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Review

Traditional uses of medicinal plants in gastrointestinal disorders in Nepal

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ABSTRACT

Ethnopharmacological relevance: Gastrointestinal disorders cause morbidity and can lead to mortality, especially in the developing world where sanitation is deficient. A large part of the human population relies on medicinal plants for treating various diseases, including gastrointestinal disorders. The present review summarizes the traditional uses of medicinal plants of Nepal used to treat gastrointestinal disorders, and evaluates their bio-efficacy based on a review of the available phytochemical and pharmacological literature.

Material and methods: We searched different electronic databases and libraries for the literature on medicinal plants used in Nepal to treat gastrointestinal disorders. For each species, we also searched the literature for information on conservation status, as well as for phytochemical and pharmacological studies in support of the ethnobotanical information. We used principal component analysis to explore the relation among disorders and plant families, plant life forms, plant parts and preparation modes. We also performed permutation tests to determine if botanical families were used more often than expected considering their availability in the Nepali flora.

Results: We documented a total of 947 species belonging to 158 families and 586 genera used to treat gastrointestinal disorders in Nepal. Diarrhea was the disorder treated by the highest number of species (348), followed by stomachache (340) and dysentery (307). Among the reported species, five were endemic to Nepal, whereas 16 orchid species were protected under CITES Appendices II and III. The randomization test showed that species belonging to 14 families were used less often than expected, whereas plants belonging to 25 families were used more often than expected. The PCA scatter plot showed distinct groups of gastrointestinal disorders treated with similar plant life forms, plant parts, and/or preparation modes. We found 763 phytochemical studies on 324 species and 654 pharmacological studies on 269 species.

Conclusion: We showed the diversity and importance of medicinal plants used to treat gastrointestinal disorders in the traditional health care system of Nepal. As such disorders are still causing several deaths each year, it is of the utmost importance to conduct phytochemical and pharmacological studies on the most promising species. It is also crucial to increase access to traditional medicine, especially in rural areas. Threatened species need special attention for traditional herbal medicine to be exploited sustainably.

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Contents

1. Introduction

It is estimated that 70–80% of the human population, mostly in the developing world, relies on medicinal plants for primary health care (WHO, 2008). Herbal medicines are also gaining popularity among the western population because they have minor or no side effects if administered properly (Jordan et al., 2010). Besides medicinal use, plants are increasingly used in cosmetics (Aburjai and Natsheh, 2003) and nutraceutics (Espín et al., 2007; Bernal et al., 2011). Herbal medicines have been proved to be highly effective to treat a wide range of diseases (Blumenthal, 2002; Mukherjee and Wahile, 2006), including gastrointestinal disorders (Heinrich et al., 1992; Manandhar, 2002; Madikizela et al., 2012; Street and Prinsloo, 2013).

Gastrointestinal disorders are ailments affecting the functions of the digestive tract, i.e., food and liquid absorption, digestion, or excretion (Neamsuvan et al., 2012). Such disorders are caused by infections by various kinds of bacteria, viruses, and parasitic organisms (Mathabe et al., 2006; Karki and Tiwari, 2007). Common gastrointestinal disorders are stomach/abdominal pain, diarrhea, dysentery, gastroenteritis, constipation, vomiting, etc. (WHO, 2008). These disorders cause morbidity and can lead to mortality, especially in the developing world where sanitation is deficient (Heinrich et al., 1992; Pawlowski et al., 2009; Tuite et al., 2011). Outbreaks of diarrhea, dysentery, or cholera caused by contaminated drinking water have claimed millions of lives worldwide, mainly infants and children (Sarkar et al., 2007; Ryan, 2011). For example, serious diarrhea/dysentery/cholera outbreaks were reported in Ethiopia (Bartels et al., 2010), Haiti (Tuite et al., 2011), Vietnam (Anh et al., 2011), Zimbabwe (Fisher, 2009), and Nepal (Bhandari et al., 2009), all with a high death toll.

In Nepal, 80–85% of the population depends on traditional medicine for primary health care (Manandhar, 2002). The use of medicinal plants is widespread, not only because they are easily accessible and affordable, but also due to persistent cultural beliefs and practices, as well as the lack of access to modern health care systems in rural areas (Coburn, 1984; Pohle, 1990; Baral and Kurmi, 2006). Medicinal plants are used to treat various gastrointestinal disorders ranging from simple types such as vomiting to more complex problems like peptic ulcer (Lama et al., 2001; Rajbhandari, 2001).

There are many studies related to traditional uses of plant species in Nepal (Manandhar, 2002; Shrestha et al., 2004; Joshi and Joshi, 2005; Kunwar and Bussmann, 2008). Besides ethnobotanical studies, in-vitro and in-vivo trials were realized to identify the mechanisms explaining the effectiveness of some of the medicinal plants used in traditional medicine (Griggs et al., 2001; Panthi and Chaudhary, 2006; Rajbhandari et al., 2009). This practice of establishing phytochemical or pharmacological explanations for traditional uses is not only helpful to institutionalize traditional medicine, but can also lead to the development of new drugs (Newman and Cragg, 2007) or indicate future directions for bio-prospecting (Soejarto et al., 2005; Douwes et al., 2008). However, only a few studies have so far linked traditional medicinal uses to pharmacological or phytochemical properties in Nepal (Kunwar et al., 2009; Uprety et al., 2010; Gaire and Subedi, 2011; Luitel et al., 2014).

The present study aimed at documenting the traditional uses of medicinal plants to treat gastrointestinal disorders in Nepal, and to evaluate the efficacy of plant species based on a review of the literature. Specifically, we sought to answer the following questions: (i) What plant species are used in gastrointestinal disorders in Nepal? (ii) Have pharmacological or phytochemical studies been conducted to determine which metabolites are active against gastrointestinal disorders? (iii) What gastrointestinal disorders are treated with the highest number of medicinal plant species? (iv) Are some botanical families more or less used than expected in gastrointestinal disorders? and (v) Which diseases are commonly treated by which plant parts, plant types, modes of admission, and botanical families?

2. Material and methods

2.1. Data collection

We reviewed studies published in journals, reports and books dealing with traditional uses of medicinal plants in Nepal to treat various gastrointestinal disorders. Different online databases were used (ISI Web of Science, MEDLINE, Science Direct, Scopus, and Google Scholar), with specific search terms such as 'medicinal plants', 'plants', 'gastrointestinal', 'gastro', 'diarrhea', 'dysentery', 'stomach' and 'Nepal' (for all terms see Table 1). The term 'Nepal' was used to limit the geographical scope of the search. We also carried out library search for hard copies. We reviewed a total of 94 publications. A master list was produced, providing vernacular name(s), mode(s) of use, and references for each species (Electronic Appendix 1).