Research Paper

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Nephroprotective Potential of Medicinal Plants: a Review

Biochemistry

KEYWORDS : Nephroprotective, Medicinal plants, Cisplatin, Nephrotoxicity, Renal failure.

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ABSTRACT

The present review was discussed about the nephroprotective effect of various medicinal plants against cisplatin induced nephrotoxicity. Cancer is major public health burdens in both developed and developing countries.Cancer affected peoples were taken various type of chemotherapeutic drugs. Among the various chemotherapeutic drugs,cisplatin was widely used by the peoples affected with cancer. When the time of treatment with cisplatin drug against cancer, Cisplatin causes a nephrotoxicity. This nephrotoxicity problem caused by cisplatin drug leads to acute renal failure in cancer affected peoples. Various medicinal plants were used for the treatment of renal failure caused by cisplatin. Hence the review is going on to investigate the nephroprotective medicinal plants against cisplatin induced nephrotoxicity. In this review, more than 50 medicinal plants were discussed along with detailed information regarding about part used, extract used about the protective effect of medicinal plants against cisplatin induced nephrotoxicity in various animal models.

INTRODUCTION

Kidney is the primary organ of the urinary system, which purifies the blood by removing wastes from it and excreting out from the body through urine. Further it also helps in maintaining the fluid homeostasis, electrolyte balance, blood pressure, etc. Hence, it is one of the vital organs of the body. Every day, the kidneys filter about 180 L of blood, about four times as much as the amount that passes through any other organ. Because of this high volume, the kidneys are more often exposed to toxic substances in the blood and are vulnerable to injury from these sources [1].

Nephrotoxicity is one of the most common kidney problems and occurs when body is exposed to a drug or toxin [2].Kidney disease is the ninth leading cause of death. Approximately, 19 million adults have chronic kidney disease and an estimated 80,000 persons have chronic kidney failure diagnosed annually in India. Till date for end stage renal failure, renal replacement is the only therapy. In case, of non-availability of kidney, dialysis is the only alternative, which unfortunately is severely limited by several constraints including a good amount of expenditure. A number of potent therapeutic drugs like aminoglycoside antibiotics, chemotherapeutic agents like cisplatin and chemical reagents like ethylene glycol, carbon tetrachloride, sodium oxalate and heavy metals such as lead, mercury, cadmium and arsenic can adversely affect the kidney resulting in acute renal failure, chronic interstitial nephritis and nephritic syndrome. Since these modern medicines have certain serious side effects, there is an urgent need to systematically evaluate plants for their activities. In response to this, the medicinal potential of a lot of plants have been explored.

Cisplatin is a potent chemotherapeutic drug that is used in the treatment of various solid tumors including testis, breast, lung, and uterine cervix carcinomas [3]. However, the severe adverse effects of cisplatin, including nephrotoxicity, have limited its clinical use in cancer treatment [4]. Approximately one-third of patients undergoing cisplatin treatment have shown clinical nephrotoxicity [5], as indicated by reduced glomerular filtration rate, increased serum creatinine, and dysregulated serum electrolyte levels [6]. Although the nephrotoxic mechanisms of cisplatin are not completely understood, several studies have reported involvement of the generation of free radicals including reactive oxygen species, disruption of mitochondrial function, depletion of anti-oxidant capacity, and activation of cell death machinery including apoptotic or necrotic pathways [7]. To develop novel strategies to prevent and/or reduce drug-induced acute kidney injury, diverse pharmacologic and molecular approaches have been investigated using cisplatin induced acute kidney injury; however, the clinical applications of these preventive approaches are still limited [8]. In this context, considering herbal medicine are potential candidates for prevention of cisplatin-induced acute kidney injury.

Nephroprotective agents are the substances which possess protective activity against nephrotoxicity. Medicinal plants have protective properties due to the presence of various active principles and Chemical substances. Ancient literature has prescribed various herbs for the cure of kidney disease. Co-administration of various medicinal plants possessing nephroprotective activity along with different nephrotoxic agents may attenuate its toxicity.

Demand for medicinal plants is increasing in both developing and developed countries. Research on medicinal plants is one of the leading areas of research globally. However, there is a need to pay closer attention to the issue of bioactivity-safety evaluation and conservation of medicinal plants. Many plants have been used for the treatment of kidney failure in traditional system of medicine throughout the world. Indeed along with dietary measures, plant preparation formed the basis of the treatment of the disease until the introduction of allopathic medicine. Ethno medicinal plants can be used to help forestall the need for dialysis by treating the causes and effect of renal failure, as well as reducing the many adverse effect of dialysis though; there are few chemical agents to treat acute renal failure [9]. Studies revealed that nephroprotective agents have adverse effect besides reduce nephrotoxicity, Various environmental toxicant and clinically useful drugs, acetaminophen and gentamicin, can cause severe organ toxicities through the metabolic activation to highly reactive free radical right from its beginning, the documentation of traditional knowledge, especially medicinal uses of plants, has provided many important drugs of modern day[10]. Several herbal drugs act as good non-specific cytoprotective. In view of this background, it is thought worthwhile to evaluate the indigenous plants which could be useful as adjuvant as nephroprotective. This helps to decrease the potential nephrotoxicity of drugs like cisplatin,gentamicin, cyclosporine, Carbon tetrachloride. Etc [11, 12]. Therefore, search of nephroprotective herbs from medicinal plants has become important and need of the day. Therefore this article shows a review on some reported nephroprotective medicinal plants with their botanical name,family and part used.

