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Exploring indigenous knowledge on medicinal plants used to treat COVID-19 related symptoms

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Abstract. The purpose of this study was to describe the indigenous plant-derived medicine used to treat symptoms related to four of the most common symptoms of the COVID-19 pandemic. Data presented in this study form part of a medical ethnobotanical study conducted in Limpopo Province, South Africa between 2012 and 2019. The study recorded 89 plant species identified as sources of medicine. Of these plants, 13 species belonging to 9 botanical families were used as sources of medicine to cure influenza, cough, sore throat and fever, while 5 species belonging to 5 botanical families were sources of preventive medicine. The treatment of the four symptoms is accomplished through the administration of oral decoctions, steaming and infusions, while preventive medicine is in the form of infusion, decoction, chew or charm, which is used to prevent susceptibility to infectious diseases such as influenza and cough. Knowledge of these medicines rests with ordinary community members who offer treatment after observations of the symptoms on their family members. The indigenous plant-derived medicines identified in this study may be tested for their safety and efficacy to discover new local, affordable and culture-specific drugs that could be used in the modern phytotherapy for conditions such as COVID-19.

Keywords. Indigenous knowledge; traditional medicine; medicinal plants; COVID-19; pandemic

1. Introduction

Indigenous health care practices play an essential role in the provision of affordable, readily available and culture-specific primary health care. The global spread of COVID-19 and its impacts on human health and livelihood challenged local communities and scientists to attempt the use of indigenous health practices to address the pandemic, especially its common symptoms such as influenza, cough, sore throat and fever. Community members and scientists brought forward evidence of the long use of plant-derived products for preventive and curative care. For example, *Artemisia* was identified as the most common species used in the treatment of fever, influenza, common cold and cough, and a possible treatment for COVID-19 (World Health Organization [WHO], 2021). The World Health Organization however, warned that without records of *Artemisia* clinical trials, none of its materials can be recommended for the cure or prevention of COVID-19 (WHO, 2020). This observation stimulated debates about the need for the identification of plant materials with similar medicinal uses as *Artemisia* to subject them to clinical efficacy and safety. There is increased acknowledgement of the use of

medicinal plants for primary health care offered at households by family members or relatives (Chukwuma & Chukwuma, 2019).

An important contribution by the present study is the presentation of 18 indigenous plant species recognised for their value as sources of medicine used in curative and preventive care of four symptoms related to some of COVID-19, namely; fever, influenza, cough and sore throat. This study records knowledge of the use of these medicinal plants held by ordinary community members other than traditional health practitioners. Community members are key primary health care-givers as they strive for the daily good and health well-being of their family members (Helman, 2000; Bussmann *et al.*, 2011; Mutta, 2016). Parents and elders continue to provide health security to their households through the administration of plant-derived medicine preferred by 75-90% of the rural population around the world (Fakchich & Elachouri, 2014). This knowledge is valuable and could be protected for the treatment of emerging diseases (Mhlongo & Van Vyck, 2019).

2. Methods

2.1 Study area

The study presents indigenous plant species identified as sources of medicine to treat four health conditions associated with COVID-19 symptoms. The study was conducted among four groups of Bapedi in Limpopo Province, South Africa. Limpopo Province is situated in the northern side of South Africa with an estimated population of 5.7 million, which translates into a population density of 44 people per square kilometre. The population of Limpopo contributes to 9.9% (5.9 million) of South Africa's population of 54 million. Limpopo is the fifth largest of South Africa's nine provinces covering an area of 125 755 km², which is 10.3% of South Africa's total land area (Statistics South Africa, 2014). Demographic figures show several ethnic groups distinguished by culture, language and race. The Department of Health Limpopo Province Vote No. 07 Annual Report 2019/2020 Financial Year reported improved performance in health care delivery. The report further shows that towards the end of 2020, the COVID-19 pandemic presented a new normal where future plans were revised to align them with the impact of the pandemic, and therefore, recovery plans and strategies were developed to flatten the curve (Department of Health Limpopo Province, 2019/2020).

2.2 Study design

2.2.1 Study approach

The researcher adopted a mixed method approach to conduct the study. This implied the simultaneous use of qualitative and quantitative research tools. The study is derived from a medical ethnobotanical enquiry conducted to describe indigenous plants used to prepare curative and preventive medicine by the members of four rural communities in Limpopo Province. The eighteen medicinal plants (Table 1) were identified from a list of 89 plant species identified by community members during several medical ethnobotanical studies conducted in Limpopo Province, South Africa between 2012 and 2019.

2.2.2 Participants

The study participants were local community members with knowledge of healing plants. They comprised a sample of 230 (115 males and 115 females) residents of four communities in four districts of the province, aged between 29 and 87 years.

