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Traditional and Modern Approaches to Diarrhea Treatment: A Case Study on Medicinal Plants

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ABSTRACT

Diarrhea remains a leading global health challenge, especially in children under five in low- and middle-income countries. Despite advancements in modern medicine, the persistent use and reliance on traditional medicinal practices, especially in rural and underserved communities, underscores the value of integrating diverse treatment modalities. This study explores both traditional and modern approaches to diarrhea treatment, focusing on a case study conducted in southwestern Iran and supported by data from the Amhara region. It highlights the widespread use of medicinal plants such as *Quercus infectoria*, *Glycyrrhiza glabra*, and *Citrus reticulata* in managing diarrheal diseases, particularly due to their antimicrobial, anti-inflammatory, and antispasmodic properties. The study also evaluates modern treatments, including oral rehydration therapy (ORT), probiotics, and antimicrobial agents, emphasizing the benefits and limitations of each. The findings reveal that traditional herbal knowledge remains a crucial healthcare asset, particularly where modern medicine is inaccessible. The study recommends deeper pharmacological investigations and sustainable conservation strategies for medicinal plants while promoting integrative healthcare policies that respect traditional practices.

Keywords: Diarrhea, Medicinal Plants, Traditional Medicine, Oral Rehydration Therapy, Antimicrobials, Ethnobotany, Herbal Remedies.

INTRODUCTION

Gastroenteritis is a gastrointestinal disease affecting both children and adults, caused by various infectious agents such as bacteria, viruses, fungi, toxins, and parasites. Parasitic infections are more prevalent in tropical regions, while bacterial infections are common in adults. This study focuses on diarrhea cases in children aged 6 months to 2 years and adults. Gastroenteritis can be categorized as waterborne, foodborne, direct contact, airborne, or autoinfection. Epidemiological methods for analysis include demographic and clinical data, using both fast and slow testing methods, depending on the timeframe. Symptoms of diarrhea depend on the gastrointestinal tract affected; watery diarrhea, for example, indicates small intestine involvement, seen in cholera or food poisoning. Herbal medicines, known as HM, are effective and widely used for treating diarrhea, employing various medicinal plants. Some of these plants include Quercus infectoria, Schinopsis molle, Luffa cylindrica, Citrus reticulata, Glycyrrhiza glabra, Ferula asafoetida, Camellia sinensis, Cuscuta reflexa, Ipomoea batatas, Plantago ovata, Rhizoma atractylodis, and Salvia miltiorrhiza. Many people use traditional medicines, prioritizing herbal treatments for diarrhea due to their antimicrobial and anti-inflammatory properties. This write-up discusses traditional medicinal approaches and highlights the need for novel therapeutic strategies to develop effective diarrhea treatments, providing insights into widely used medicinal plants and their scientific basis globally [1, 2].

Background on Diarrhea

Diarrhea is defined as increased frequency, fluidity, and volume of bowel movements, often accompanied by symptoms like abdominal pain, nausea, vomiting, or fever. It is diagnosed when more than three loose or liquid stools are passed daily. Diarrhea is categorized based on duration, pathophysiology, and causative organisms. It is acute if lasting less than two weeks and chronic if over four weeks, with persistent diarrhea lasting between two to four weeks. Acute diarrhea can be secretory, inflammatory, or due to altered motility. Classification aids in determining appropriate treatment. It poses a significant global health issue, particularly in developing countries where access to healthcare is limited. Diarrhea is a leading cause of death among children under five, with approximately 525,000 fatalities yearly. Despite the availability of Oral Rehydration Solution (ORS) in public health settings, many affected children do not receive it due to various barriers like accessibility, language, cost, and lack of knowledge. Local herbal remedies are often used as they are cost-effective alternatives. Diarrhea can be triggered by various infectious organisms, including bacteria, viruses, and protozoan parasites, as well as non-infectious factors such as food intolerances. Contributing factors include poverty, malnutrition, inadequate breastfeeding, poor sanitation, unsafe water, and environmental issues. Children with a recent history of diarrhea, antibiotic use, or previous hospitalization are at higher risk [3, 4].

