EVALUATION OF ANTIDIARRHOEAL ACTIVITY OF MEBARID: AN AYURVEDIC FORMULATION

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Received: 3 Jan 2012, Revised and Accepted: 1 Feb 2012

ABSTRACT

Antidiarrhoeal effect of Mebarid, an Ayurvedic formulation was subjected to pharmacological evaluation. Mebarid, at a dose of 2.5 to 10 ml/kg showed antidiarrhoeal activity in castor oil and magnesium sulphate induced diarrhoea. It has also produced antimotility and antisecretory activity in castor oil induced intestinal transit and intraluminal fluid accumulation in mice. Phytochemical analysis showed the presence of carbohydrates, steroids, triterpenoids, alkaloids, flavonoids and tannins as major constituents. These results suggest that Mebarid possesses antidiarrhoeal effect may be due to its antimotility and antisecretory effect. Antimotility and antisecretory effect of Mebarid may be due to the presence of different phytochemicals.

Keywords: Mebarid, Diarrhoea, Intestinal transit, Intestinal fluid accumulation.

INTRODUCTION

Diarrhoea is a frequent medical problem.1 Intestinal infection is the most common cause of diarrhoea worldwide and is responsible for the deaths of 3–4 million individuals each year, mostly in preschool-age children.2 The major cause of diarrhoea among children in developing countries is malnutrition. In some developing countries, children may suffer from repeated attacks of acute diarrhoea, which contribute to the infection–malnutrition cycle and consequent impairment of growth and development. Acute diarrhoea in children leads to significant morbidity and mortality, even in the wealthy industrialized countries. Chronic diarrhoea is also a major problem in some other clinical situations.3,4

In order to combat the problems of diarrhoea globally, the World Health Organization in Diarrhoeal Disease Control Programme has given a special emphasis on the use of traditional medicines in the control and management of diarrhoea, as medicinal herbs constitute an indispensable component of the traditional medicine practiced worldwide due to the economical viability, accessibility and ancestral experience.3,4 As Mebarid is widely used Ayurvedic antidiarrhoeal pediatric syrup, present study was conducted to investigate the antidiarrhoeal, antimotility and antisecretory effect of Mebarid in mice.

MATERIALS AND METHODS

Drugs


Composition of Mebarid

Each 10 ml of Mebarid contains i) Ajmoda (100 mg), ii) Bael (100 mg), iii) Lodhara (100 mg), iv) Dadim (100 mg), v) Badishep (100 mg), vi) Darahalad (100 mg), vii) Jaiphal (50 mg), viii) Suth (50 mg), ix) Ativish (50 mg), x) Kuda (50 mg), xi) Sugar (q.s.).

Animals

“Swiss albino mice” of either sex, weighing: 20 – 25 gm obtained from VIPER, Pune, were used for the experiments. They were kept in standard environmental condition, fed standard food and water ad libitum. All experiments were performed after an overnight fast. The study was approved by Institutional Animal Ethical Committee of Government College of Pharmacy, Aurangabad, Maharashtra, India (GCPA/IAEC/2011/235, 11/03/2011).

Experimental procedure for antidiarrhoeal activity

Acute toxicity

Initially the Mebarid was studied for acute oral toxicity as per revised OECD guidelines number 423. Mebarid was devoid of any toxicity up to 20 ml/kg in albino mice by oral route. Hence for further studies 2.5 to 10 ml/kg doses of these formulations were used.

Castor oil induced diarrhoea

The animals were divided in to control, positive and test groups containing six in each group. Each mouse was kept for observation under a glass funnel, the floor of which was lined with blotting paper and observed for 4 h. Diarrhoea was induced by administering 0.2 ml of castor oil orally to mice.9,10 The control group received only distilled water (10 ml/kg, p.o.); the positive control group received loperamide (2 mg/kg, p.o.); test group received Mebarid at doses of 2.5, 5, 10 ml/kg, p.o., body weight immediately after charcoal meal administration. The positive control group received atropine sulphate (5 mg/kg, i.p.), while the control group received distilled water (10 ml/kg, p.o.). After 30 min, the animals were sacrificed and the movement of charcoal from pylorus to caecum was measured. The peristaltic index, which is the distance travelled by charcoal meal to the total length of small intestine expressed in terms of percentage.13

Gastrointestinal motility by charcoal meal

The animals were divided in to control, positive and test groups of six mice each. Each animal was given orally 0.2 ml of charcoal meal (3% charcoal in 5 % gum acacia). The test groups received the Mebarid at doses of 2.5, 5, 10 ml/kg, p.o., body weight immediately after charcoal meal administration. The positive control group received atropine sulphate (5 mg/kg, i.p.), while the control group received distilled water (10 ml/kg, p.o.). After 30 min, the animals were sacrificed and the movement of charcoal from pylorus to caecum was measured. The peristaltic index, which is the distance travelled by charcoal meal to the total length of small intestine expressed in terms of percentage.13

