Research Article

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AN EXPERIMENTAL STUDY OF KUTAJARISHTA (AN AYURVEDIC HERBAL FORMULATION) FOR ITS ACTION ON INTESTINAL MOTILITY

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ABSTRACT

Kutajarishta is a self-generated alcoholic preparation of Ayurveda, the Indian System of Medicine. It is a polyherbal formulation containing *Holarrhena antidysenterica* Wall. ex DC (Family: *Apocynaceae*) as a chief ingredient. It is used in the conditions like diarrhea, amebic dysentery and irritable bowel syndrome. Formulations of Kutaja are found to be very useful clinically in these conditions and are being used since centuries by Ayurvedic practitioners. In the conditions like Grahani, Atisara and Pravahika, intestinal motility is affected. Hence, it is expected that the drugs that can reduce intestinal motility are helpful in treating these disorders, especially different types of diarrhoea. Experimental study was conducted to scientifically validate the action of Kutajarishta on intestinal motility. The study was carried out in Institute of Post Graduate Teaching and Research in Ayurveda, Jamnagar, India. Time taken for excretion of Kaolin and charcoal meal test were considered as parameters. Treated Swiss albino mice showed statistically highly significant delay in the excretion of Kaolin and charcoal in comparison with the control group.

The study indicates that Kutajarishta reduces intestinal motility thereby contributing to its usefulness in treating diarrheas.

Keywords: Kutajarishta, Holarrhena antidysenterica, intestinal motility, diarrhea.

INTRODUCTION

Kutajarishta[1] is a self-generated alcoholic preparation of Ayurveda and is popularly being used in clinical practice in the conditions like, diarrhea, amoebic dysentery, mal absorption syndrome etc. Fresh stem bark of Kutaja (*Holarrhena antidysenterica* Wall. ex DC, Family: Apocynaceae) is the primary ingredient of this formulation which is a known drug for Ayurvedic physicians and being used popularly in diarrhea, dysentery and other gastrointestinal manifestations[2]. Modern pharmacological researches carried out on *Holarrhena antidysenterica* bark confirm its activity against both acute and chronic amoebic dysenteries[3]. It is also found that this drug has potent immune-stimulatory[4] effect. Antidiarrheal activity [5], antimotility and antisecretory[6] effect of Kutajarishta have been established in castor oil and magnesium sulphate induced diarrhoea models.

In the present study, considering all the above factors an experimental study of Kutajarishta was planned. In the conditions like diarrhea, amoebic dysentery, mal absorption syndrome and Irritable bowel syndrome intestinal motility and absorption are disturbed. On the basis of previous studies, a well-established charcoal meal test[7,8] and newly developed Kaolin excretion test[9] were followed. Accordingly animal models were planned to evaluate the effect of test drug.

MATERIALS AND METHODS

Preparation of drug

Flowers of Madhuka, *Madhuca longifolia* (J.Konig) J.F.Macbr (Sapotaceae) were collected from the forests of Madhya Pradesh. Fresh trunk bark of Kutaja, *Holarrhena antidysenterica* (L.) R.Br. (Apocyanaceae) and bark of Kashmarya, *Gmelina arborea* Roxb. (Verbenaceae) were collected locally from Jamnagar. Flowers of Dhataki, *Woodfordia fruticosa* (L.) Kurz, were collected from Udupi. Raisins of Draksha *Vitis vinifera* L. (Vitaceae) was collected from Saputara Gujarat. Adjuvants like honey and jaggery were collected from local market. Kutajarishta was prepared in laboratory at IPGT and RA, Jamnagar following standard operative procedure as per the reference of Sharngadhara Samhita [10]. Prepared sample was evaluated for its quality by using organoleptic, physico-chemical parameters and advanced analytical techniques like TLC, UV-visible spectrophotometry etc. and authenticated.

Evaluation of effect of Kutajarishta on intestinal motility

Experimental study was carried out after obtaining the concurrence from Institutional Ethical Committee of IPGT and RA Jamnagar. In Grahani, Atisara and Pravahika wherever intestinal motility is affected Apana Vayu is vitiated. Ayurvedic classics have mentioned that in the situations of vitiated Apana Vayu, medicine has to be administered in Pragbhakta time (just before food)[11]. To validate this concept, the study was done, by comparing time taken by individual animal for excretion of Kaolin,

when drug is administered before food and after food. Similarly charcoal meal test was also carried comparatively administering the medicine before and after food.
All experiments were in compliance with the ANMAT No. 6344/96 for animal care guidelines.

Kaolin Excretion Test
Animals: "Swiss Albino mice" were used for the present study.

Drugs and chemicals
- Kutajarishta
- 40% Kaolin (as a marker) (CDH)
- Distilled water

Kutajarishta was prepared in Rasasastra and Bhaisajya Kalpana department of IPGT and RA, Jamnagar, India.

Dose Selection
The dose of Kutajarishta was calculated by extrapolating the human dose to animals, based on the body surface area ratio by referring the "Paget and Barnet's" standard table (conversion factor: 0.0026). The dose of Kutajarishta was fixed as 7.8 ml kg^{-1}

Preparation of Kaolin Suspension
4 g of Kaolin powder was mixed with 10 ml distilled water to form a 40% solution and was administered orally into the individual mouse by using a syringe with an attached gastric tube.