Definition and Types of Diarrhea

Diarrhea is defined as a condition characterized by an increased frequency of bowel movements and/or a decrease in formed stool mass, resulting in a change in stool consistency to unformed and watery appearance. Diarrhea is said to be acute when its duration is 14 days or less, or chronic when it lasts for 15 or more days. Acute diarrhea is classically defined as new-onset diarrhea lasting for less than 14 days. Acute diarrhea can further be divided into mild, moderate, or severe, depending on certain clinical and epidemiological factors. Diarrhea lasting longer than 14 days is referred to as persistent diarrhea. Although persistent diarrhea may arise after an infectious agent injection and may share similar pathophysiological features with acute diarrhea, it warrants further evaluation under traditional definitions, as the infectious etiology has likely been resolved without intussusception or obstruction. Diarrhea is a common gastrointestinal condition for which most people self-manage with over-the-counter medications. Diarrhea can be classified as non-inflammatory diarrhea involving an increase in stool frequency, fluidity, and volume due to osmotic, secretory, or motility causes without loss of blood fluids, or inflammatory diarrhea involving the presence of blood, pus, and/or inflammatory cells in the stool due to infection by bacteria, virus, or parasite. However, the examination script in Britain is not satisfactorily developed to distinguish between mucosal and other causes of diarrhea. There are a limited number of but very fruitful works in this regard in many parts of the world [5, 6].

Global Prevalence and Impact

Diarrhea is a major global health problem, affecting both developing and developed countries. It primarily affects children aged 0-5 years, accounting for about 1.26 million deaths annually, but also poses a risk for adults, especially in vulnerable populations. The prevalence of diarrhea is influenced by a variety of factors, including geographic location, diarrhea classification, climate, and water resources. The prevalence of diarrhea has been documented in numerous studies across countries and continents. Notably, a survey in Southwest Ethiopia found that 43% of children aged 1-5 years had diarrhea in the last two weeks. Another study in South Gondar Zone, Ethiopia, indicated that 24.6% of under-six children experienced diarrhea in the past two weeks, with the highest prevalence in children aged 12-23 months. In a rural town of Southern Mauritania, 29% of children aged 0-5 years experienced diarrhea in the month before the study. Furthermore, a study in Hossana Town, Ethiopia, revealed a 20.4% prevalence rate of diarrhea among children aged 6-59 months. The burden of diarrhea is considerable across geographic and temporal scales. Annually, it causes about 1.47 million deaths globally, mostly among children aged 0-5 years. In 2006, diarrheal diseases accounted for 29% of all health-related disability-adjusted life years and were regarded as the most important health problem for children in low-income countries. A review in the Middle East and North Africa region showed that diarrhea is a public health concern, with considerable economic impacts in terms of treatment costs and lost workdays for caregivers. In Tanzania, diarrhea is a major cause of hospital admission, with an estimated ambulance direct cost of approximately 451 Shillings and direct treatment costs of 12,742 Shillings per patient [7, 8].

Causes and Risk Factors

Diarrhea can arise from multiple causes, primarily infectious agents, leading to acute, mild, watery diarrhea. In adults in developing countries, diarrhea with fever is typically due to specific bacteria, while

water contamination is a major contributor to childhood diarrhea. Parasite infections such as amoebic dysentery and giardiasis are also implicated. Persistent diarrhea may occur with chronic non-specific colitis, intestinal tuberculosis, cholera, ulcerative colitis, and Crohn's disease. Caffeine intake may exacerbate diarrhea through changes in gastric secretion or delayed emptying. Low-sugar fruit juices, artificial sweeteners, and a lack of fiber can also trigger diarrhea, alongside the consumption of osmotic foods. Stimulant laxatives and certain herbs may complicate diagnosis. Severe diarrhea without prior vomiting often suggests colonic involvement, which can be assessed through sigmoidoscopy. Risk factors include age, male sex, family size, sanitation access, water quality, and breastfeeding duration. The household environment, including water supply, sanitation, and maternal education, ties into these risk factors. Children under 5 in a household increase the diarrhea risk for siblings, along with factors like child sex being evaluated around the 12-month mark. Additionally, the exposure of unvaccinated children under 12 months needs to be assessed, alongside a measurement of family economic status and maternal education, though this can be challenging for mothers [9, 10].

