



## Review Article

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### OVERVIEW OF FOLK MEDICINE USED FOR TYPHOID IN INDIA

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#### ABSTRACT

Typhoid fever is a systemic infection caused by *Salmonella typhi*, which remains a serious problem in developing country. The traditional Vaidya belonging to various tribes are using folk medicine to prevent and cure the various diseases including Typhoid. The herbs used for Typhoid from various national-international journals and discussed. Most of the mentioned herbs have Katu-Tikta Rasa, Krimighna and Jvaragna property which help to displace or kill the microbe by Prakriti Vighat by decreasing Kapha and Malas on which these microorganisms lodges, flourish, grows and increase in numbers, thus leading to disease. Most of the mentioned folk herbs used for Typhoid have significant result *in vitro* and *in vivo* anti-microbial activity as well as clinical efficacy and also justified the concept of Ayurveda. Hence it can be stated that Typhoid can be treated by giving herbal drug which is already in use by traditional Vaidya and tribes in India, though there is further need of documentation for experimental and clinical study.

**Keyword:** Typhoid, enteric fever, folk medicine, herb

#### INTRODUCTION

Typhoid fever is a systemic infection caused by the bacterium *Salmonella enterica* subspecies *enterica* serotype typhi, which is acquired by ingestion of contaminated food and water. In 2010, there were an estimated 13.5 million typhoid fever episodes globally, while in 2000 typhoid fever caused an estimated 21.7 million illnesses and 217,000 deaths, and paratyphoid fever caused an estimated 5.4 million illnesses worldwide<sup>1</sup>. In India 1084885 case were reported out of which 440 had died due to Typhoid<sup>2</sup>. Folk Medicine is a part of traditional medicine and there are many traditional vaidya belonging to various tribes who are giving folk medicine to cure the various diseases including Typhoid. India is a treasure of traditional knowledge and medicinal herb and traditional vaidya are using this to prevent and cure Typhoid, but scientific literature is scattered and it's need of time to evaluate it scientifically.

#### Typhoid

Typhoid fever is a systemic disease characterized by fever and abdominal pain caused by dissemination of *S. typhi* or *S. paratyphi*. It mainly spreads when people eat food or drink water which is already been infected with *Salmonella typhi*. These bacteria live only in humans. Persons with typhoid fever carry the bacteria in their bloodstream and intestinal tract.

#### Clinical Feature of Typhoid

The most prominent symptom of this systemic infection is prolonged fever (38.8 to 40.5°C, or 101.8 to 104.9°F). A prodrome of nonspecific symptoms often precedes fever and includes chills, headache, anorexia, cough, weakness, sore throat, dizziness, and muscle pains. Gastrointestinal

symptoms are quite variable. Patients can be presented with either diarrhoea or constipation. Early physical findings of enteric fever include rash ("rose spots"), hepato-splenomegaly, epistaxis, and relative bradycardia. Rose spots make up a faint, salmon-coloured, blanching, maculopapular rash located primarily on the trunk and chest.

#### Ayurvedic Aspect of Typhoid

Gananath Sen mentioned the Antrik Jwar caused due to ingestion of bacterial contaminated food and water, which is spread by contaminated stool and urine. He is the first author who mentioned the Jivanu means bacteria as causative microorganism of Antrik Jwar.

#### Folk Medicine

The term folk medicine refers to healing practices and ideas of body physiology and health preservation known to a limited segment of the population in a culture, transmitted informally as general knowledge, and practiced or applied by anyone in the culture having prior experience. Folk medicine may also be referred to as Traditional medicine, Alternative medicine, Indigenous medicine, Complementary medicine, Natural medicine. In fact, out of these terms perhaps only indigenous medicine and Traditional medicine are the terms well congruent with folk medicine<sup>3</sup>. Folk medicine is the mixture of traditional healing practices and beliefs that involve herbal medicine, spirituality and manual therapies or exercises in order to diagnose treat or prevent an ailment or illness. The World Health Organization states that it is mostly practiced by indigenous or native populations and as much as 80 % of the population in certain countries within Asia and Africa rely on it for primary care<sup>4</sup>.

