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## Ethnomedicinal use of fishes by tribal communities in India: A review

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### Abstract

Study on fish based Zootherapy could be a viable option for discovery of new compounds with therapeutic potentials. In India from primitive time animals are used as medicine to cure different diseases by tribal communities. However, the present generation attitude toward traditional medicine as being unscientific and acculturation are the main causes of decline of such practices in tribal societies. The present review article describes the traditional knowledge of the ichthyotherapy, the use of fishes as medicine to cure human different diseases by tribal communities of India. Respondent listed about 45 fresh water fish species, which are used in primary health care needs of human being. Head, eyes, blood, gall bladder, bile, flesh, fins, bones, mucous, air bladder, otolith etc. are most commonly used parts to treat diseases such as asthma, cough and cold, chicken pox, small pox, kala-azar, diarrhea, malaria, anemia, general weakness, Premenstrual pain, abdominal pain, headache, fever, arthritic etc. The findings are more important for remedial measure and documentation although these have to be tested scientifically and clinically. It is essential to study in detail the use of these fish parts which may in future help medical science and also call for conservation of these fishes. Study on ichthyotherapy could be a viable option for discovery of new compounds with therapeutic potentials. The present ichthyotherapy work has been studied from different published research paper of various authors on ethnozoology/zootherapeutic studies in India from 1987 to 2020 and it gave us an idea that many types of diseases are cured by fishes and their body parts.

**Keywords:** Ichthyotherapy, ethnomedicine, cure, disease, tribal community

### Introduction

Animals occupy an important position in culture and religion of traditional societies all over the world. Animals, whether domestic or wild, have always been providing a number of goods and services to human beings. The ethnic people maintained a healthy natural environment by making prudent use of the biological resources. The wildlife provides protein and other necessary food materials to the rural tribal communities of developing countries including India. Besides this, animals and animal derived products have always been source of traditional or folk medicine which still prevalent among the tribal communities in India as means of primary health care. Poverty and limited access to modern medicine are the main factors for their dependence on traditional medicine, particularly in rural areas.

World Health Organization (WHO) defines traditional medicine as “the sum total of knowledge, skill and practices based on theories, beliefs and experiences indigenous to different cultures that are used to maintain health as well as to prevent, diagnose, improve or treat physical and mental illnesses.”

Traditional medicine is not only a source of healing, but the practice is also an important part of their religion and culture. So, far as modern medicine is concerned, it is reported that more than half of the world’s modern drugs are of biological sources and out of 252 that has been selected by WHO as essential to human health, 8.7% comes from animal sources (Lohani, 2010) [21]. Although traditional medicine mainly relies on herbal treatment but animals (whole and their body parts) and their products are also used. It has been reported that more than half of the world's modern drugs are of biological resources.

Due to the vast progress and researches in allopathic drugs there has been a great set-back for the traditional drugs all over the world and in India also. If one looks into the olden days, one can find the frequent use of such traditional drugs by our ancestors to cure the various human ailments. World Health Organization has reported that about 80 percent of the world’s populations rely primarily in folk medicine derived from plant and animal origin for immediate cure against illness (Soni *et al.*, 2020) [34].

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The traditional medicinal knowledge of the indigenous people across the globe has played an important role in identifying living organisms which are used in treating livestock and human health problems, and loss the knowledge may exert a significance adverse impact on the development of modern medicine (Yirga *et al.*, 2011) [37]. Hence, it is important to document, as much as possible, the traditional knowledge of various tribal communities which are on the verge of losing their socio-economic and cultural characteristics (Alves and Rosa, 2007; Jamir and Lal, 2005; Chanu *et al.*, 2014) [1, 9, 16].

Research interest and activities in the area of ethnobiology and ethnomedicine have increased tremendously since last decade. By the end of the 20<sup>th</sup> century, the life of the traditional communities was disturbed and disrupted, causing imminent danger of extinction of their culture and ethnomedicinal practices which their forefathers had. In India the traditional knowledge system is fast eroding due to urbanization. So, there is an urgent need to inventories and systematic documentation of such precious ethnobiological knowledge among different ethnic communities before the traditional cultures are completely lost.