Table.1.Plants with nephroprotective activity against cisplatin induced nephrotoxicity [13-64]

S.No	Plant name	Family	Parts used	Extract
1	Abutilon indicum L.	Malvaceae	Leaves	Petroleum ether
2	Aloe barbadensis	Aloeaceae	Leaf	Aqueous
3	Aerva lanata	Amaranthaceae	Whole plant	Ethanol
4	Aerva javanica	Amaranthaceae	Fresh Roots	Aqueous
5	Azadirachta indica	*Meliaceae*	Leaves	Methanol
6	Berberris aristata	Berberidaceae	Root bark	Decoction
7	Benincasa hispida	cucurbitaceae	Fruits	Ethanol
8	Bauhinia variegatea	Caesalpiniaceae	Stems	Ethanol
9	Cichorium intybus	Asteraceae	Aerial Parts	Ethanol
10	Cassia auriculata	Fabaceae	Roots	Ethanol
11	Carica papaya	Caricaceae	Seeds	Ethanol
12	Ceratonia siliqua L.	Fabaceae	Leaves	Ethanol
13	Cyanotis fasciculata	commelieceae	Whole plant	Ethanol
14	Dendropanax morbifera	Araliaceae	Leaves	Methanol
15	Dichrostachys Cinera Wight & Arn.	Mimosaceae	Roots	Alcohol
16	Ficus racemosa	Moraceae	Stem bark	Ethanol and aqueous
17	Ficus religiosa	Moraceae	Latex	Methanol
18	Ficus hispida	Moraceae	Fruit	Methanol
19	Graptophyllum pictum (L.) Griff.	Acanthaceae	Whole Plant	Ethanol
20	Heliotropium eichwaldi	Boraginaceae	dried roots	Methanol
21	Hibiscus sabdariffa	Malvaceae	calyces	Aqueous
22	Hygrophila spinosa	Acanthaceae	Whole plant	Methanol
23	Indigofera tinctoria	Fabaceae	Root and Leaves	Water (decotion)
24	Kigelia africana	Bignoniaceae	fruits	Alcohol
25	Launea taraxacifolia	Asteraceae	Leaves	Aqueous extract
26	Lepidium sativum	Brassiaceae	Seeds	Ethanol
27	Lantana camara	Verbanaceae	Flowers	Ethanol
28	Michelia Champaca	Magnoliaceae	Flowers	Ethanol
29	Morus alba	Moraceae	Leaves	Hydro alcohol
30	Merremia emarginata	Convulaceae	Plant	Ethanol
31	Morinda citrifolia	Rubiaceae	Fruits	Ethanol
32	Mucuna pruriens	Papilionaceae	Seed	Aqueous Extract
33	Ocimum basilicum	Labiaceae	Aerial	Ethanol and Water
34	Ocimum gratissimum	Labiaceae	Leaves	Aqueous
35	Orthosiphon Stamineus	*Lamiaceae*	Leaves	Methanol
36	Phyllanthus fraternus Web	Euphorbiaceae	Aerial parts	Methanol
37	Picrorhiza Kurroa Royle	Scrophulariaceae	dried rhizomes	Ethanol
38	polygonum glabrum	Polygonaceae	Whole plant	Methanol
39	Portula oleracea	Portulaceae	Leaves and stems	Ethanol
40	Pongamia pinnata	Papilionaceae	Flowers	Ethanol
41	Pedalium murex Linn	Pedaliaceae	Dried fruits	Ethanol
42	Rubia cordifolia	Rubiaceae	Root	Ethanol
43	Rubus ellipticus	Rosacea	Fruits	Aqueous and Ethanol
44	Salvia Officinalis	Lamiaceae	Leaf	Aqueous
45	Sida cordifolia	Malvacea	Root	Aqueous
46	Solanum xanthocarpum.	Solanaceae	Fruits	Ethanol
47	Syzygium cumini	Myrtaceae	Fruits	Ethanol
48	Terminalia arjuna	Combretaceae	Bark	Ethanol
49	Thespesia populnea	Malvaceae	Leaves	Methanol
50	Tinospora Cardifolia	Menispermeacea	Stem	Alcohol
51	Tribulus terrestris	*Zygophyllaceae*	Fruits	Ethanol
52	Vernonia cinerea	Compositae	Aerial parts	Alcohol

Conclusion

From this study, it is clear that the medicinal plants play a prominent role against nephrotoxicity. A variety of medicinal plants have been reported for its significant nephroprotective activity in animal models. The nephroprotective activity is probably due to the presence of Anti-oxidants, flavonoids in all the medicinal plants. The results of this study indicate that extracts of leaves and plants of medicinal plants have good potentials for use in kidney damage. Hence, the review of the study is concluded that the herbal drug possesses nephroprotective activity and it has been proven by different animal models which gives many links to develop the future trials.

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