Table 1: Folk Medicine for Typhoid used in India

S. No.	Herb	Family Name	Vernacular Name	Part Used
1	<i>Abrus precatorious</i>	Fabaceae	Gunja	Seed
2	<i>Achyranthes aspera</i>	Amaranthaceae	Apamarga	Root, Leaf
3	<i>Actiniopteris dichotoma</i>	Actiniopteridaceae	Mayurshikha	Whole plant
4	<i>Aerva lanata</i>	Amaranthaceae	Gorakshaganja	Leaves , Whole Plant
5	<i>Ailanthus excels</i>	Simaroubaceae	Aralu	Stem Bark
6	<i>Aloe vera</i>	Liliaceae	Kumari	Whole Plant
7	<i>Ammannia baccifera</i>	Lythraceae	Agnigarba	Leaf Juice
8	<i>Asparagus racemosus</i>	Liliaceae	Satavari	Root Extract
9	<i>Blechnum orientale</i>	Blechnaceae	Centipede Fern	Rhizome
10	<i>Berberis aristata</i>	Berberidaceae	Daruharidra	Whole Plant
11	<i>Boerhavia diffusa</i>	Nyctaginaceae	Punarnava	Root Juice
12	<i>Buchanania lanzan</i>	Anacardiaceae	Priyala	Decoction of Bark
13	<i>Calligonum polygonoides</i>	Polygonaceae	phog	Plant Extract
14	<i>Clerodendrum seratum</i>	Verbenaceae	Bharnagi	Leaf
15	<i>Corallocarpus epigaeus</i>	Cucurbitaceae	Patalagaruda	Root
16	<i>Cassia tora</i>	Caesalpiniaceae	Cakramarda	Root
17	<i>Cymbopogon martinii</i>	Poaceae	Dhyamakah	Smoke of Inflorescence
18	<i>Desmodium gangeticum</i>	Fabaceae	Shaliparni	Root
19	<i>Drynaria quercifolia</i>	Polypodiaceae	Oak-leaf fern	Whole Plant, Rhizome,
20	<i>Eranthemum roseum</i>	Acanthaceae	Dashnuli	Root
21	<i>Echinops echinatus</i>	Asteraceae	Brahmadandi	Root Powder
22	<i>Ficus racemosa</i>	Moraceae	Udumbara	Latex Raw
23	<i>Glossocardia bosvallia</i>	Asteraceae	Parpata	Plant Extract
24	<i>Hodgsoniam acrocarpa</i>	Cucurbitaceae	Hati-kerela	Root and Seed
25	<i>Holiotropium indicum</i>	Boraginaceae	Indian Heliotrope	Whole Plant
26	<i>Jatropha gossypifolia</i>	Euphorbiaceae	Ratanjoti	Latex
27	<i>Leptadenia reticulata</i>	Asclepiadaceae	Caksusya	Leaves Raw
28	<i>Leucas aspera</i>	Lamiaceae	Dronapuspi	Whole Plant
29	<i>Morinda pubescens</i>	Rubiaceae	Nagkura	Bark Decoction
30	<i>Moringa oleifera</i>	Moringaceae	Shigru	Stem Bark
31	<i>Ocimum sanctum</i>	Labiatae	Tulasi	Leaves
32	<i>Ruta graveolens</i>	Rutaceae	Sudapa	Leaf Powder
33	<i>Ricinus communis</i>	Euphorbiaceae	Eranda	Seed
34	<i>Spilanthu sacmella</i>	Compositae	Akarkara	Leaf
35	<i>Tephrosia villosa</i>	Leguminosae	Sharapunkhan	Root paste
36	<i>Tinospora cardifolia</i>	Menispermaceae	Guduci	Juice with Sugar
37	<i>Vitex peduncularis</i>	Verbenaceae	Boruna	
38	<i>viscum monica</i>	Santalaceae		

*Abrus precatorious* seed powder is given in Amarantak Region Madhya Pradesh, India for treatment of Typhoid<sup>5</sup>. Antimicrobial study show Gunja exhibited significant antimicrobial activities against *Salmonella typhi*<sup>6</sup>. *Achyranthes aspera* root decoction is given in Shekhavati Rajsthan and Leaf 10 g with 7 black pepper seed in Orissa<sup>8</sup> to cure Typhoid. Extracts in organic solvents of *Achyranthes aspera* but neither the leaf nor stem parts of *A. Aspera* in any organic extractions showed antibacterial activity<sup>9</sup>. Whole plant of *Actiniopteris dichotoma* is used in Rajsthan<sup>10</sup>. *Aerva lanata* leaves extract 1 teaspoon full twice a day for 3 day orally given in Buldhana district (Maharashtra)<sup>11</sup> and decoction of whole plant in Shekhawati Region Rajasthan<sup>12</sup> to cure Typhoid. *Ailanthus excels* stem bark extract is given by Bhil Tribes of Bibdod Madhya Pradesh, India<sup>13</sup>. *Aloe vera* whole plant is used in Eastern Ghat of Koli Hill Tamil Nadu, India for the treatment of Typhoid<sup>14</sup>. The study revitalizes the traditional system of medicine in order to achieve self-reliance in health care and health for all by analysing the antimicrobial property of aqueous extracts of *Aloe vera* and to assess the reason for inhibition of growth of pathogenic organisms by DNA and protein analysis. Various aqueous extracts showed inhibition to microorganisms *Salmonella typhi*<sup>15</sup>. Leaf juice of *Ammannia baccifera* with honey is given empty stomach