Ethnozoology focuses at direct relationship of animals to mankind. Ethnozoology is a branch of biology which deals the relationship with tribal people to animals and their interaction. Ethnozoology is divided into number of branches such as ethnoentomology (deals the therapeutic use of insect in human health care), ethnoichthyology (deals the therapeutic use of fishes in human health care), ethnoherpetology (deals the therapeutic use of snakes in human health care) and ethnoornithology (deals the therapeutic use of birds in human health care). Zootherapy is an integral part of traditional health care practice among the ethnic communities in India but there is a dearth of reports in this regard. A large number of animals had been found providing a number of substances with medicinal properties which the people use to treat a wide range of ailments (Chanu *et al.*, 2014) [9]. In India there has been only few articles have been published with an ethnozoological approach, although some anthropological, folk and ethnomedicinal studies have focused on the connections between human society and animals (Joseph, 1982; Gupta, 1987; Puspagandhan, 1990; Sharma, 1990; Azmi, 1989 & 1991; Jamir and Lal, 2005; Azmi and Bharti, 2013; Chanu *et al.*, 2014; Borah and Prasad, 2017; Prakash, 2017; Chhetri *et al.*, 2020; Prakash and Yadav, 2020; Prakash and Verma, 2021) [2, 3, 8-10, 14-16, 18, 27-30].

Fishes have a long history of interaction with humans, thus “ethnoichthyology” is playing an important role in ethnozoological research (Begossi and Garavello, 1990) [7]. Besides being a source of food, fish is used for treatment of different ailments by various groups of tribal people around the world and in India also. There are large number of fish species used in traditional medicines, mainly in fishing communities to treat illnesses and health conditions in India (Azmi and Bharti, 2013; Teronpi *et al.*, 2012; Gupta and Day,

2017; Prakash and Yadav, 2020) [3, 14, 34, 29]; however, the documented report on the therapeutic use of fish in health care practices among the tribal population was very scanty and scattered.

India is gifted immense faunal and floral biodiversity, because of the extreme variation in geographical and climatic condition prevailing in the country (Bagde and Jain, 2013) [5]. The freshwater fish fauna of India is highly diverse in nature and constituting 1027 species (Gopi *et al.* 2017) [13]. In India, different tribal and ethnic communities are lived throughout the country. People of these communities great knowledge about ichthyofauna and their medicinal value, and they also provide considerable information about the use of freshwater fishes and their by-products as medicine. Most of the rural areas, tribal and ethnic people are totally dependent on local traditional medicinal system for their health care because they are living in remote areas where hospital and other modern medicinal facilities are not available, so they use their traditional knowledge for medicinal purpose and this knowledge is passed through oral communication from generation to generation (Jaroli *et al.*, 2010) [17].

This review paper illustrates the therapeutic use of fish species by Indian ethnic societies. It provides an inventory of the species that have been used for medicinal purposes from ancient times to the present, and analyses the medical use of fishes in the 20th century. Thus, our main objective is to obtain an inventory of the fish species that have been used in India for therapeutic purposes from antiquity to the present. From this we determine which medicinal species have survived to recent times and what diseases or medical conditions they have been used for.

### Ethnomedicinal use of some fishes by ethnic communities of India

Traditional medicine is an indispensable part of primary health-care among the tribal communities in India. Traditional health-care practices of these tribal communities are generally based on religious beliefs and therefore, are an important driver for continuation of their culture (Teronpi *et al.*, 2012) [34]. Fishes are the cheapest way for cure of various health disorders. Approximately 45 fresh water fish species are reported to use in the treatment of about 45 disease conditions as traditional medicine by different tribal communities in various parts of India. The inventoried fresh water fish species belongs to 9 order: Cypriniformes (20), Siluriformes (9), Ophiocephaliformes (5), Synbranchiformes (3), Perciformes (2), Anabantiformes (2), Clupiformes (2), Anguilliformes (1) and Beloniformes (1). Traditional health care practices among the tribal population in India include oral therapy, contact therapy, by preparing solutions or powders. The order, scientific name, common name and conservation status of fishes used by ethnic communities in India for medicinal purpose along with method of application is given in the table.