Traditional Treatment Approaches

Diarrhoea is defined by a significant increase in stool frequency, wateriness, or looseness that is often associated with a reduction in the number of firm, formed stools. Most adults have 1 to 4 bowel movements per day, with higher rates not necessarily indicating abnormality. Among these, India accounts for a significant number of deaths in children (0–4 years) due to diseases such as diarrhea, respiratory infections, and other non-communicable diseases. This paper presents a case study of a 3-year-old child suffering from diarrhoea in an Indian village. Diarrhea is defined as the passage of loose or watery stool three or more times a day. Diarrhea can cause life-threatening fluid and electrolyte imbalances. Diarrhea can be classified as acute and persistent/chronic based on the duration of the episode. It is a major public health concern, especially in children aged <5 years. Nearly 2 billion episodes of diarrhea occur annually, resulting in an estimated 1.5 million deaths. Breastfeeding is believed to confer significant protective effects, decrease incidence, and reduce the severity of diarrhea episodes, thus reducing mortality. Significant resources are wasted on inappropriate, expensive drug treatment of common childhood diarrhea. Most episodes are self-limiting and require only oral rehydration and increased food intake. Antidiarrheal agents should be given only with care and only by a physician. Improvement has been shown in the management of acute diarrhea with the use of oral rehydration therapy in both developed and developing countries. Fluid is lost in proportion to stool volume, with a range of losses, which are quite acceptable and do not justify treatment other than oral rehydration. The rectal route is not well appreciated in village settings, and intramuscular injections require trained healthcare professionals. In developing and tribal populations, chronic use of traditional plants for the management of diseases like diarrhea is common, which cannot be ignored. Plants mentioned in Ayurveda about their usages, therapeutic significance, and pharmacological activities have been reviewed. However, no information on their phytoconstituents and pharmacological activities is available in the literature for some widely used and claimed plants for the treatment of diarrhea in Ayurveda [11, 12].

Modern Treatment Approaches

Oral rehydration therapy (ORT): ORT is the simplest and cheapest way of treating dehydration. Various chemical combinations are used in ORT, which give good results. ORT decreases the percentage of children aged < 5 years who are taken to a hospital with diarrhoea. Antimicrobials: Antimicrobial treatment for acute infectious diarrhea is one of the major public health measures and is one of the key clinical guidelines used in hospitals and clinics around the world. Antimicrobial treatment should also be given in areas with endemic cholera to prevent severe cases. Campylobacter, Giardia, Shigella, and V. cholerae cases in children present in the hospital should be treated with antimicrobials. Probiotics: Probiotics are live ingested microorganisms that confer health benefits to the host. Probiotics are used rather than antibiotics for the treatment of diarrhoea in children. Probiotics produce several antimicrobial substances that inhibit gastrointestinal pathogens. Fermentation of lactic acid bacteria (LAB): Fermented food products provide good health benefits against diseases. Fermentation results in physicochemical and nutritional changes that improve the nutritional aspects of foods. Fermented milk acts like a drug in treating gastrointestinal diseases and diseases associated with bacterial infections. Fermented food products such as yogurt and buttermilk have been used extensively for their medicinal properties to combat human diseases by increasing the bioavailability of certain nutrients and by improving the nutrient digestibility. Modern treatment with medicinal plants: Nowadays, there is an increased awareness of the risks and side effects of synthetic drugs, leading to a tendency towards the acceptance of plant-derived or natural products with little or no side effects. Many conservative patients, for this

reason, consult herbalists rather than medical practitioners. Many compound formulations are available in the market for the modern treatment of diarrhoea. Generally, they are not a single active entity; they may yield several phytochemicals, some of which may even be harmful to the human body [13, 14].