in south Orissa<sup>16</sup>. The ethanolic extract of leaf of *A. baccifera* exhibited highest and lowest ( $22.0 \pm 0.8$  and  $10.9 \pm 0.11$  mm) inhibition against *S. typhi* and *S. aureus*, respectively. *S. typhi* was also strongly inhibited ( $18.5 \pm 0.27$  mm) whereas *E. coli* inhibited poorly ( $10.1 \pm 0.13$  mm) by its root extract<sup>17</sup>. Bhil Tribes of Bibdod Madhya Pradesh, India uses root extract of *Asparagus racemosus*<sup>18</sup>. Methanolic extract of *Asparagus racemosus* particularly at concentration of  $1 \mu\text{g}/\mu\text{l}$  was found to be effective against all bacterial strains including *Salmonella typhi*<sup>19</sup>. *Blechnum orientale* rhizome used in Western Ghat, Himalaya, Tripura, and Orissa and Western Ghats of Maharashtra, India<sup>20,21</sup>. The antimicrobial property in the extracts of *Blechnum orientale* has been evaluated on clinically isolated bacterial pathogens, aqueous extract showed relatively higher zone of inhibition against *S. typhi*<sup>22</sup>. Entire Plant of *Berberis arishtata* is used in Belgaum district karntaka, India<sup>23</sup>. The aqueous and methanol extracts from the studied plants including *Berberis arishtata* showed broad range of activity and could be potential source of antimicrobial compounds<sup>24</sup>. Bhils and its Sub tribes give *Boerhavia diffusa* root Juice 5 g twice a day for 7 days orally with Ghee<sup>25</sup>. Among the three extracts methanol crude extract of aerial part of plant of *Boerhavia diffusa* exhibited strong antibacterial activity compared to petroleum ether extract and

chloroform extract<sup>26</sup>. Tribals of Kinwat Forest Maharashtra, India gives bark decoction of *Buchanania lanzan* twice a day for 3 day<sup>27</sup>. Methanol extracts of *Acacia caesia* (bark), *Dillenia pentagyna* (bark) and *Buchanania lanzan* (bark) screened for antimicrobial potential against seven bacterial species including *Salmonella sp.* and *B. lanzan* showed highest zone of inhibition<sup>28</sup>. Plant extract of *Calligonum polygonoides* is used in Shekhawati Region Rajasthan, India<sup>29</sup>. The tribes of Khammam Andhra Pradesh, India use *Clerodendrum seratum* leaf for enteric fever<sup>30</sup>. Meena community in Rajasthan, India uses root of *Corallocarpus epigaeus* for Typhoid<sup>31</sup>. Root paste of *Cassia tora* and along with the powder prepared from the horn of a cow is used as traditional medicine for Typhoid in Rajasthan, India<sup>32</sup>. Ethanolic extract (0.15 mg) and aqueous extract (0.31 mg) of *Cassia tora* showed antibacterial activity against all tested bacteria but maximum activity were showed by aqueous extract against *Staphylococcus aureus* and *Lactobacillus*. But aqueous extract did not showed any activity against *Salmonella typhi*<sup>33</sup>. Bhils and its Sub tribes use smoke of Inflorescence of *Cymbopogon martini* to treat the enteric fever<sup>34</sup>. The essential oil and extract of *C. martini* have significant antimicrobial activity on *S. typhi*<sup>35</sup>. *Desmodium gangeticum* root extract<sup>36</sup> and root paste with Long Pepper is used in Purulia District West Bangal, India<sup>37</sup>. The methanolic extract of *D. gangeticum* be able to use as potential antibacterial source for various infective pathogens including *S. typhi*<sup>38</sup>. Dry *Naria quercifolia* plant decoction is used in Western Ghat<sup>39</sup> and Arunachal Pradesh, India<sup>40</sup>, while rhizome are used in Wayanadu district of Kerala, India<sup>41</sup> and whole plant in Western Ghat, Tripura Orissa, India<sup>42</sup>. Ethanolic and methanolic extracts of rhizome of *D. quercifolia* showed high efficiency of antibacterial activity and gram-negative bacteria were more susceptible to all the extracts tested<sup>43</sup>. Bhils and its Sub tribes give *Eranthemum roseum* root ground with glassful of water 1/6 glass twice a day for 3 days orally<sup>44</sup>. Antimicrobial activity of the roots of *Eranthemum roseum* (Vahl) R.Br. (Dasmuli), were tested against different bacteria including *Salmonella typhi*, showed strong activity of the petroleum ether extract of the roots of plant against the bacteria<sup>45</sup>; *Echinops echinatus* root powder 1 tablespoonful, once a day at morning for 21 days orally is used in Buldhana District Maharashtra, India<sup>46</sup>. The mother tinctures of desert were screened for antibacterial activity against bacterial strains of Gram-positive and Gram-negative bacteria. *Echinops echinatus* mother tincture showed highly effectiveness only against *Salmonella typhi*<sup>47</sup>. Bhils and its Sub tribes give raw latex of *Ficus racemosa* ¼ table spoonful once a day orally<sup>48</sup>. Ethanolic extracts of 7 plants including *F. racemosa* showed antibacterial activity against *S. typhimurium*<sup>49</sup>. In another study the presence of wide spectrum of antibacterial activities against all the above bacterial pathogens studied. The maximum zone of inhibition observed for each bacterium was as follows: *S. typhi* (12 mm)<sup>50</sup>. Tribals of Kinwat Forest Maharashtra, India give spoonful extract of *Glossocardia bosvallia* plant with cow milk twice a day<sup>51</sup>. The Naga Tribes give root and seed of *Hodgsonia macrocarpa* for Typhoid<sup>52</sup>. Whole plant of *Holiotropium indicum* is given in primary