2.2.3 Data Collection

A semi-structured questionnaire was designed to collect the medical ethnobotanical knowledge of the four communities. The questions were developed in terms of themes such as knowledge of healing plants, names of the plants, plant materials used, preparation and administration methods and the types of diseases treated. The interviews were conducted face-to-face in the households of participants, followed by transect walks to identify and collect the plant voucher specimens for botanical identification. The vouchers were deposited into the Larry Lach Herbarium situated in Limpopo.

2.2.3 Data analysis

The researcher employed the thematic content analysis method to analyse qualitative data. This method was used to determine the presence of certain words or concepts within a text or sets of texts. The data were analysed by organising them into categories based on themes, concepts or similar features. Quantitative data were analysed through a statistical programme and presented in a graph and a table.

3. Results

3.1 Indigenous plant-derived medicine administered for COVID-19 related symptoms

A total of 18 indigenous medicinal plants belonging to 15 botanical families (Table 1) were identified and recorded as sources of medicine to treat influenza, fever, cough and throat infection. Details of the species are presented in Table 1 below in terms of the plants' botanical families and vernacular names, habits, parts used, preparation and administration methods, and their uses in indigenous healing

3.1.2 The plant habits

Herbs were the most common materials used (78%) followed by trees (17%) and shrubs (6%) (Figure 1).

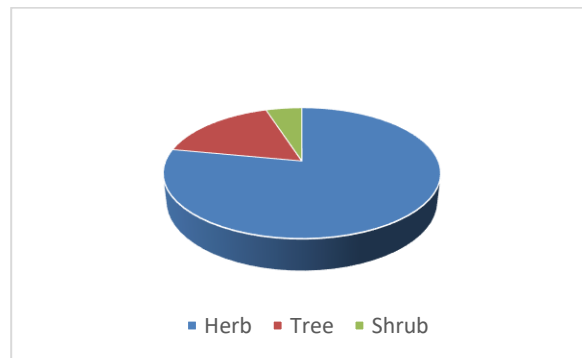


Figure 1: Plant Growth Forms

3.1.3 The plant materials used

The plant materials harvested included roots, bulbs and leaves. The most common materials used were the roots (39%), bulbs (22), leaves (22), with bark and stem each used in single instances.

3.1.4 The indigenous plant-derived medicine used to treat COVID-19 related symptoms

Table 1 above presents a list of indigenous plants identified as sources of medicine to treat conditions associated with COVID-19 symptoms such as influenza, fever, cough and sore throat. The table presents botanical families, names and species' collection numbers, vernacular names, habits, materials used and their use in the treatment of associated symptoms.

4. Discussion

4.1 COVID-19 symptoms

COVID-19 is a disease caused by a new coronavirus called SARS-CoV-2. The World Health Organization first learned of this new virus on 31st December 2019, following a report of a cluster of cases of viral pneumonia in Wuhan, People's Republic of China (WHO, 2020). The disease initially named SARS-CoV-2 was renamed Coronavirus Disease 2019 (COVID-19) by the World Health Organization on 30 January 2020, which declared the outbreak a global public health emergency (Zhou *et al.*, 2020). As of 20 February 2020, based on 55924 laboratory confirmed cases, typical signs and symptoms included fever, sore throat, dry cough, nasal congestion and conjunctival congestion (WHO, 2020). The most common symptoms of the infection include fever, runny nose, cough, shortness of breath and diarrhoea (Hoffman *et al.*, 2020). A complete clinical manifestation was not yet clear, but the symptoms recorded so far match the above indications with mild to severe consequences (Huang *et al.*, 2020). These symptoms are similar to those identified by participants during an ethnobotanical study in 2012-2019, identified were influenza, fever, cough and sore throat.

4.2 Discussion of the results

It is observed that local community members hold indigenous knowledge of the use of plant-derived medicine for curative and preventive purpose of primary health care. The knowledge is used to treat some of what the World Health Organization listed as the main symptoms of the COVID-19 pandemic (WHO, 2020). The symptoms commonly displayed by people infected by the COVID-19 pandemic include fever, influenza, cough and sore throat. Indigenous healing practices, community members are more focused on symptomatic relief from self-terminating or chronic conditions, and not so much on finding cures for particular ailments (Mogale & Van Wyk, 2019).

