONCLUSION**

The present study reports that the Gentamicin induced severe nephrotoxicity in rats through the excretion of glucose, protein, micro albumin, leucocytes and urobilinogen in urine. The result of this study demonstrates that Muniprabha plus has potent nephroprotective action upon Gentamicin-induced renal damage in rats and possessed anti lipid peroxidative and free radical scavenging activities.

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**REFERENCES**

1. Waiker SS, Bonventre JV. Acute kidney injury. Harrison's Principles of Internal Medicine. In: Longo DL, Kasper D, Jameson JL, Fauci AS, Hauser SL, Lonsalzo J, editors. 18th ed. Vol. 2. New York: McGraw Hill; 2011. pp. 2293–308
2. Balakumar P, Rohilla A, Thangathirupathi A. Gentamicin-induced nephrotoxicity: Do we have a promising therapeutic approach to blunt it? Pharmacol Res. 2010;62:179–86. [PubMed]
3. Guyton AC, Hall JE. 9th ed. Ch. 31, Unit V. Bangalore: Prism Books (Pvt) Ltd; 1996. Text Book of Medical Physiology; p. 411
4. Robbins KC. 6th ed. Ch.14, Unit 2. Saunders: Harcourt Asia Publication; 2002. Basic Pathology; p. 459.
5. Spandana Uppuluri, Shaik Liakhat Ali, Thota Nirmala, Markapudi Shanthi, Babu Sipay, Kiran Babu Uppuluri, Nephroprotective activity of hydro alcoholic extract of *Tinospora cordifolia* roots on cisplatin induced nephrotoxicity in rats. Drug intervention today, 5(4), December 2013, 281-2870.

6. Sawardekar SB, Patel TC. Evaluation of the effect of *Boerhavia diffusa* on gentamicin-induced nephrotoxicity in rats. Journal of Ayurveda and Integrative Medicine. 2015;6(2):95-103.

7. Rajput K, Mishra RN. *Boerhaavia diffusa* roots (Punarnava mool) – Review as Rasayan (Rejuvenator/Antiaging) Int J Res Pharm Biomed Sci. 2011;2:1451-60.

8. Aml F. Elgazar and Alaa O. AboRaya, 2013. Nephroprotective and Diuretic Effects of Three Medicinal Herbs Against Gentamicin-Induced Nephrotoxicity in Male Rats. Pakistan Journal of Nutrition, 12; 715-722.

9. Kalra, Prema&Karwasra, Ritu& Nag, Tapas & Gupta, Yogendra Kumar & Singh, Surender. (2017). Protective effect of *Emblica officinalis* fruit extract on cisplatin-induced nephrotoxicity in female rats. Bulletin of Faculty of Pharmacy, Cairo University. 10.1016/j.bfopcu.2017.04.001.

10. Yokozawa T, Fujioka K, Oura H, Tanaka T, Nonaka G, Nishioka I. Conformation that tannin containing crude drugs has a uremic toxin decreasing action. Phytotherapy Research.1995; 9: 1-5.

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