health care Karnataka, India to treat Typhoid<sup>53</sup>. The carbon tetrachloride soluble materials of *H. indicum* demonstrated activity against *S. typhi* with zone of inhibition  $7.0 \pm 0.73$ <sup>54</sup>. Tribals of Kinwat Forest Maharashtra, India give *Jatropha gossypifolia* 12 drops of latex mixed with 100 g of Jaggery thrice a day for 3 days<sup>55</sup>. The extracts of 24 plants including *Jatropha gossypifolia* showed anti-microbial activity in a range of 75-1200 µg/ml<sup>56</sup>. Bhils and its Sub tribes 4-5 leaves of give *Leptadenia reticulata* thrice a day orally<sup>57</sup>. Amongst the tested three extracts, chloroform extract showed high antimicrobial activity against *E. coli*, alcoholic extract showed high antibacterial activity against *Pseudomonas aeruginosa*, while petroleum ether extract showed antibacterial activity against *Klebsilla pneumoniae*, but no antimicrobial activity of *J. gossypifolia* has seen against *S. typhi*<sup>58</sup>. Whole plant of *Leuca saspera* is given in Nilgiri Biosphere Reserve<sup>59</sup>. Methanol extract of *L. aspera* showed stronger activity compared to ethyl acetate and petroleum ether extracts. It showed highest activity against *Pseudomonas aeruginosa* with zone of inhibition of 15 mm. The standard chloramphenicol did not show any activity against *Shigella sonnei*. But all the extracts showed moderate activity against this pathogen with zone of inhibition ranging from 10 to 13 mm<sup>60</sup>. In another study significant (P < 0.05) zone of inhibitions against Gram positive and Gram negative *Salmonella typhi*, *Salmonella paratyphi* was observed<sup>61</sup>. Tribes of Kinwat Forest of Nanded District, Maharashtra, India uses bark decoction of *Morinda pubescens* 2 table spoonful thrice a day for 3day<sup>62</sup>. Bhils and its Sub tribes give Stem Bark Decoction of *Moringa oleifera* 2 table spoonful once a day orally<sup>63</sup>. The fruit extract of *Moringa oleifera* showed a broad-spectrum antibacterial activity with a zone of inhibition of *Salmonella typhi* range from 11-15 mm<sup>64</sup>. In another study the ethanolic extract was active against *Salmonella typhi* and *Staphylococcus aureus* whereas the aqueous extract exhibited an inhibitory effect on *Staphylococcus aureus* only<sup>65</sup>. Vaidyas in Uttaranchal India uses *Ocimum sanctum* leaves Juice and Pudina leaves with 5 g sugar<sup>66</sup>. The antibacterial results showed methanol extracts (0.4 g/ml) of *Ocimum gratissimum* and *Ocimum sanctum* showed maximum zone of inhibition (30 mm and 25.5 mm, respectively) against *Salmonella typhi*<sup>67</sup>. *In vitro* and *in vivo* study, among all the extracts methanolic extracts of both the plants had stronger antibacterial activity. On prolonged incubation bacterial colonies reappeared within the zone of inhibition indicating bacteriostatic effect than bactericidal activity. 250 mg/kg body weight oral dose of *O. sanctum* and *A. mexicana* was found ideal and nontoxic in chickens and experimental chickens were fed this dose for 21 days for determination of *in vivo* antibacterial effect. On 22<sup>nd</sup> day respective groups of chickens were challenged orally with ID<sub>50</sub> dose of *Salmonella enteric*, *Serovar typhimurium* and *Escherichia coli*. 83 % chickens of OS fed groups and 66 % chickens of AM fed groups were protected from challenge of *S. enterica Serovar typhimurium* and *E. coli*. *O. sanctum* provided better clearance of both the pathogens from blood as compared to *A. mexicana*<sup>68</sup>. *Ruta graveolens* leaf powder with a cup of hot water is given in Bhadravati Taluka Shimoga District Karnataka, India<sup>69</sup>.

