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A STUDY OF ANTIDIARRHEAL MECHANISMS OF KUTAJARISTA USING CASTOR OIL INDUCED DIARRHOEA MODEL IN THE RATS

Ayurveda

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ABSTRACT

A study on Kutajarista was carried out and it was tested for Antidiarrheal mechanisms using castor oil induced diarrhoea model in the rats which is presented in this paper.

KEYWORDS

Kutajarista,Cyperus rotundus ,Nagarmotha,Loperamidehydrochloride,diarrhoea.

1.INTRODUCTION

Diarrhoea has long been recognized as one of the most important health problems in developing countries[4]. Diarrhoea remains the number one killer disease among children aged 1-5 years, and worldwide the disease accounts for 4-5 million deaths among humans annually[6]. To overcome the menace of diarrhoeal diseases in developing countries, the World Health Organization (WHO) has included a programme for the control of diarrhoea, which involves the use of traditional herbal medicine[5]. Several plants have been reported to be used in treating and managing diarrhoeal diseases [1,2]. The present study attempts to identify anti-diarrheal activity of an Ayurvedic formulation Kutajarista using castor oil induced diarrhoea model in the rats.

2.MATERIALS AND METHODS

Source of data:G.S Medical College &K.E.M Hospital.
Study Design: It was prospective Observational Study.
Study Period: 18 monthsMay 1996-99.

Aims: In the present study, Kutajarishta, an Ayurvedic formulation as prescribed for diarrhoea was selected.

Objective: To evaluate anti-diarrhoeal effects of Kutajarishta and compare it with that of other commonly used anti-diarrhoeal plantCyperus rotundus and with allopathic drug loperamidehy drochloride (Johnson and Johnson pvt ltd) as Standard Modern drug

Methodology:Plant material

Kutajarista, a formulation containing Holarrhena antidysentrica as main ingredient and 2 other plants 1. Hoalarrhena antidysentrica (kutaj) and 2. Cyperus rotundus (Nagarmotha) where selected. The activity of Holorrhena antidysenrica was evaluated and compared with commonly used plant Cyperus rotundus Nagarmotha, and compared with allopathic drug loparamide hydrochloride (Johnson and Johnson pvt ltd) as Standard.Kutajarishta by M/S Sandu Bros was used. This form Model of diarrhoea - Castor oil induced diarrhoea model was set up. Castor oil-induced diarrhoea in rats is described to be an appropriate model of the complex, prolonged processes of hypersecretion and accelerated transit that characterize secretory diarrhoea.This formulation was prepared as per Ayurvedic textbook.

Extract I

Stems of Holarrhena antidysentrica were finely powdered. To this powder distilled water was added and the mixture was heated on the low flame till the original volume was reduced to 1/8th).

Extract 2

Mixture of finely powdered stems of Holarrhena antidysentrica and distilled water was heated on the low flame till the original volume was reduced to 1/4th,

Animal Materials

Charles Foster rats of either sex between 200-250 gms. were selected for the study. of both sex weighing between 150-250 gms were used. Institutional Animal Ethics Committee approved the experimental protocol; animals were housed under standard conditions of temperature (24 ± 2°C) and relative humidity (30-70%) with a 12:12 light: dark cycle. The animals were given standard diet and water *ad libitum*.

Drug and Chemicals:

loperamide hydrochloride (Johnson and Johnson Pvt. Ltd.) was used as the standard anti-diarrhoeal drug

Model: Castor oil induced diarrhoea[3,4]

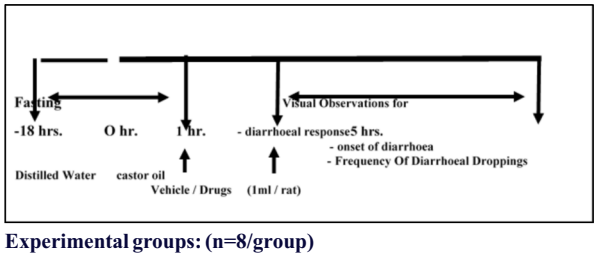
A group of rats was challenged with castor oil (I ml per rat after 18 hours fasting). Those showing diarrhoeal response to castor oil were selected for the study. Thus, 56 responders were identified and divided randomly into 7 groups. While carrying out the experiment, a rat from each group was selected randomly. Thus for an individual experiment, 7 rats from 7 groups were taken. They were kept fasting for 18 hr. Following this period, they were administered a single dose of either distilled water, vehicle or drugs under evaluation. One hour later, castor oil was administered in a dose of 1 ml per rat. Each of the animal was then housed in a specially designed cage. At the bottom of the cage, a blotting paper was placed. Above this, a grid was placed to prevent the animal touching blotting paper. The rat was kept on the grid. Rats from individual cages were inspected for diarrhoeal droppings, for a period of 4 hours. The blotting paper placed beneath the grid was replaced after each dropping. Number of animals showing diarrhoea at the end of 4 hrs was counted and percentage of responders were calculated. Time taken for onset of diarrhoea and frequency of diarrhoeal droppings were noted and compared amongst the groups. This experiment was repeated 8 times so that data for all the 8 animals from each group were collected.