Of the plants identified in the study, herbs had the highest proportion followed by trees, while shrubs were the least life-form for the plant species used to treat COVID-19 associated symptoms (Figure 1). The dominance of herbs was evidence that leaves and bulbs dominate the plant materials used to treat fever, influenza, cough and sore throat. The dominance of herbs is proof that most of the medicines administered for respiratory diseases are herbs (Semenya & Maroyi, 2018). The plant parts used include roots in majority followed by bulbs, leaves, barks and stems. The plant materials used to treat COVID-19 related symptoms reported in the study are dominated by roots which, according to Mbuni *et al.* (2020) these are highly utilised in the treatment of illnesses and diseases. Roots are dominant compared to other plant parts in the treatment of respiratory infections (Phumthum *et al.*, 2018). It was noticed that decoction and infusion were the most widely used methods of preparation mainly because orally-administered medicine is more preferable and effective. Within the Marakwet, Luhya and Pokot communities, the common way of administering traditional medicines is drinking (Mutwiwa *et al.*, 2018).

Thirteen medicinal plant species belonging to 9 families were identified as sources of curative medicine. Leaves, roots, bulbs and barks were used to make infusions, decoctions and therapeutic steam to treat the symptoms of influenza, fever, cough and sore throat. These observations are consistent with findings that indigenous plant-derived medicine is often used to treat fever, cough and influenza, which are recently associated with some of the COVID-19 symptoms (York *et al.*, 2011; Lam *et al.*, 2021). These were identified as the most common symptoms treated with plant-derived medicines that are administered orally for respiratory infections in South Africa (York *et al.*, 2021). The same observation was made in several studies in other parts of the African Continent, that respiratory infections are conditions that are

treated with different medicinal plants by the local people (Ibekwe *et al.*, 2014; Erinoso & Aworinde, 2017). The utilisation of indigenous plant-derived medicines to counteract cough, fever and influenza is evident in other parts of the world. is a continuous and widespread wealth of knowledge of utilisation of medicinal plants at household level (Lawal *et al.*, 2020). The use of *Artemisia* and *Lippia javanica* to treat fever, sore throat and influenza, which according to the World Health Organization, are associated with the COVID-19 pandemic (Mhlongo & Van Wyk, 2019).

Of the indigenous medicinal plants identified by participants, *Artemisia* has been in demand since the COVID-19 outbreak in South Africa for its known medicinal uses. For example, in June 2020, *Artemisia* was in high demand on the streets of Johannesburg in South Africa, with the belief that it could be the most efficient source of medicine to treat the COVID-19 symptoms. As a result, *Artemisia*'s silvery leaves went for sale at roadside vendors and in the city's popular traditional markets (WHO, 2020). The World Health Organization is now working with various research institutions to test the infusions and decoctions derived from this species for clinical efficacy and safety as treatment for COVID-19. However, the WHO emphasised that traditional medicines should first be tested and approved by the national medicine regulatory agencies and the medicines' production before it is used (<https://www.capetownetc.com/news/who-recognises-traditional-medicine-in-covid-19-treatment>).

Fewer (5) plant species belonging to five botanical families were identified as sources of medicine used to prevent susceptibility to any infectious diseases. Roots, leaves and bulbs are collected to make preventive medicine in the form of infusion, decoction, chew or charm. Influenza and cough were identified as the most common infectious illnesses. Anyone showing these symptoms is separated from the rest of the family to receive treatment; a similar practice in respect of the COVID-19 pandemic. COVID-19 symptoms like those identified in the study are understood to be more transmittable, and therefore, the health authorities have developed and mandated vaccination jabs to prevent the spread of the pandemic.

The most common practices in response to the COVID-19 pandemic adopted by members of the public involve non-pharmacological and self-management approaches (Lam *et al.*, 2021). For example, the use of ginger, lemon, turmeric and onion to prevent the infection. Little is known about the use of traditional, complementary and integrative medicine as an effective preventive measure (Lam *et al.*, 2021). To this observation, the benefits of traditional medicine, vitamins and herbal medicine surpass non-pharmacological materials in the treatment of COVID-19 (Ng, 2020). This assertion is corroborated by the meta-analyses, which have shown the effectiveness of herbal medicine in improving the treatment and reducing the symptoms of fever and fatigue in COVID-19 patients (Fan *et al.*, 2020). People who expressed greater concern about being infected and the continuous spread of the pandemic are likely to seek different types of self-protective measures, including indigenous health practices (Pao, 2020).

Despite evidence of the wide use of indigenous plant-derived medicine for preventive and curative care, the World Health Organization and regional and national health authorities are still sceptical about its immediate integration into the mainstream health care. The main concern is the non-pharmacological evidence of the medicines, and issues such as maintaining good hygiene and reducing contact that could facilitate COVID-19 infection (Wang & Zhang, 2020). Existing evidence of the value of traditional Chinese medicine motivated their application to the treatment of COVID-19, although so far there is still no scientific evidence regarding this experience (Ding *et al.*, 2017). The main reason is that herbal formulas contain many compounds, and are tailored to patients' symptoms and environmental factors (Wang &

Zhang, 2020). It is recommended that before indigenous health practices could be fully integrated and used adjacent to other health care practices, they should be subjected to a scientific process of extraction, isolation and characterisation to determine active compounds and clinical trials.