The ethanolic stem extract of *R. graveolens* showed pronounced inhibition of growth than other extracts. The ethanolic extract showed most susceptible activity against *S. aureus* and *B. subtilis* where as *P. aeruginosa* was the most resistant bacteria strain<sup>70</sup>. *Ricinus communis* seed is used in Eastern Ghat of Koli Hill Tamil Nadu, India<sup>71</sup>. Antimicrobial test with eleven bacteria demonstrated that the extracts of cell suspension culture of *R. communis* L. cv. Roktima holds the merit of antimicrobial activity and it was considered to be the potent source of antibacterial compounds<sup>72</sup>. Gond Tribe in Bhandara District Maharashtra, India uses *Spilanthus acmella* leaf<sup>73</sup>. The Kandhas of Kandhamal District of Orissa, India uses *Tephrosia villosa* root paste with raw milk for 7 day<sup>74</sup>. Tribes in Satpuda region of Dhule and Jalgaon (Maharashtra), India uses *Tinospora cardifolia* juice with sugar<sup>75</sup>. The methanolic extract of *T. cardifolia* plant was found to have antimicrobial activity against *Bacillus subtilis*, *E. coli*, *Staphylococcus aureus* and *Salmonella typhi*<sup>76</sup>. The tribals of Ajoydha Hill Region, Purulia District West Bengal, India use *Vitex peduncularis* in Typhoid<sup>77</sup>. The results of antibacterial activity of *vitex* species showed that the extracts possessed a broad spectrum of antibacterial activity. The *V. peduncularis* possessed the highest activity against all the microorganisms screened<sup>78</sup>. The tribes of Kerala use *Viscum monica* for the treatment of enteric fever<sup>79</sup>.

## DISCUSSION

Folk medicine is used all over India by Traditional practiser or Tribes for enteric fever, but generally practice of folk medicine found in rural, tribal and backward region. Though all the parts are used to treat the typhoid, but root, stem bark and whole plant are used frequently in mentioned folk medicine. None of the family have dominant in the management of such fever. Maximum plants which are given by Traditional practiser or Tribes for enteric fever have significant anti-microbial activity including *S. typhi*. Most of the plants have alkaloid as a major chemical constituent and active principle. Alkaloids have an anti-microbial property which helps to act as a bactericidal or bacteriostatic action. But alkaloids from bitter plant have more intense anti-microbial activity than other. Acharya Charak has also stated that Tikta Rasatmak Dravya (Bitter Drugs) is acts as a Krimighna (anti-microbial) along with Jvaraghna (anti-pyretic)<sup>80</sup>. Even most of the herbs mentioned by Charak for Vishama Jwar have bitter property<sup>81</sup>. The maximum plants are used by Traditional Vaidyas or Tribes having also Tikta Rasa and krimighna in property which help to kill or displace the *S. typhi*. Charak described the Prakriti Vighata that uses the drugs which stops growth of pathogenic microbes by producing an unfavourable condition for microorganisms to growth. Drugs having Katu, Tikta, Kshra (alkali), Ushna (worm material) properties decreases the Kapha and Malas on which these microorganisms abide, germinate, reproduce and increase colony causing pathology. Thus Herbs or Drugs having these properties help to kill and remove the bacteria and its toxin causes early recovery from infective pathology including Typhoid.

## CONCLUSION

Most of the mentioned folk herbs used for Typhoid have significant result *in vitro* and *vivo* anti-microbial activity as well as clinical efficacy and also justify the concept of Ayurveda. Hence it can be stated that Typhoid can be treated by giving herbal drug which is already used by Traditional Vaidya and Tribes in India, though there is further need of documentation by experimental and clinical study on large scale to give validity.

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