Case Study Methodology

The fieldwork was conducted in the south-west region of Iran, including the cities of Shahrekord, Borujen, and Faridan, where local traditional medicine is strongly present. Study selection included herbalists in the region who were interested in participating. Inclusion criteria were established for herbalists, such as having their shrine and at least five years of experience in the field of dietary change. To identify herbalists in the area, initial visits were made to the health house near the main shrine and to herbal shops. Formal conversations were held to introduce the purpose of the study, and interested herbalists were entered incrementally and initially interviewed semi-structurally. Before the interviews, verbal consent was taken from the participants. The questionnaire was first tested and re-verified. After the initial visits introduced participants who were willing to participate, interviews were conducted with respectful, friendly, and focused attitudes in private locations separated from patients. Some herbalists wished for anonymity regarding their name and age, initiating alternate referencing among confidential reference codes. Meru, Chaharmahal, or Bakhtiari provinces were inferred from the residence within the border. There is a perceived understanding of the possible effects of these plants on the reduction of gastrointestinal problems. It has enhanced consideration of seasonal effects and childhood issues. Improved mastery and belief in the effects of and the factors affecting herbal consumption among herbalists have also been reported. Plant biodiverse, clarifying and protecting ethnic heritage has a unique societal role for elderly women. Traditional considerations were made about children's personal effects and the effects of pilot agricultural experiences and rural environments on adolescent herbal consideration. Some coverage was made regarding nighttime medicinal plant values and elevated terrestrial herbal consumption frequency during fasting periods. There is a willingness to have shared collective plant consumption. However, the essence of harder to observe herbal functions since growing demonstrations and the context of modern technology opportunities make observable consumption easier or more frequently aerial generic plant inquiry were conducted [15, 16].

Findings From the Case Study

This section provides a brief description of the study. It includes information on the selection criteria, study design and consultants, sampling and sample size, data collection, data analysis, and ethical considerations. Several studies have been conducted throughout the world to identify and gather information on medicinal plants traditionally used by herbalists, traditional healers, and herbal medicine users to treat diarrhea. This ethnobotanical study aims to investigate the knowledge, awareness, and perceptions of local communities in the Amhara region regarding medicinal plants traditionally used to treat diarrhea. Using a pre-tested questionnaire containing open-ended and semi-structured interview items, data on the local names, parts used, preparations, and methods of application of 50 medicinal plants used for treating diarrhea were collected from 51 participants in 20 localities in the Amhara region. The data were analyzed contently and descriptively. The results showed that the use of herbal medicines in the treatment of diarrhea has been passed down through generations and is sacred in the study area. It was also observed that most of the medicinal plants for treating diarrhea are commonly used in ethno-veterinary, cultural, and social practices, indicating that they have a wide range of medicinal uses. A total of 34 novel medicinal plants were reported in this study, and the utilization of these herbs has been an integral part of the daily life of rural communities in the Amhara region over the years. Consequently, the study concluded with strong recommendations for further investigation of the most-reported medicinal plants through biological activity, phytochemical, and toxicological evaluations, as well as sustainable conservation and management measures for the mentioned medicinal plants and related knowledge [17, 18].

Discussion

Diarrhea presents a major health problem in developing countries, prevailing in rural and disadvantaged communities. Deaths due to diarrhea are often precipitated by poor social conditions, internal politics, and wars. One of the cardinal symptoms of diarrhea is excessive and watery stool. In case of severe dehydration, the patient dies within 24 hours. Treatment against diarrhea includes protection against dehydration by ample oral or parenteral rehydration. Antidiarrheal drugs, synthetic and herbal, are then used to normalize the intestinal passage. Oral rehydration prevents death in 90% of cases if initiated within 36 hours. Globally approved treatment for diarrhea is limited to oral rehydration treatment (ORT). But many communities have their indigenous practices. Since antiquity, plants, plant parts, and