**Table 1:** List of freshwater Ichthyofauna uses as medicinal purposes by tribal communities in different part of India

Scientific/Common name (Conservation status)	Parts used	Disease condition	Method of application/consumption	Reference No.
<b>Order: Clupiformes</b>				
<i>Notopterus notopterus</i> (Pallas)/Featherback (LC)	Whole body	Abdominal & Delivery Pain	Burned and Cooked with black Pepper	[14]
<i>Hilisa ilisha</i> (Hamilton)/herring (LC)	Body oil	Arthritis, Cracked heels, Nightblindness, Scurvy	Used as ointment for hands, heels and legs	[9]
<b>Order: Cypriniformes</b>				

<i>Labeo rohita</i> (Hamilton)/Rohu, carp (LC)	Whole body	Rheumatism, Galactoschesia, Whooping cough, Bronchitis, Loss of sexual vigour	Fish Curry	[14, 29, 31]
	Fat	Facial Paralysis	Warmed, massaged externally thrice daily, for three weeks.	[29]
	Eye, Oil/Fat	Night blindness	The boiled decoction of eye and fish oil is given 2/3 times in a week	[9]
	Liver	Night blindness	Boiled in water, soup drunk and remainder cooked and eaten	[29]
	Scales/Teeth/Bones	Weak-sight, Eye troubles	Incinerated powdered mixed in honey and applied into the eyes at bed time.	
	Stone	Kidney stone	2mg stone taken orally	[5]
	Gall Bladder/Bile	Gastric enteritis, Gastric ulcer, Intestinal cancer	Ground the gall bladder with water or 8-10 drops bile diluted in one glass of water and drunk in empty stomach	[17, 29]
Cervical vertebra	Urine blockage Problem	A cervical vertebra is rubbed with water and this essence water is taken	[25]	
<i>Labeo pangusia</i> (Hamilton)/Carp fish (LC)	Flesh	Food Poisoning Brain improvement	The cooked fish is given as antidote for food poisoning	[9]
		Weakness after delivery	Boiled fish is taken as tonic	[17, 34]
	Bile	Stomach ache	Bile is taken orally	
<i>Labeo gonius</i> (Hamilton) /Carp fish (LC)	Flesh, Bone	Obesity; Allergy		[11, 26, 31]
<i>Catla catla</i> (Hamilton)/BCatla (LC)	Opercul-um	Ripening of boils	Crushed operculum is made into paste and applied to affected area	[9]
<i>Barbus</i> sp. (Cuvier & Cloquet)/Ray finned fish (LC)	Slime/Mucous	Chicken pox	Mucous applied on affected parts	[11]
<i>Puntius</i> sp. (Hamilton) (LC)	Whole body	Eye problem	Cooked with black pepper	[12]
		Blood Purifer	Cooked with bamboo shoot	[14, 34]
		Common cold	Cooked with chili	
		Plague, Ulcer (gastric)	Fermented fish is crushed into a paste with cooked rice; the paste is taken before meal for one week	[9]
	Head	Night blindness	Cooked head consumed	[34]
Memory	Boiled head consumed			
<i>Amblypharyngodon mola</i> (Hamilton)/Mola (LC)	Whole body	Premenstrual pain; Chicken & small pox, Pain, Asthma	Boiled or Cooked the Fish with light spices and consumed	[11, 14, 8, 29]
<i>Semiplotus</i> sp. (Bleeker)/king fish (LC)	Stomach & Gut	Stomach ache & digestive problems	Cooked/ boiled with black pepper and salt	[11]
	Whole body	Small Pox		
<i>Chela bacaila</i> (Hamilton) /Chilwa	Whole body	Weal-sight, Night blindness, Eye ailments	Boiled, squashed, macerated in water and taken; Deep fried in mustard oil, extracted the oil from the body and applied into eyes.	[29]
<i>Cyprinus carpio</i> (Linnaeus) /Common carp (VU/TH)	Bile, Fat	Fever, Headache	Bile are swallowed; Fat is taken/eaten	[20]
<i>Danio aequipinnatus</i> (McClelland)/Giant danio (LC)	Whole body	Constant spitting	Boiled fish is consumed	[34]
<i>Tor puntitora</i> (Hamilton)/Mahaseer (EN)	Bile	Asthma	Fresh bile taken orally	[22]
<i>Tor tor</i> (Hamilton)/ Mahaseer (NT)	Bile	High fever	Fresh bile taken orally	[21]
<i>Psilorhynchus pseudochenesis</i> (Menon & Dutta)/ Nepalese Minnow (LC)	Whole body, Bile	High fever, problem in Urine discharge	Cooked and eaten orally. Bile is taken orally in case of high fever	[21]
<i>Psilorhynchus balitora</i> (Hamilton)/Balitora minnow (LC)	Whole body	Diarrhoea		[11]
<i>Schizothorax plagiastomus</i> (Heckel)/Snow trout	Gastro-intestinal Tract	Gastritis and loss of appetite	Gastrointestinal tract along with its contents is boiled in water and eaten.	[21, 22]
	Bile	Body ache, Headache	Bile is taken orally	
<i>Barilius bendelisis</i>	Whole body	Constipation, deworming	Cooked with pieces of <i>Pinus insularis</i> & <i>Murdania</i>	[9]