5. Conclusion

Medicines derived from indigenous plants identified in the study are trusted for the treatment of fever, influenza, sore throat and cough associated with the COVID-19 pandemic. Unfortunately, it remains a challenge to recommend their use in case of COVID-19 cure and prevention because of lack of scientific evidence about the medicines. The World Health Organisation requirements in terms of the use of indigenous health care practices is that they should first be tested for their efficacy and quality standards, and should be subjected to clinical trials before they are fully integrated into the main health stream. The study results may be essential to initiate the process of testing the efficacy and safety of the identified plant-derived medicines.

Author Contribution

I am the sole author of the manuscript.

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Table 1: List of indigenous plants used to treat COVID-19 associated symptoms

Family Name, Scientific Name & Species No.	Vernacular	Habit	Plant material used	Symptoms treated
Amaranthaceae <i>Amarantus hybridus</i> (SAR 44)	<i>Sebjane</i>	Herb	Root	Decoction taken orally for immunisation against attack by influenza
Amaryllidaceae <i>Crinum Macowanii</i> L. (SAR 20)	<i>Letotše</i>	Herb	Bulb	Infusion administered orally for cough
Asclepiadaceae <i>Asclepias fruticose</i> (SAR 69)	<i>Fore</i>	Herb	Stem	Dry stem is burnt, and the resulting ash is taken with water to treat cough
Asteraceae <i>Artemisia afra</i> . Jacq. ex. Wild (SAR 31)	<i>Lengana</i>	Herb	Leaf	Infusion administered orally for fever, cough, sore throat and influenza
<i>Dicona gerrardii</i> (Harv. ex. Fc Wilson (SAR 26)	<i>Phalalegola na</i>	Herb	Root	Decoction taken orally to cure cough
Canellaceae <i>Warburgia salutaris</i> (G. Bertol) (SAR 19)	<i>Molaka</i>	Tree	Bark	Infusion taken orally cures cough and fever
<i>Eucomis autumnalis</i> (Mill) Chitt. (SAR 57)	<i>Mathubadifala</i>	Herb	Bulb	Decoction orally administered treats cough and fever
Capparaceae <i>Cadaba aphylla</i> (Thunb) Wild (SAR 42)	<i>Monnamotšho</i>	Herb	Root	The root is crushed to make powder which is used as a strong protective measure against infectious diseases such as cold, cough and influenza
Crassulaceae <i>Cotyledon orbiculata</i> L. (SAR 48)	<i>Seredile</i>	Herb	Leaf	Dried leaves make a protective charm to ward off disease diseases such as cold, cough and influenza
Hyacinthaceae <i>Drimia robusta</i> Bak. (SAR 76)	<i>Phaya-basimane</i>	Herb	Leaf	Infusion taken orally to ward off cold and influenza
Hypoxidaceae <i>Cf Hypoxix</i> L. (SAR 73)	<i>Phela</i>	Herb	Bulb	Decoction administered orally treats cough and sore throat
Mmoraceae <i>Ficus burkei</i> (Miq) (SAR 37)	<i>Mokumu</i>	Tree	Bark	Infusion taken orally treats colds and throat infection
Myrtaceae <i>Syzygium cordatum</i> Hochst. ex. (SAR 66)	<i>Monthlo</i>	Tree	Root	Decoction taken orally treats respiratory diseases and bronchitis and throat infection
<i>Lycium</i> sp. (SAR 72)	<i>Ngangi</i>	Shrub	Root	Decoction taken orally treats fever
Rhamnaceae <i>Berchemia discolor</i> (Klotzsch) hemsl. (SAR 43)	<i>Monoko</i>	Herb	Root	Decoction of root chips is sprinkled in the household or courtyard to prevent attack by infectious diseases such as influenza and common cold
Verbenaceae <i>Lippia javanica</i> Burm F. (SAR 78)	<i>Mošunkwane</i>	Herb	Leaf	Infusion taken orally treats cough, influenza and fever
Vitaceae <i>Rhoicissus tridentata</i> (L.F) Wild & Dumm (SAR 47)	<i>Mopidikwa</i>	Herb	Root	Decoction taken orally to treat cough and influenza
Zingiberaceae <i>Siphinochilus aethiopicus</i> (SAR 45)	<i>Serokolo</i>	Herb	Bulb	The rhizomes are chewed rubbed on the body for protection against attack by all varieties of diseases