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Diversity of plants used in the treatment of *Helicobacter pylori* associated morbidities in the Nkonkobe municipality of the Eastern Cape Province of South Africa

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**Helicobacter pylori** is a major cause of gastro-duodenal pathologies. Expenses associated with combination therapy and the adverse effects of the treatment regimens have led to increased usage of ethnomedicines in the management of infections. Despite the usage of plants in the management of infections in the Nkonkobe municipality, empirical studies to document the specific plant species used by traditional doctors are lacking. This study was conducted to document the various plant families and species used in the management of *H. pylori* associated morbidities in the Nkonkobe municipality. A semi-structured questionnaire was used to interview the local dwellers including traditional doctors, herbalists and hawkers in traditional medicine. The plant parts used, preparation, mode of administration and dosages were recorded. Seventeen plant species belonging to 13 genera and 11 families were collected and identified by their vernacular and scientific names. The Asphodelaceae was the most represented family (4 species), followed by Apocynaceae (3 species) and Loganiaceae (2 species). The plant parts most frequently used were the roots (35.3%), followed by the leaves and stem barks (23.5% each). Further research is needed to scientifically correlate treatment claims with folkloric uses and to isolate the plants active components, determine their *in-vivo* potencies and toxicity.

Key words: Helicobacter pylori, stomach morbidities, ethnomedicines, Nkonkobe municipality, South Africa.

INTRODUCTION

*Helicobacter pylori*, a Gram negative microaerophilic helical bacillus has been implicated in the pathogenesis of a number of digestive tract disorders such as chronic active gastritis, peptic ulcer, gastric cancer and mucosa associated lymphoid tissue (MALT) lymphoma (Ndip et al., 2008; Manyi-Loh et al., 2010). The organisms are found to be suspended in the stomach mucosa or attached to epithelial cells of the stomach which happens to be the only known reservoir of infection (Atherton, 2006; Correa and Piazuelo, 2008).

Half of the world’s population is infected by this organism and a high prevalence of up to 90% has been reported in the developing countries (Adrienne et al., 2007), as opposed to 20 to 50% in the developed nations (Castillo-Juarez et al., 2009). A high prevalence of infection has been found almost always to correlate with low socio-economic status and poor sanitary conditions (Ndip et al., 2004; Kusters et al., 2006).

Infections are treated with potent combination therapies, a proton pump inhibitor (PPI) or bismuth in combination with two antibiotics most commonly metronidazole, clarithromycin, amoxicillin and tetracycline with an expected success rate of 80 to 90% (Njume et al.,
In the Nkonkobe municipality just like many areas of the developing world, the use of medicinal plants in the treatment of stomach related morbidities is an old custom that has co-existed with the people for many years (Wintola and Afolayan, 2010). This municipality is located within the Eastern Cape Province, home to 15.5% (6.3 million) of South Africa’s total population and incorporates two of the former ‘homelands’ of the apartheid period (that is, Ciskei and Transkei), where many aspects of traditional culture are still part of everyday life (Dold and Cocks, 2002). Consequently, the people of the Eastern Cape tend to be more traditional and rural than those in other parts of South Africa.

The use of medicinal plants in the treatment of diseases has occupied a pivotal position in the socio-cultural and spiritual lives of rural and tribal families in this municipality (Oyedemi et al., 2009). This region abounds in its ethnic diversity, in which many aboriginal cultures have retained traditional knowledge concerning the medicinal utility of the native flora.

Herbal remedies are commonly used in this municipality to treat gastritis, peptic ulcer, stomach cancer and other H. pylori associated pathologies, as a means to evade the high cost and adverse effects associated with Western drugs. Contrary to these drugs, most of the herbal remedies used are readily available with almost no resistance reported (Wintola and Afolayan, 2010). Ethno botanical studies to identify potential sources of new drugs have become very necessary considering the ever evolving nature of H. pylori resistance to current antimicrobial agents (Njume et al., 2009). Equally important is the potential of such studies to bring to lime light numerous plants having significant medicinal properties hitherto unknown to the scientific world.

More than 80% of rural African people depend on plant based remedies for primary health care (Afolayan and Lewu, 2009). In order to preserve valuable plant information and prevent lost of traditional values, it is imperative for studies covering the folkloric use of these plants to be assembled into regional or provincial pharmacopoeias. This becomes very important considering that 25% of prescription drugs issued in the USA and Canada today contain bioactive compounds that are derived from or modelled after plant natural products (Singh and Lal, 2008). This study was carried out as a means to preserve the enormous wisdom and traditional knowledge associated with treatment of infections symptomatic of H. pylori in the Nkonkobe municipality. This becomes imperative considering that most of the traditional doctors are old and may die with
reduce the quality of life and discourage patients from chemotherapy as well as the many adverse effects which due to expenses associated with antimicrobial associated diseases is becoming more and more popular.