(Hamilton) (LC)			<i>nudiflora</i> and water without oil	
<i>Osteobrama belangeri</i> (Valenciennes) (NT)	Fat/Oil	Aphrodisiac and Loosening of vaginal muscles	Oil is extracted from pectoral muscles and mixed with root juice of <i>Musa paradisiacal</i> and taken twice a day for one month	[9]
<i>Osteobrama Cotio cotio</i> (Hamilton) (LC)	Whole body	Ringworm	Sundried whole body crushed into a powder and used as dried powder	[9]
<i>Esomus danricus</i> (Hamilton)/Flying barb (LC)	Whole body	Lactation	Smoked fish cooked with <i>Allium sativum</i> and <i>Allium cepa</i> as curry and takes twice daily for two days	[9]
<b>Order: Siluriformes</b>				
<i>Heteropneustes fossilis</i> (Bloch)/Singhi (LC)	Whole body	Anemia' Weakness after delivery	Boiled Fish	[14, 34]
		Pain, Wound healing, Impotency	flesh cooked with black pepper than consumed	[8, 29]
		Blood Purifier, Anemia	Cooked/Boiled with <i>Phylogacanthus thysiflorus</i>	[9]
	Brain	Sting by the fish itself	Raw brain is consumed when stung by fish, as analgesia	[34]
<i>Clarias batrachus</i> (Linnaeus)/Mangur (LC)	Flesh (Whole body except skin)	Anemia, Malnutrition	Boiled with <i>Emblica officinalis</i> and <i>Allium sativum</i> and make as soup	[9]
	Whole body	Small pox	Cooked fish	[11, 14, 34]
		Weakness after delivery	Boiled fish is taken regularly to regain the strength	
		Body ache, Bronchitis Wound healing	Cooked with black pepper and take orally	[8, 29]
		Gum-boils, Teething problem	Incinerated powder mixed with honey and applied on jaws of babies	
<i>Mystus sp.</i> (Bloch) /Tengara (LC)	Whole body	Small pox	Cooked fish	[14, 34]
		After delivery to new mother	Used as tonic	[11]
		Dysentery	Boiled with <i>Portulaca oleracea</i> , curry taken two times daily for three days	[9]
<i>Aorichthys seenghala</i> (Sykes)	Liver, Eye	Nightblindness	Boiled liver and eyeball	[9]
	Bile	Chronic Fever	Fresh bile with water	
<i>Wallago attu</i> (Schneider)/Pardhin (LC)	Head	Liver tonic	Boiled head taken regularly to regain the strength	[14, 34]
	Barbeles	Diarrhoea; Impotency	Rosted barbell is mixed with powdered, tender leaves of <i>Psidium guajawa</i>	[9]
	Air bladder	Asthma	Used in diet	[26]
	Flesh	Asthma, Breathing problem Tuberculosis	Cooked with light spices and taken orally.	
	Fat	Loss of erectile power	Warm fat massaged on the lumbo-sacral region at night	[29]
		Burn, Wound, Foot cracks	Warmed and applied externally	
<i>Chaca chaca</i> (Hamilton)/Devil fish (LC)	Whole body	Polio	Dried fish is boiled or cooked with spice and taken orally	[11, 14]
<i>Bagarius bagarius</i> (Hamilton)/Gangetic goonch (NT)	Fat	Gout, Rheumatism & Joint pain	Massaged on the joints	[20]
	Fins & Bones	Body Burn; Stomach Pain	-	[11]
<i>Amblyceps sp.</i> (Blyth)	Bones	Body Burn		[11]
<i>Eutropiichthys vacha</i> (Hamilton) (EN)	Flesh	Tuberculosis, To improve Brain	Used as curry two times in a week for one month	[9]
<b>Order: Ophiocephaliformes</b>				
<i>Channa Punctatus</i> (Bloch)/Snake headed fish (LC)	Eyes	Corn or Clavus	Eyes mixed with salt and applied to affected part to remove corn	[14, 34]
	Head	Swelling of the testicles	Heads are tapped on the affected testicle to control swelling	[34]
	Bile	Malaria	Bile is taken orally twice a day till recovery	[11]
	Whole body	After delivery to new mother; Body Pain	Used as tonic	
		Diarrhea	Boiled fish is consumed	[34]
		Eye-ailments	Oil extract applied on the eyes	[29]
Flesh	General weakness, Tuberculosis	Prepare soup with light spices and taken		
<i>Channa striatus</i> (Bloch) /Snake headed fish (LC)	Whole body	Diabetes, Pain, High BP	Boiled in water with salt and make a soup than drink	[29]
		Vitamins and general body tonic	Boiled with <i>Clarias batrachus</i> as soup	[9]
<i>Channa orientalis</i> (Bloch)/Smooth breasted snake fish (VU)	Whole body	Stone case, opening of swelling/boil inside the body	Cooked with <i>Cissus adnata</i> as curry once a week	[9]
<i>Channa stevartii</i> (Playfair) /Snake headed fish (LC)	Whole body	Diabetes, Pain, High BP	Boiled in water and consumed	[8]
<i>Channa gachua</i> (Hamilton) /Snake headed fish (LC)	Whole body	Abdominal pain	Boiled fish	[11, 14]
		Dysentery	Fish is mixed with salt and warped in banana leaf,	[34]