Small intestinal secretions

Effect of Mebarid on intestinal secretion was indirectly studied byentero-pooling assay. The mice were divided into different groups and treated with Mebarid (2.5, 5, 10 ml/kg, p.o.), distilled water (10 ml/kg, p.o.) and standard chlorpromazine (30 mg/kg, i.p.) before the oral administration of castor oil 0.2 ml per mouse. These mice were sacrificed 30 min later and entire small intestine from each animal was
Statistical analysis was carried out using Student’s t-test. The results of all experiments were reported as mean ± S.E.M.

The results revealed that Mebarid inhibited the gastrointestinal transit of charcoal in mice by 20.48 %, 31.02 % and 45.16 % at doses of 2.5 ml/kg, 5 ml/kg and 10 ml/kg respectively while atropine hydrochloride at dose of 5 mg/kg showed 55.94 % inhibition of gastrointestinal transit as shown in Table 3.

Effect of Mebarid on small intestinal transit

The results revealed that Mebarid inhibited the gastrointestinal transit of charcoal in mice by 20.48 %, 31.02 % and 45.16 % at doses of 2.5 ml/kg, 5 ml/kg and 10 ml/kg respectively while loperamide at dose of 2 mg/kg showed 92.45 % inhibition of diarrhea as shown in Table 1.

Table 1: Effect of Mebarid on castor oil induced diarrhea in mice.

<table>
<thead>
<tr>
<th>Group</th>
<th>Dose (/kg)</th>
<th>Onset of diarrhea (min)</th>
<th>Total weight of stools (g)</th>
<th>Weight of wet stools (g)</th>
<th>Total number of stools</th>
<th>Number of wet stools</th>
<th>% Inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td>53 ± 2.11</td>
<td>0.372 ± 0.010</td>
<td>0.35 ± 0.010</td>
<td>13.33 ± 0.33</td>
<td>11.00 ± 0.36</td>
<td></td>
</tr>
<tr>
<td>Mebarid</td>
<td>2.5 ml</td>
<td>83 ± 2.09</td>
<td>0.177 ± 0.006</td>
<td>0.16 ± 0.006</td>
<td>6.16 ± 0.30</td>
<td>4.83 ± 0.30</td>
<td>56.09</td>
</tr>
<tr>
<td>Mebarid</td>
<td>5 ml</td>
<td>110 ± 4.47</td>
<td>0.092 ± 0.008</td>
<td>0.091 ± 0.006</td>
<td>3.16 ± 0.30</td>
<td>2.66 ± 0.21</td>
<td>75.81</td>
</tr>
<tr>
<td>Mebarid</td>
<td>10 ml</td>
<td>170 ± 5.48</td>
<td>0.040 ± 0.002</td>
<td>0.035 ± 0.003</td>
<td>1.16 ± 0.16</td>
<td>1.00 ± 0.25</td>
<td>90.90</td>
</tr>
<tr>
<td>Loperamide</td>
<td>2.0 mg</td>
<td>223 ± 5.16</td>
<td>0.036 ± 0.002</td>
<td>0.030 ± 0.003</td>
<td>1.00 ± 0.25</td>
<td>0.83 ± 0.16</td>
<td>92.45</td>
</tr>
</tbody>
</table>

Values are mean ± standard error of mean. Each value represents average of six determinations. $P < 0.05$ vs. control, Student’s t-test.

Table 2: Effect of Mebarid on magnesium sulphate induced diarrhea in mice.

<table>
<thead>
<tr>
<th>X</th>
<th>Dose (/kg)</th>
<th>Onset of diarrhoea (min)</th>
<th>Total weight of stools (g)</th>
<th>Weight of wet stools (g)</th>
<th>Total number of stools</th>
<th>Number of wet stools</th>
<th>% Inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td>47 ± 2.06</td>
<td>0.32 ± 0.01</td>
<td>0.29 ± 0.009</td>
<td>11.50 ± 0.42</td>
<td>8.16 ± 0.30</td>
<td></td>
</tr>
<tr>
<td>Mebarid</td>
<td>2.5 ml</td>
<td>56 ± 3.31</td>
<td>0.135 ± 0.006</td>
<td>0.123 ± 0.005</td>
<td>4.66 ± 0.33</td>
<td>3.33 ± 0.49</td>
<td>59.19</td>
</tr>
<tr>
<td>Mebarid</td>
<td>5 ml</td>
<td>113 ± 4.41</td>
<td>0.083 ± 0.005</td>
<td>0.067 ± 0.004</td>
<td>2.83 ± 0.30</td>
<td>2.00 ± 0.30</td>
<td>75.49</td>
</tr>
<tr>
<td>Mebarid</td>
<td>10 ml</td>
<td>201 ± 5.20</td>
<td>0.027 ± 0.002</td>
<td>0.024 ± 0.002</td>
<td>0.83 ± 0.16</td>
<td>0.66 ± 0.21</td>
<td>91.91</td>
</tr>
<tr>
<td>Loperamide</td>
<td>2.0 mg</td>
<td>207 ± 6.58</td>
<td>0.030 ± 0.004</td>
<td>0.027 ± 0.006</td>
<td>0.83 ± 0.16</td>
<td>0.66 ± 0.21</td>
<td>91.11</td>
</tr>
</tbody>
</table>