Parameters of assessment

1. Percentage of animals showing diarrhoea at the end of four hours,
2. Time taken for onset of diarrhoea, and
3. Frequency of diarrhoeal droppings for four hours.

Experimental design

Rats (n=8/group)



Experimental groups: (n=8/group)

Group 1: Untreated control group (distilled water).
Group 2: Vehicle control group (acidified hydroalcoholic solvent).

Group 3: Standard therapy group (Loperamide hydrochloride).
Group 4: Treated with Extract I of Holarrhena antidysentrica.
Group 5: Treated with Extract 2 of Holarrhena antidysentrica.
Group 6: Treated with Extract of Cyperus rotundus.
Group 7: Kutajarishta therapy

MATERIALS AND METHOD

Experimental study

After obtaining permission from the Institutional Ethic committee for animal studies the entire experimental work was carried out in randomly bred Charles Foster rats of either sex. In the experiment rats weighing between 200-250 grams were used. The animals Prior to the experimental day, -the rats were kept fasting for 18 hrs, with free access to water.

Therapeutic agents

Following therapeutic agents were selected for the treatment of the diarrhoea:

1. Formulation of Kutajarishta

Kutajarishta formulation manufactured by MS Sandu Bros- Pvt Ltd served as a standard for the present study. The steps involved in the preparation of this formulation are described in the following paragraphs. The ingredients andtheir quantities are presented in **Table 1**

Table 1:Kutajarishta Formulation (200 ml)

Sr. No.	Ingredients	Part used	Quantity (Grams)
1	Holarrhena antidysentrica	Stem	200
2	Vitis vinifera	Fruit	100
3	Maduka indica	Flower	20
4	Gmelina arborea	Stem	20
5	Woodfordiafruticosa	Flower	40
6	Sugar		160

- **Percentage of castor oil responders**

The percentage of animals responding to castor oil was calculated.

- **Time taken for onset of diarrhoea**

After giving the castor oil the time taken for onset of diarrhoea was noted in minutes till 4 hours.

- **Frequency of diarrhoeal droppings**

The frequency of diarrhoeal droppings was calculated by observing the number of times diarrhoeal discharge had occurred in 4 hours.

Experimental groups

Group-1 The rats from this group received distilled water in a dose of 1 ml/ 200g of rat orally; this served as untreated control group.

Group-2 This group was administered acidified hydroalcoholic solvent in a dose of 1ml per200g of rat orally. This group served as vehicle treated group.Acidified hydroalcoholic solvent was used as a vehicle for Kutajarishta.

Group-3 This group received loperamide hydrochloride in a dose of 0.288 mg per 200 gm of rat (i.e. 1ml). This group was selected as the standard therapy group.

Group-4 This group received whole extract (extract l) of Holarrhena antidysentrica in a dose of 270 mg per 200 gms of rat (i.e. 1ml).

Group-5 To these rats whole extract (extract 2) of Holarrhena antidysentrica in a dose of 83 mg per 200 gms of rat was used orally (i.e. 1ml).

Group-6 Animals from these group received whole extract of Cyperus rotundus. The dose of 180 mg per 200 gms of rat was administered orally.

Group-7 Formulation of 'Kutajarishta' was fed to these rats orally in a dose of 0.8ml per 200g of rat.

Statistical Analysis

Data of all 8 rats from each group were pooled to calculate mean and standard deviation. Percentage of castor oil responders was calculated. Fisher's exact test was used to compare the castor oil responders (number of animals) in various groups. The data for other 2 parameters were analysed using Student's unpaired 't' test.

RESULTS:

Model: Castor oil induced diarrhoea

- **Percentage of responders to castor oil**

Percentage of responders to castor oil (i.e. the rats showing diarrhoea) were 100 % in Group l, which was treated only with distilled water.

In Group 2, which received only the vehicle, response to castor oil was 87.5 %.

Group3. castor oil failed to induce diarrhoea in any of the animals given loperamide The incidence of diarrhoea exhibited in the rats given whole extract of Holarrhena antidysentrica (viz Extract I in Group 4) was 87.5 %.

However, Extract 2 of Holarrhena antidysentrica was found to protect 50 % rats against diarrhoea ($p < 0.01$ vs Group l).

Extract of Cyperus rotundus offered protection in 37. 5 % animals while Kutajarishta offered protection in 25 % rats. **Table 2**

Table 2: Effects of various plant products against castor oil induced diarrhoea.