			boiled and eaten	
		Gall bladder stone	Flesh is cooked and consumed	[12]
		Asthma, Tuberculosis	Dried powder mixed with honey and consumed	
	Flesh	Diabetes General debility	Prepare soup with salt and light black pepper than taken orally.	[29]
	Mucous	Menstrual irregularity	Dermal secretions are scrapped, dried and transformed into pills and taken orally	
<b>Order: Anabantiformes</b>				
<i>Colisa sota</i> (Hamilton) (LC)	Whole body	Post delivery Period	Sundried fish is crushed with <i>Alocassia indica</i> and made into a fermented paste	[9]
<i>Anabas testudineus</i> (Bloch)/Climbing perch (LC)	Whole body	Dymenorrhoea	Head boiled with spice	[14]
		General weakness, Malaria	Boiled fish is taken to regain the strength	[11]
<b>Order: Anguilliformes</b>				
<i>Anguilla bengalensis</i> (Gray)/Fresh water Eel (NT)	Whole Body	Piles & Meningitis	Cooked with <i>Stelloria media</i> and taken as soup	[9]
	Fats	Rheumatoid arthritis	Fat is applied and massage to relieve pain	[14, 34]
	Body mucous	Burns	Mucous applied on the affected parts	[11]
	Blood	Weakness	Blood of eel mixed with turmeric (hot dry) and taken orally	[26]
	Dried Tail And Dried gall bladder	For easy and normal delivery	Dried tail of the fish is soaked in water and the decanted water is given to the women at time of her delivery. Dried gall bladder is soaked in water and rubbed on the stone to obtain its smooth paste. It is believed that it facilitates easy expulsion of placenta.	[22]
<b>Order: Synbranchiformes</b>				
<i>Amphipnous cuchia</i> (Hamilton)/Mud Eel (LC) Or <i>Monopterus cuchia</i> (Cuchia Eel)	Meat	Premenstrual abdominal pain	Boiled fish	[11, 14, 34]
		Kala-azar, Weakness after delivery	Raw fish is boiled and taken orally	
	Blood	Asthma, Jaundice, Anemia, Kala-azar, Weakness, Diabetes	Raw Blood is Consumed	[11, 14, 24, 29, 34]
	Gall bladder	Asthma, Rhinitic (Inflammation in nasal lining by sneezing & runny nose)	Prepare a paste from Fresh or sun dried Gall bladder and taken orally	[22]
<i>Monopterus albus</i> (Zuiew)/Asian swamp eel (LC)	Flesh	Undernourished and anemic child and adult	The flesh is cooked in fresh milk and curry is taken once a week	[9]
<i>Mastacembelus armatus</i> (Lacepede) /Zig-Zag eel; Spiny eel (LC)	Whole body	Carbuncle		[11]
	Flesh, Liver, Bile	Kwashiorkor, Night blindness, Chronic Fever	Liver is boiled and bile is crushed with water. Soup is taken two times a day for one week.	[9]
<b>Order: Beloniformes</b>				
<i>Xenotodon cancila</i> (Hamilton)/Gar fish (LC)	Whole body	Joint Pain, Swelling	Cooked and consumed; Spines and bones is used to pick out the clotted blood	[11, 14]
<b>Order: Perciformes/Gobiiformes</b>				
<i>Glossogobius gutum</i> (Hamilton)/Tank goby (LC)	Flesh	Nocturnal enuresis (involuntary urination during sleep)	Cooked and eaten	[26]
<i>Pseudosciaena coitor</i> (Hamilton)	Internal ear	Rickets in children and trouble in urinary passage.	Otoliths, hard calcium carbonate bodies present in internal ear are taken orally	[15]

