The protective effect of Gubeish ethanolic extract against renal failure in rats

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Abstract

The present study was undertaken to evaluate Guiera Senegalensis protective effects on gentamicin-induced nephrotoxicity in rats.

40 albino rats of either sex, weighing 150-200g were divided into 4 groups; Control group, gentamicin 80 mg/kg, i.p., for 6 days, Guiera Senegalensis 250 and 500 mg/kg i.p., for 10 days, Guiera Senegalensis 4 days prior and concurrently with gentamicin for 6 days. Radical scavenging activity of Guiera Senegalensis was determined; Catalase and super oxide dismutase, urea and creatinine in serum and urine were analyzed.

Gentamicin administration caused nephrotoxicity as evidenced by the remarkable elevation of urea and creatinine in serum and urine.

Urea and creatinine in serum and urine were increased in response of gentamicin administration compared to the control group. (55.95 ± 2.40 mg/dl, 3.82 ± 0.33 mg/dl, 1219.2 ± 36.49 mg/dl and 139.4 ± 20.27 mg/dl respectively).Co-administration of Guiera Senegalensis with gentamicin decreased the rises of these parameters.

To conclude, our data suggest that supplementation of Guiera Senegalensis may be useful in reducing gentamicin nephrotoxicity in rats.

Introduction

Guiera senegalensis (Gs) occurs in the savanna zone from Senegal East to Sudan. (Sanogo, R., 2012). Several reports in the literature have described the use of Gs in traditional medicine for treatment of many diseases (Fiot et al., 2004). Adam 1974).

Nephrotoxicity induced by gentamicin is a complex phenomenon characterized by an increase in plasma creatinine and urea levels and severe proximal renal tubular necrosis, followed by deterioration and renal failure (Cuzzocrea.S et al 2002, A. Al-Majed et al 2002).Various studies have claimed antioxidant property of drugs for their nephroprotective effects in gentamicin induced renal damage (K.V. Kumar et al 2000, I.T.Abdel-Raheem et al 2009, I. Yaman and E. Balikci 2010, G V. Harlalka et al 2007).

Materials and Methods

Guiera senegalensis leaves were collected from West Sudan (North Kordofan).

Extraction was carried out for the plants according to the method descried by (Sukhdev *et. al.* 2008). albino rats of either sex weighing150-200 gram were used for this study.the animals were divided randomly into four groups (n=10), and placed in metabolic cages separately for collecting 24-hour urine samples. After collecting the first urine samples, the animals were divided into the normal control group (fed with the standarad diet and water ad liptum.), the gentamicin group (gentamicin 80mg/kg/day i.p.) and treated group (Guiera Senegalensis -250mg/kg/day and 500mg/kg/day, started 4 days prior orally and concurrently with Gentamicin 80 mg/kg i.p. for six days). Blood was collected in the first day (day 0) and then every five days from the orbital plexuses, Twenty-four hours after the last injection, urine samples were collected.

Results

In vitro antioxidant activity of Guiera senegalensis ethanolic extract:

The DPPH radical scavenging was determined in Guiera senegalensis (Gubeish) extract and the percentage of radical scavenging activity exhibited highly percentage (93%) (table1) when comparing with the standard drug propyl Gallate(PG) which found to be 95%.

Table1. The DPPH radical scavenging determination of Guiera senegalensis extract.

No	Sample code	% RSA±SD (DPPH)
1	Guiera senegalensis (Gubeish)	93±0.01
2	Propyl Gallate(PG)	95±0.01

Antioxidant activity of Guiera senegalensis (in vivo):

There was a significant decrease in Catalase and superoxside dismutase activities in genta mycin group (Table 2) while the administrations of guiera senegalensis prevent the inhibition of catalase and super oxide dismutase acivity..

Table 2. The activity of Catalase (U/ml) and Superoxide dismutase in rats'sera samples treated with (Guiera senegalensis) Gubiesh extract at different doses.

Animal group	Catalase (Mean ± SE)	Superoxide dismutase (Mean ±SE)
Control	14.27± 0.47b	92.42 ± 4.82c
GM. 80mg	7.75 ± 1.20a	42.97 ± 9.66a
GM+250 Gs	13.97 ± 1.31b	64.97 ± 3.20ab
GM+500 Gs	13.44± 0.64b	67.67 ± 2.83b

Biochemical results

In the present study, gentamicin (80 mg/kg) when injected for 6 consecutive days caused remarkable nephrotoxicity as evident from Table 3. There was a significant ($P < 0.05$) increase in urea and creatinie in serum and urine as compared to the negative control group.