Administration of Drug
Kutajarishta was administered as it is with the help of a gastric tube. The animals of control group received plain tap water. Drug was administered for 7 days.

Preliminary study
Preliminary study was carried out to observe the characteristics of fecal matter. Initial weights of the mice were recorded and they were placed in separate containers with blotting paper placed at the bottom. Feeding time was restricted to between 9 a.m. and 10 a.m. Animals were isolated after 10 a.m. After this, Preliminary study in relation to the latency of onset of Kaolin excretion was carried out in the same 18 individual mice. For this, feed was given at 9 A.M., 40% kaolin was given after 1 hour (at 10 A.M.) and immediately the mice were isolated. The time at which the coloration of fecal matter begins to assume the color of Kaolin was noted.

Experimental Protocol
The comparative effect of test drug on fecal matter was evaluated when the drug was administered before feeding and after feeding.

Experiment 1: When the drug was administered before feeding
12 Swiss albino mice were grouped into two, each containing 6 animals, control group received tap water and the test group received Kutajarishta at a dose of 7.8 ml kg^{-1}as mentioned earlier. Drug was administered at 9 A.M. and then the feed was given. Feeding time was restricted to between 9 A.M. and 10 AM. Then the animals were administered with 40% Kaolin and isolated. Time taken by each mouse for excretion of Kaolin in the fecal pellets was noted. Experiment was carried out for 7 days.

Experiment 2: When the drug was administered after feed
Here for the same animals drug was administered after 2 hours of feed followed by Kaolin administration. Same procedure as in Experiment 1 was followed. Experiment was carried out for 7 days.

Collection of data: Time required for the excretion of Kaolin in the fecal matter was recorded when the drugs were administered before feed and after feed.

Charcoal Meal test
As an attempt, to assess the effect of test drug on intestinal motility in a precise and objective manner, charcoal meal test was carried out. In this parameter, the observations recorded gave more accurate data.

Procedure
All the materials were same as described in Kaolin excretion test, but instead of Kaolin, 3% activated charcoal was used as a marker. Grouping, dose fixation, drug administration were same as before. Here also, the experiments were carried out in two phases, when drug was administered before feed and after feed.
Drug was administered for seven days. On 8th day, activated charcoal meal (3%) was administered after one hour of drug administration. Mice were sacrificed (by stunning and severing of neck vessels) exactly after 10 minutes of charcoal administration. Total intestinal length and the distance traveled by charcoal in each mouse were measured. Percentage of distance traveled by charcoal was calculated.

Statistical analysis
Data obtained during experimentation was subjected to statistical analysis by employing "paired and unpaired students't' test" and percentage change in comparison with preliminary study was also carried out.

RESULTS

A slight increase of 6.59% in the latency of onset of kaolin expulsion was observed when compared to control group. When compared with preliminary study, a delay of 5.08% was observed in the onset of kaolin expulsion in comparison to pre-drug assessment in Kutajarishta group. In control group a marginal decrease (1.4%) in latency was observed (Table1 and Table 2, Graph 1).
When the drug was administered after feeding, 29.15% reduction in fecal output was observed in Kutajarishta group. When the drug was administered before feeding, expulsion of Kaolin was delayed by 6.59% in Kutajarishta group. When the drugs were administered after feeding, 6.35% delay was observed in Kutajarishta group in the onset of Kaolin expulsion. When compared with data of pre-drug preliminary study, 13.54% delay in the onset of

kaolin excretion in fecal matter was observed in Kutajarishta group. In control group 7.57% delay was observed. The differences were not statistically significant (Table 3, Graph 2).

When the drug was administered before feed, a remarkable reduction of 48.3% was observed in the distance traveled by activated charcoal in intestine, when compared with control. This was statistically highly significant (t = 9.96; P < 0.001). (Table 4, Graph 3)

When the drug was administered after feed, a reduction of 2.09% was observed in the percentage distance traveled by activated charcoal when compared with control. (Table 5, Graph 4)

Table 1: Baseline data on fecal output and latency of kaolin expulsion in animals selected for experimentation

Group	Dose	Latency of Kaolin expulsion seen (in minutes)
Control	-	370.69 ± 10.73
Kutajarishta	-	373.22 ± 16.73

Table 2: Effect of Kutajarishta on latency of onset of kaolin expulsion (in minutes) when administered before feed

Group	Dose	Latency of onset of Kaolin expulsion (in minutes) Mean ±S.E.M	% Change
Control	7.8 ml kg^{-1}	365.43 ± 12.48	-
Kutajarishta	7.8 ml kg^{-1}	391.24 ± 18.00	6.59% ↑

Table 3: Effect of Kutajarishta on latency of onset of kaolin expulsion when drugs are given after feed

Group	Dose	Mean ± SEM Latency of onset of Kaolin expulsion(in minutes)	% Change
Control	7.8 ml Kg^{-1}	398.45 ± 11.05	-
Kutajarishta	7.8 ml Kg^{-1}	423.76 ± 4.99	6.35 ↑