Pisces are one of the widely used animal groups by the ethnic communities of the India. Different ethnic groups are using 45 different species of fresh water fishes for medicinal purpose. The whole body and their body parts like head, eyes, blood, gall bladder, bile, flesh, fins, bones, mucous, air bladder, otolith etc. are most commonly used to cure diseases such as asthma, cough and cold, chicken pox, small pox, kala-azar, diarrhea, malaria, anemia, general weakness, Premenstrual pain, abdominal pain, headache, fever, arthritic etc. Mostly treated ailments are the asthma, anemia, joint pain, burn, anaemia, etc. *Labeo sp.*, *Puntius Sp.*, *Channa sp.*, *Anguilla sp.*, *Heteropneustes fossilis*, *Clarias batrachus*, *Wallago attu*, and *Amphipnous cuchia* are commonly used in treating number of human ailments. The population of these medicinal

important fishes was drastically declined in their natural habitats due to indiscriminate and uncontrolled fishing and habitat destruction especially by using chemicals (Chanu *et al.*, 2014) [9].

### Conclusion

Traditional medicine is based on resource availability and therefore, study of such practices provides information about diversity and distribution of organisms in the past. Further, traditional knowledge of indigenous/tribal people can provide leads for sustainable use and management of natural biological resources. Today however, overexploitation of biological resources has pushed our natural resources toward the brink of collapse. Besides being a source of food, fish is

used in health-care practices among the tribal population of India. Poverty and limited access to modern medicine are the main factors for their dependence on traditional medicine, particularly in rural areas.

From this review, it can be concluded that people belonging to the different ethnic communities on India have a rich Ethnozoological knowledge and biological resources. Number of fishes had been found providing a number of substances with medicinal properties which the people use to treat a wide range of ailments. The present study indicated that fresh water fishes are still being used by different tribal communities of India, to treat various illnesses. The review throws light on the fact that fishes can be used in treating a number of human ailments. The empirical knowledge reported in this study will provide outstanding possibilities for the discovery of new sources of medicine for the drug industry. If fish can be used as a good source of simple forms of medicine traditionally used earlier, the common people may have an easy way to avoid the high cost of modern medical treatments, thereby improving their economic condition. Industrial pollution and destructive fishing practices by poisoning water bodies with synthetic chemicals pose serious threats to aquatic fauna especially freshwater fishes. Detailed investigations and proper traditional management strategy is urgently required to keep each species intact before the population of species dwindle (Chanu *et al.*, 2014) [9]. I hope that this review will be helpful in further research in the field of ethnozoology, zootherapy, ethnopharmacology and biodiversity conservation point of view.

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