A total of 17 plant species belonging to 13 genera and 11 families were sampled (Table 2). The Asphodelaceae was the most represented family (4 species), followed by Apocynaceae (3 species) and Loganiaceae (2 species). The roots were the most commonly used plant parts, constituting 35.3% of all medicinal preparations. This was followed by the stem bark and leaves (23.5% each), rhizome, tuber and whole plants each having a percentage representation of 5.9% (Figure 1). Stomach pain was the most frequent manifestation that was treated with most of the plants. Except for one plant, treatment was given orally for all stomach related illnesses (Table 2).

### DISCUSSION

The folkloric use of plants in the treatment of *H. pylori* associated diseases is becoming more and more popular due to expenses associated with antimicrobial chemotherapy as well as the many adverse effects which reduce the quality of life and discourage patients from observing medication protocols (Bohr and Malfertheiner, 2009). Numerous plants, 17 of which are enlisted herein are used in the treatment of stomach related morbidities in the Nkonkobe municipality of South Africa and other parts of the developing world (Ndip et al., 2007, 2009). However, this study is the first to document plant species used in the treatment of infections symptomatic of *H. pylori* in this municipality.

The results of this study indicate that three species; *Aloe arborescens*, *Aloe tenuior*, *Aloe ferox* from the Asphodelaceae family are commonly used in the treatment of stomach problems in our study area. Our results are consistent with the findings of Wintola and Afolayan (2010) who also reported the use of these species in the treatment of constipation in this municipality. It is worth mentioning that the Aloes are widely distributed in Africa and have been reported to be useful medicinal plants with antibacterial properties (Mbanga et al., 2010). However, little is known about their anti-*H. pylori* activities.

Thong-Ngam and Chatsuwan (2007) evaluated the antimicrobial activity of *A. vera* on *H. pylori* and found no activity. However, aloe-emodin, a compound that is found in some *Aloe* species has been shown to elicit a dose dependent growth inhibition of *H. pylori* cultures (Wang et al., 1998). *A. arborescens* was also recently reported to exhibit strong antimicrobial activities against a wide variety of organisms including *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhimurium*, *Salmonella gallinarum*, *Klebsiella species*, *Proteus* species and *Candida albicans* in Zimbabwe (Mbanga et al., 2010). The antimicrobial activity of plant extracts may vary across different regions and may depend on the age of the plants as well as the parts used (Ndip et al., 2007). More studies to evaluate the antimicrobial activities of these plants against *H. pylori* would shed light on their potential usefulness as possible sources of novel therapies against this notorious pathogen.

Information from literature indicates that almost all of these plants have been used in the treatment of other illnesses in humans or animals in the Eastern Cape province of South Africa and other countries in Africa (Dold and Cocks, 2002; Cocks and Dold 2006). Five of the plants studied herein have been recently reported in our study area as remedies for the treatment of constipation. They include; *Strychnos henningsii*, *A. arborescens*, *A. tenuior*, *A. ferox* and *Alepidea amatymbica* (Wintola and Afolayan, 2010). Two of these; *S. henningsii* and *A. ferox* are also used for treating diabetes mellitus (Oyedemi et al., 2009), while *A. amatymbica* is used in the treatment of diarrhoea (Afolayan and Lewu, 2009).

This is not surprising considering that a single plant species may contain several chemical compounds that may be active against a wide variety of diseases. Plant cells fundamentally are chemical factories and many

<table>
<thead>
<tr>
<th>Locality</th>
<th>Traditional doctors</th>
<th>Herbalist</th>
<th>Traditional medicine sellers</th>
<th>Villagers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Beaufort</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>02</td>
</tr>
<tr>
<td>Alice</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>09</td>
</tr>
<tr>
<td>Middle drift</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>03</td>
</tr>
<tr>
<td>Keiskammahoek</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>05</td>
</tr>
<tr>
<td>Dimbaza</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>05</td>
</tr>
<tr>
<td>King William’s town</td>
<td>0</td>
<td>0</td>
<td>28</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>04</td>
<td>04</td>
<td>36</td>
<td>08</td>
<td>52</td>
</tr>
<tr>
<td>Percentage</td>
<td>7.7</td>
<td>7.7</td>
<td>69.2</td>
<td>15.4</td>
<td>100</td>
</tr>
</tbody>
</table>