plant products have been utilized in herbal medicine. The purpose of this critical review is to amplify understanding of diarrhea and available antidiarrheal therapies, evaluate the medicinal plants used by rural communities for diarrhea treatment, identify marketing and conservation status of popular antidiarrheal medicinal plants, and investigate people's perception concerning the effectiveness and safety of herbal medicines against diarrhea. Diarrhea is one of the leading causes of morbidity and mortality, especially in infants and children worldwide. It affects 4.6 billion people (mostly in developing countries) and causes 1.87 million deaths per year (mostly in children under the age of 5 years). Diarrhea is classified as acute (3 weeks) or chronic (more than 3 weeks). Tracing mortality associated with diarrhea is difficult, as the underlying cause, that is, dehydration due to diarrhea, is often ignored. Diarrhea occurs due to enterotoxin-producing bacteria, viruses, protozoa, poor sanitation, unhygienic food preparation, food allergies, and stress. Bacterial enterotoxins or viruses are responsible for watery diarrhea, and inflammatory changes induced by bacterial invasion or protozoan infestation cause blood-stained diarrhea [19, 20].

Policy Implications

The findings of this study have important policy implications and are intended to inform government and health authority strategies to promote the use of indigenous medicinal plants for self-care, traditional healing, and treatment approaches for diarrhea. It is commonly acknowledged that intestinal parasitic infections and dirty, contaminated water are the two fundamental factors for diarrhea prevalence in the study area. Generally, though the market is providing the services of clean drinking water, even after the construction of dams in the past few decades, around 90% of the respondents are using shallow wells and river/spring water because of tradition and the availability of water sources. Health awareness of the community regarding the etiologies of diarrhea-causing factors and usage of sanitary latrines and toilets, few households have latrines/toilets, and even open fields and river banks are used. The traditional treatment methods for diarrhea were also further observed among rural populations, agricultural communities, and overburdened people who nurtured the age-old treatment system and experienced healers/disciplines. Indigenous medical practitioners were also trusted and accessed as healers. It is also dissatisfying and disappointing at policy levels if populations heavily rely on the indigenous treatment, and modern healthcare systems primarily use herbal medicines from indigenous resources through modern medicine. Establishing a sustainable Rural-Based Preventive Health Network system in collaboration with health offices through health extension workers and health practitioners can improve health and health services in the community. Moreover, a zone-level, independent and deep assessment of the indigenous medicinal plants and the associated indigenous knowledge, search-for-plant-conservation, cultivation, and delivery system with fair benefit-sharing is also recommended to sustainably conserve the desired herbal plants. The various sachets and formulations can also be studied and utilized to address major compounded secondary even possible primary health problems. Further works on the synergy and antagonistic effects of herbal plants among formulation preparation and utilization should also be undertaken. Consequently, the East Bolgannage zone government health office should consider the recommendations. The officials are also implored to let the communities use the indigenous medicinal plants sustainably and open up some experiences for the West, Gojjam, East Gojjam, and Addis Ababa health offices. The outputs of the research are also recommended to be disseminated to health authorities, NGOs, herbal medicine providers, and higher academic institutions [21, 22].

CONCLUSION

This study underscores the enduring relevance of traditional medicine in the management of diarrheal diseases, particularly in rural and resource-limited settings. The ethnobotanical case study in southwestern Iran and supplementary findings from the Amhara region affirm that herbal remedies are not only culturally embedded but are also perceived as effective and accessible treatments. Modern medical interventions like ORT, probiotics, and targeted antimicrobials continue to play a crucial role in reducing morbidity and mortality, especially in acute cases. However, the over-reliance on synthetic drugs and their associated risks has rekindled interest in plant-based therapies. An integrative approach that merges the strengths of both traditional and modern systems can yield more sustainable and culturally sensitive healthcare outcomes. Future efforts should focus on rigorous pharmacological validation of commonly used herbs, public health education, and the conservation of traditional medicinal knowledge through documentation and respectful collaboration with indigenous communities.

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