Treatment group (n=8/Group)	No. of animals having diarrhoea	Castor oil responders (%)	Onset (min)	Frequent
Untreated control (Distilled water)	8	100	54.4 ± 16	2.63 ± 0.92
Untreated vehical control (Acidified hydroalcoholic Solvent)	NS 7	87.5	NS_1 78.6 ± 53	NS_1 1.25 ± 0.71
Loperamide	0	0	0	0
Extract 1 of Holarrhena antidysentrica	NS 7	87.5	** 115 ± 64	** 1.0 ± 0.53
Extract 2 of Holarrhena antidysentrica	$ 4	50	*** 147 ± 30	*** 0.5± 0.53
Whole extract Cyperus rotundus	NS 5	62.5	* 92 ± 37	*** 0.63 ± 0.52
Kutajarishta	NS	75	*	**

Values representing onset and frequency of diarrhoea are expressed as Mean ± SD

Fisher's exact test: $ $p<10^2$ vs Distilled water, NS= Not significant vs Distilled water

Student's unpaired 't' test: * p<O.01 vs Distilled water, ** p<lo-3 vs Distilled water, *** vs. Distilled water,NS_1 Not significant vs. Distilled water

DISCUSSION

As seen from the results, response to castor oil was 100 % in rats given only distilled water. The average frequency of faecal matter dropping was 2.63 + 0.92 during 4 hr period and these droppings were of non-formed watery stools which occurred within an hour of castor oil administration (54.4 + 16 min). These findings were also observed in the vehicle treated group. An acidified hydroalcoholic acid solvent (7.5 % alcohol in distilled water pH: 3.5) was used to match Kutajarishta. Loperamide protected all the animals against developing diarrhoea.

Of the 2 extracts of Holarrhena antidysentrica, Extract 2 protected 50% rats; it significantly reduced the frequency (0.5 + 0.53) and also delayed the onset by 2 1/2 hr. Though 7/8 rats given Extract 1 exhibited diarrhoeal response, the onset was delayed by an hour. Frequency was reduced significantly compared to the control group. The lower efficacy of Extract 1 probably suggests that with prolonged exposure to heat the active phytoconstituent in this extract may have undergone decomposition. Surprisingly, Kutajarishta was found to be less effective than Extract 2, (though the difference between the two agents was not statistically significant). This raises doubt regarding the role of other ingredients in Kutajarishta. It appears that they do not offer additive effect to the formulation. Whether the fermentation process carried out to increase the stability of the formulation decreases its efficacy is yet another question. Cyperus rotundus, the other anti-

diarrhoeal drug prescribed in Ayurveda showed results comparable to that of Extract 2.

CONCLUSION:

Kutajarista, an Ayurvedic formulation possessed anti-diarrhoeal activity as reported in Ayurveda[9]. Though it did not decrease the incidence of diarrhoea induced by castor oil, it significantly delayed its onset and reduced the frequency. Its protective effect against this irritant (or secretory) diarrhoea was of lesser degree than the modern medicinal agent, loperamide, which could protect all the animals from diarrhoea.

Of the 2 comparators (loperamide and Cyperus rotundus), loperamide was 100% effective in controlling diarrhoea induced by castor oil. Loperamide is one of the most efficacious and widely employed antidiarrheal drug. Loperamide effectively antagonized the diarrhoea induced by castor oil[6].prostaglandin[7] or cholera toxin[8]. The therapeutic effect of loperamide is believed to be due to its antimotility and antisecretory activity.

REFERENCES

1. Raina MK. Standardization and quality control of herbal medicines. 2"d National Workshop -cum training programme on Quality control and Standardization of Herbal remedies. Jammu Tawi , India. March 25 th - 29th 1997: 32-41.
2. Akade S, Narayana DBA, Bridayan NB, KatiyarCK . Quality control of herbal medicine. IDMA Bulletin 1995; 32 : 984 -91.
3. Iwao I, Terada Y, Mechanism of diarrhoea due to castor oil. Jpn J Pharmacol 1962;12: 137 - 45.
4. Awouters F, Niemegeers CJF, Lenaerts FM, Janssen PAJ. Delay of castor oil diarrhoea in rats. J Pharm Pharmacol 1978; 30 : 41-5.
5. Kirtikar KR. Basu BD. In : Blatter E, Caius JF, Maskar KS Eds. Indian Medicinal Plants, 22 ed Alhahabad, : Basu Publications 1984 a : 1570-1.
6. Nadkami KM. Indian plants and drugs with their medicinal properties Indian Materia Medica, 14" ed. Delhi: Asciatic Publishing House 1998 a 139.40
7. Delay of castor oil diarrhoea in rats: a new way to evaluate inhibitors of prostaglandin biosynthesis.[J Pharm Pharmacol. 1978]
8. Dineshchandra, An experimental study of kutajarishtawith special reference to amoebiasis.Anc Sci Life. 1988 Oct-Dec; 8(2): 100–102.
9. Prashant B. Shamkuwar .Antidiarrhoeal Mechanisms of Kutajarishta Der Pharmacia sinica. 3 (1); 2012: 71-75.