### Types of plants sampled

A total of 17 plant species belonging to 13 genera and 11 families were sampled (Table 2). The Asphodelaceae was the most represented family (4 species), followed by Apocynaceae (3 species) and Loganiaceae (2 species). The roots were the most commonly used plant parts, constituting 35.3% of all medicinal preparations. This was followed by the stem bark and leaves (23.5% each), rhizome, tuber and whole plants each having a percentage representation of 5.9% (Figure 1). Stomach pain was the most frequent manifestation that was treated with most of the plants. Except for one plant, treatment was given orally for all stomach related illnesses (Table 2).
Table 2. Plants used in the treatment of *Helicobacter pylori* related morbidities in the Nkonkobe municipality of the Eastern Cape province of South Africa.

<table>
<thead>
<tr>
<th>Scientific name/Family</th>
<th>Vernacular/Local name(s)</th>
<th>Herbarium vouchers</th>
<th>Parts used /State</th>
<th>Type of stomach illness</th>
<th>Preparation</th>
<th>Mode of administration and dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoxis hemerocallidea (Hypoxidaceae)</td>
<td>Inongwe (African potato)</td>
<td>CNUFH07</td>
<td>Tuber (Fresh)</td>
<td>Gastritis</td>
<td>Crushed in warm water and sieved</td>
<td>Taken orally, three glasses a day</td>
</tr>
<tr>
<td>Rubia petiolaris (Rubiaceae)</td>
<td>Ubulawu</td>
<td>CNUFH08</td>
<td>Roots (Fresh)</td>
<td>Severe stomach and chest pains</td>
<td>Infusion</td>
<td>Taken orally until symptoms subside</td>
</tr>
<tr>
<td>Strychnos henningsii (Loganiaceae)</td>
<td>Umnonono</td>
<td>CNUFH04</td>
<td>Stem bark (Dry)</td>
<td>Stomach pains</td>
<td>Infusion</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Strychnos decussata (Loganiaceae)</td>
<td>Umnonono</td>
<td>CNUFH06</td>
<td>Stem bark (Dry)</td>
<td>Stomach pains</td>
<td>Infusion</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Aloe arborescens (Asphodelaceae)</td>
<td>Unomawenii</td>
<td>CNUFH09</td>
<td>Leaves (Fresh)</td>
<td>Stomach pains</td>
<td>Decoction</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Aloe ferox (Asphodelaceae)</td>
<td>Ikhalaah</td>
<td>CNUFH10</td>
<td>Leaves (Fresh)</td>
<td>Stomach pains</td>
<td>Decoction</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Aloe tenuior (Asphodelaceae)</td>
<td>Intelezi</td>
<td>CNUFH11</td>
<td>Leaves (Fresh)</td>
<td>Stomach pains</td>
<td>Decoction</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Alepidea amatymbica (Apiaceae)</td>
<td>Iqwili</td>
<td>CNUFH03</td>
<td>Rhizome/Roots (Fresh or dry)</td>
<td>Chest pain, belching</td>
<td>Boiled, infusion</td>
<td>Steam inhaled until symptoms subside</td>
</tr>
<tr>
<td>Hydnora africana (Hydnoraceae)</td>
<td>Umavumbuka</td>
<td>CNUFH12</td>
<td>Whole plant (dry)</td>
<td>Gastritis, stomach cramps, ulcers</td>
<td>Infusion</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Pachycarpus concolor (Apocynaceae)</td>
<td>Itshongwe</td>
<td>CNUFH13</td>
<td>Roots (Dry)</td>
<td>Stomach ache, gastritis</td>
<td>Infusion</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Xysmalobium orbiculare (Apocynaceae)</td>
<td>Itshongwe</td>
<td>CNUFH14</td>
<td>Roots (Dry)</td>
<td>Stomach ache, gastritis</td>
<td>Infusion</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Xysmalobium undulatum (Apocynaceae)</td>
<td>Itshongwe</td>
<td>CNUFH15</td>
<td>Roots (Dry)</td>
<td>Stomach ache, gastritis</td>
<td>Infusion</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Elephantorrhiza elephantine (Fabaceae)</td>
<td>Intolwane</td>
<td>CNUFH16</td>
<td>Roots (Fresh)</td>
<td>Stomach pains</td>
<td>Boiled</td>
<td>Taken orally, three glasses daily</td>
</tr>
<tr>
<td>Ilex mitis (Aquifoliaceae)</td>
<td>Isidumo</td>
<td>CNUFH17</td>
<td>Stem bark (Dry)</td>
<td>Bloated painful stomach</td>
<td>Infusion</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Cissampelos capensis (Menispermaceae)</td>
<td>Umayisake</td>
<td>CNUFH18</td>
<td>Leaves (Fresh and dry)</td>
<td>Stomach pains</td>
<td>Crushed in hot water</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Bulbine abyssinica (Asphodelaceae)</td>
<td>Uyakayakana</td>
<td>CNUFH19</td>
<td>Roots (Fresh)</td>
<td>Stomach pains</td>
<td>Infusion</td>
<td>Taken orally</td>
</tr>
<tr>
<td>Trichilia dregeana (Meliaceae)</td>
<td>Umkhuhlu</td>
<td>CNUFH20</td>
<td>Stem bark (Fresh and dry)</td>
<td>Pains and stability of the stomach</td>
<td>Infusion</td>
<td>Taken orally</td>
</tr>
</tbody>
</table>
possess a rich supply of therapeutically useful constituents (Akinpelu et al., 2009). Some of these constituents: tannins, catechins, alkaloids, steroids, triterpenoids, essential oils and polyphenolic acids have antibacterial properties and health promoting abilities with therapeutic effects on multiple disease conditions (Cowan, 1999; Iwalewa et al., 2007; Adeboye et al., 2008).