Table 4: Effect of Kutajarishta, administered before feed on the distance covered by activated charcoal (in percentage)

Group	Dose	Distance covered Mean ± SEM	% Change
Control	7.8 ml Kg^{-1}	94.74 ± 2.67	-
Kutajarishta	7.8 ml Kg^{-1}	48.91 ± 3.75	48.37 ↓

Table 5: Effect of the Kutajarishta, administered after food on the distance covered by activated charcoal

Group	Dose	Distance covered by charcoal in % Mean ± S.E.M.	% Change
Control	7.8 ml kg^{-1}	56.34 ± 9.61	-
Kutajarishta	7.8 ml kg^{-1}	55.16 ± 11.79	2.09 ↓

Figure 1: Photograph showing coloration of fecal pellets of mice by Kaolin
1. Normal colored feces, 2.White colored fecal pellet indicating the excretion of Kaolin

DISCUSSION

Many formulations have been in use in Ayurveda which are not seen in other systems of medicine. Formulation is important in relation to palatability, to increase or decrease the dose, to minimize the duration of treatment, to reduce and minimize toxicity and adverse effects, as a method of preservation etc. In the present study, Arishta of drug Kutajawas taken for the study. As the standardization is part of this study, the study of pharmacological actions of prepared drugs on experimental animals helps to test the genuineness of the sample.

Kutaja, *Holarrhena antidysenterica* is known for its antidiarrheal and anti-dysenteric activities[11]. From the detailed study of the modern review on gastrointestinal tract it was clear that any derangement in gastrointestinal motility may produce various disorders like nausea, vomiting, diarrhea etc. Digestion and absorption of food

depends upon the regular and constant motility of the gastrointestinal tract. In many of the diseases diarrhea may occur due to disturbed gastric emptying and hyper motility of the gut. Kutajarishta is mentioned for the treatment of Pravahika, Atisara etc. in all the Ayurvedic texts. Considering all these factors it was planned to evaluate the effect of Kutajarishta on intestinal motility of experimental animals.

Here the study was carried out in Swiss albino mice. The preliminary study was carried out to observe normal pattern of fecal output and also to make animals habituated to a restricted time of feeding and to that of residing in separate containers.

Selection of Marker[12]

As it was difficult to assess in vivo movement of the drug it was thought useful to administer a marker, which causes color change of fecal matter and will not cause alteration of drug effect. On the basis of previous work carried out, 40% Kaolin solution was used as it was ideal to alter the color of fecal pellets (Fig.1).

The drugs were administered immediately before the feeding and also after feeding in another group to confirm the appropriate time for drug administration[13] to assess the influence of presence of food on intestinal motility.

Selection of Parameter

Time required for the onset of Kaolin expulsion

To assess the action of Kutaja on the intestinal motility, latency of onset of Kaolin expulsion in fecal matter was selected as a parameter. Reduction in the intestinal motility due to the action of Kutaja could be inferred by the delay in onset of the Kaolin expulsion.

Distance covered by charcoal

Lesser the distance traveled by the charcoal (in the intestinal) was considered as better action of Kutaja in reducing the intestinal motility.

Effect of test drugs as per the above parameters

When the results of the experimental study are analyzed the observations clearly support the hypothesis that Kutaja reduces the intestinal motility in Arishta form.

Drugs used in the symptomatic treatment of diarrhea can be divided as follows[14]:

- Gastrointestinal protectives and adsorbents. This includes both absorbents and adsorbents
- Drugs affecting intestinal motility
- Miscellaneous: This included Anti-scouting drugs, Astringents, Lactobacillus etc.

Antidiarrheal activity of Kutaja may be because of its specific action as, anti-parasitic activity as it has proved activities against *E. hystolytica* and *G. lamblia* [15]. Efficacy of the product may also be due to its non-specific and actions as one among the above.

Kutaja contains tannin[16] which is an astringent. The astringents, because of their ability to precipitate superficial proteins form a protective layer on mucous membrane, also reduced secretion. Present study suggests the anti-motility activity of Kutaja in Arishta (self-generated alcoholic preparation) form.

Antimotility activity may be activities similar to that of opoid agonists. They act at μ and σ receptors in the gastrointestinal tract to alter both motility and secretion. Activation of receptors can lead to increased tone of rectal sphincters, to a disruption of normal peristaltic motion and to reduce secretion, Activation of δ receptors can lead to reduced scouting activity[17]. Here intestinal transit will be slowed down (permitting more time for absorption). Another possibility is the PG inhibiting activity. Prostaglandins are known to stimulate intestinal fluid secretion and intestinal motility. Anticholinergic action is also one of the modes of activity in reducing the intestinal motility.

CONCLUSION

In the selected animal models, delay in the latency of onset of Kaolin expulsion in fecal matter was observed in treated group. Lesser distance was traveled by the charcoal in intestine in the case of Kutajarishta. By these findings, it became evident that the product Kutajarishta is very effective in reducing intestinal motility and hence can be considered as very useful in the conditions like, diarrhea and dysentery.

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