Values are mean ± standard error of mean. Each value represents average of six determinations. $P < 0.05$ vs. control, Student’s t-test.

Table 3: Effect of Mebarid on castor oil induced intestinal transit in mice.

<table>
<thead>
<tr>
<th>Group</th>
<th>Dose (/kg)</th>
<th>Percent intestinal transit</th>
<th>% Inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td></td>
<td>73.30 ± 1.60</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>2.5 ml</td>
<td>81.33 ± 2.13</td>
<td>20.48</td>
</tr>
<tr>
<td>Mebarid</td>
<td>5 ml</td>
<td>50.55 ± 1.84</td>
<td>31.02</td>
</tr>
<tr>
<td>Mebarid</td>
<td>10 ml</td>
<td>40.19 ± 1.48</td>
<td>45.16</td>
</tr>
<tr>
<td>Atropine sulphate</td>
<td>5 mg</td>
<td>32.29 ± 1.02</td>
<td>55.94</td>
</tr>
</tbody>
</table>

Values are mean ± standard error of mean. Each value represents average of six determinations. $P < 0.05$ vs. control, Student’s t-test.

Table 4: Effect of Mebarid on castor oil induced intraluminal fluid accumulation in mice.

<table>
<thead>
<tr>
<th>Experimental Group</th>
<th>Dose (/kg)</th>
<th>Weight of small intestine mg</th>
<th>Castor oil induced intraluminal fluid (mg)</th>
<th>% Inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td></td>
<td>1123 ± 25</td>
<td>505 ± 40</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>2.5 ml</td>
<td>1372 ± 22</td>
<td>249 ± 17</td>
<td>50.69</td>
</tr>
<tr>
<td>Mebarid</td>
<td>5 ml</td>
<td>1286 ± 21</td>
<td>163 ± 12</td>
<td>67.72</td>
</tr>
<tr>
<td>Mebarid</td>
<td>10 ml</td>
<td>1223 ± 25</td>
<td>100 ± 11</td>
<td>80.19</td>
</tr>
<tr>
<td>Chlorpromazine</td>
<td>30 mg</td>
<td>1176 ± 24</td>
<td>53 ± 8</td>
<td>89.50</td>
</tr>
</tbody>
</table>

Values are mean ± standard error of mean. Each value represents average of six determinations. $P < 0.05$ vs. control, Student’s t-test.
DISCUSSION

Castor oil induces diarrhoea by causing increased secretion of fluid and electrolytes into the lumen of the bowel by intestinal mucosa, resulting in fluid accumulation and a watery luminal content that flows rapidly through the small and large intestines. This is brought about by the irritant effect of ricinoleic acid liberated by pancreatic enzymes. Charcoal meal test in mice is a method used to study the effect of drugs on the motility of small intestine, since it delayed the gastrointestinal transit in mice as compared to the control.

Gastrointestinal motility describes the contraction of the muscles that mix and propel contents in the gastrointestinal tract. Charcoal meal test in mice is a method used to study the effect of drugs on the motility of intestine. Mebarid may have increased the absorption of water and electrolytes from the intestinal mucosa membranes to water and electrolytes resulting in fluid and watery luminal content that flows rapidly through small and large intestines. Mebarid inhibited the castor oil induced intestinal fluid accumulation. Preliminary phytochemical analysis revealed the presence of carbohydrates, steroids, triterpenoids, alkaloids, flavonoids and tannins as major constituents.

CONCLUSION

Mebarid possesses antidiarrhoeal effect may be due to its antimotility and antisecretory effect. Antimotility and antisecretory effect of Mebarid may be due to the presence of different phytochemicals.

ACKNOWLEDGEMENT

The authors express their gratitude to the Principal, Government College of Pharmacy, Aurangabad, for providing research facilities.

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