Our results show that traditional naming of plants in the Nkonkobe municipality is a little controversial considering that different plants may be given the same names. For example, *Strychnos henningsii* and *Strychnos decussata* are both referred to as ‘Umnonono’ while ‘Itshongwe’ can be used to mean *Pachycarpus concolor*, *Xysmalobium orbiculare* or *Xysmalobium undulatum* (Table 2). This phenomenon has been reported in many traditional societies and is probably due to the fact that most of these plants are named after their uses (Bussmann et al., 2006; Focho et al., 2009), which may cut across a number of plants. The results also demonstrate that dosage was dependent most of the time upon the disappearance of symptoms. This may give a false impression of treatment considering that clinical presentations may vary amongst patients and there is also the risk of over dosage.

In this study, the most used plant parts are roots (35.3%), leaves (23.5%) and stem barks (23.5%) (Figure 1). The frequent harvesting of roots and barks may destroy the plants, but they are preferable, probably due to the fact that they contain larger quantities of antibacterial components and they are easier to transport or store for longer periods as previously suggested (Eloff, 2001). It would be much more sustainable if traditional medicine practitioners and dealers in traditional medicine are encouraged to use leaves.

The Apocynaceae was also one of the most represented families in this study (Table 2). A World Wide Web search indicates that none of the three members represented herein: *P. concolor*, *X. orbiculare* and *X. undulatum* has been evaluated against *H. pylori*. This calls for more research on these plants which could be possible sources of new compounds for the eradication of *H. pylori* infections. Equally important is the need to document their toxicological properties and in vivo potencies.

Although the use of traditional medicine to manage *H. pylori* associated morbidities is gaining interest in this municipality, information on the effectiveness as well as the toxicological and pharmacological properties of most of these plants are lacking. The locals claim they are efficient and safe because of their natural origin. As a consequence, the inhabitants often use these remedies without medical advice, and in some cases combined with medically prescribed drugs. This constitutes a health risk because some of these plants may contain several constituents which could interact with the prescribed drugs and affect drug metabolic pathways.

The use of medicinal plants in the management of *H. pylori* related morbidities and other infections needs to be regulated considering that some of these plants contain pesticides or heavy metals. Equally important is the fact that a misidentified plant might be used or a different plant than the one originally used for the treatment may be substituted for the same treatment. Not only could plant components affect the efficacy of current *H. pylori* treatment regimens, their interactions could lead to toxicity. However, despite the aforementioned problems, some of these plants are already showing promising results as potential sources of novel anti-*H. pylori* compounds. One of these plants, *Hydnora africana*, studied in our group has been embraced as a potential reservoir that may contain a large repertoire of new anti-*H. pylori* compounds (Unpublished findings).

**Conclusion**

Ethnobotanical studies of plants used to manage *H. pylori*...
associated morbidities can help in identifying cheap sources of new efficient compounds that would be used to better manage the infection. In this study, 17 species belonging to 11 families were identified. More research is needed to scientifically correlate treatment claims with the use of these plants as well as isolate the plants chemical compounds, determine their toxicities and in vivo potencies. These aspects are already receiving attention in our group.

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