The Guiera Senegalensis administered groups showed a significant nephroprotective effect as evidenced by a decrease in the renal parameters i.e. urea and creatinine in serum and urine when compared to the Gentamicin treated group. Moreover, the lower dose seems to be better in protecting the kidney from gentmicin damage.

Table 3. Effect of Guiera senegalensis (Gs) on biochemical parameters in rats intoxicated with getamicin

Animal group	Urea (serum) Mean±SE	Creatinine (serum) Mean±SE	Sodium (serum) Mean±SE	Potassium (serum) Mean±SE	Calcium Serum Mean±SE	Urea Urine Mean±SE	Creatinine Urine Mean+SE
Control	38.24 ± 1.86a	0.33 ± 0.03a	88.10 ± 1.10ab	2.86 ± 0.15b	9.30 ± 0.70a	919.1 ± 0.06a	86.98 ± 0.01a
GM. 80mg	55.95 ± 2.40b	3.82 ± 0.33c	105.1 ± 1.70c	2.22 ± 0.20a	9.55 ± 0.10a	1219.2± 36.49b	139.4 ± 20.27b
GM+250 Gs	51.07 ± 3.00ab	0.88 ± 0.03a	86.51 ± 3.29a	3.14 ± 0.16b	9.10 ± 0.22a	960.0 ± 51.96a	84.90 ± 1.67b
GM+500 Gs	50.42 ± 1.88ab	2.11± 0.35b	94.42 ± 0.00b	2.80 ± 0.15ab	9.50 ± 0.37a	1013 ± 58.31a	104.50 ± 4.91b

Disscusion

In the present study, we investigated the effect of Guiera senegalensis on gentamicin-induced nephrotoxicity. Results of this study confirmed that gentamicin at a dose of 80 mg/kg produces significant renotoxicity as evidenced by increase in urea and creatinine in serum and urine which corroborated with previous reports (A. Al-Majed et al 2002, K.V. Kumar et al 2000, I.T.Abdel-Raheem et al 2009, I. Yaman and E. Balikci 2010, G.V. Harlalka et al 2007, Jain Avijeet and A.K.Singhai 2010]. Pretreatment with Guiera senegalensis extract provided marked functional and protection against acute renal damage in rats treated with gentamicin. This study revealed that orall administration of Guiera senegalensis has a significant protective effect in gentamicin-induced nephrotoxicity in rats as evident by the significant decrease in urea and creatinine in serum and urine. A relationship between oxidative stress and nephrotoxicity has been well demonstrated in many experimental animal models (K.V. Kumar et al 2000, I.T.Abdel-Raheemet al 2009, I. Yaman and E. Balikci, 2010, G.V. Harlalka et al 2007). In gentamicin treated rats, a significant decrease in catalase and super oxide dismutase activities suggesting the involvement of oxidative stress. A role of lipid peroxidation in gentamicin-induced acute renal failure has also been described in previous studies (S.Cuzzocrea et al 2002).Moreover, pretreatment of rats with hydroxyl radical scavengers has shown protection against gentamicin induced acute renal failure (K.V. Kumar et al 2000).from this study It has been demonstrated that Guiera senegalensis has a strong antioxidant activity (RSA=93%) in vitro, Therefore, it is not unreasonable to assume that the nephroprotection shown by Guiera senegalensis extract in Gentamicin induced nephrotoxicity is mediated through its potent antioxidant effects that help to preserve intracellular catalase and super oxide dismutase levels. The antioxidant activity of Guiera senegalensis might have contributed to its nephroprotective effect by inhibiting gentamicin-induced lipid peroxidation. However other mechanisms of protection (Denis Beauchamp et al 1997) like inactivation of the aminoglycoside by electrostatic complex formation or preventing its binding to the brush border membrane or by forming complexes at acidic pH and preventing phospholipid overloading in lysosomes cannot be negated also. Therefore, further investigations should be conducted in order to better characterize the attenuation of gentamicin-induced nephrotoxicity by Guiera senegalensis.

Conclusion

To conclude, this study provides scientific evidence of the nephroprotective effects of orally administration of *Guiera senegalensis* in toxicant that directly induces renal damage. It further proposes that observed protective effects of *Guiera senegalensis* in gentamicin nephrotoxicity could be attributed to its well-known antioxidant potential.