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An Ethno Veterinary Survey Of Medicinal Plants Used For The Management Of Livestock Respiratory Diseases Bapedi Of Sekhukhune Limpopo Province Of South Africa

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Abstract
The present study was initiated to quantitatively document their indigenous knowledge on the utilization of most common medicinal plants for livestock treatment respiratory. Since many small scale and resource-poor livestock farmers cannot afford synthetic pharmaceutical drugs, they turn to indigenous knowledge as an alternative key to unlock the power of ethnoveterinary medicinal plants to treat animal diseases. However, there is no ethnoveterinary pharmacopeia and data on ethnoveterinary usage of plants are still sparse. In this study, an ethnobotanical survey was conducted to document the indigenous knowledge of medicinal plants used to treat respiratory livestock diseases. Using semi-structured interviews and questionnaires, ethnobotanical data were collected from 5 farmers and 30 traditional healers in Sekhukhune region. The results showed that 28 native plant species were used to manage respiratory livestock diseases. Plant leaves were commonly used, being crushed in water, and administered orally or topically. During the survey, it was noted that twenty eight plants were traditionally used by indigenous people to treat various human and veterinary diseases such as basic first aid for pneumonia, respiratory, flu, bronchitis, tonsillitis, influenza, TB and chronic conditions like anthrax or chronic obstructive pulmonary disease. The information provided in this study would bring new insights on the development of environmental friendly, effective medicines and vaccines to control veterinary diseases in the future. In addition, this study may be highly useful to protect and conserve the endemic flora species of study area.

Keywords: *Ethnoveterinary uses, Medicinal plants, Veterinary ailments, Traditional herbal healers, Indigenous knowledge, Livestock disease.*

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I. Background

Nature is provided with a lot of herbal medicinal plants which play a main part in the management of diseases. Plants are considered as the most important and fundamental sources of medicinal traits. Medicinal plants form the richest entity in medicines, food supplements, nutraceutical, pharmaceutical and chemical industries for improvement drugs [1]. Application of these medicinal plants as a foundation of drugs in treating human and animal diseases has been a traditional practice. Many studies have been carried out on treating specific ailments in livestock with the help of herbal medicines and its derivatives. The traditional use of medicinal plants in treating veterinary diseases is of paramount significance in developing countries; where in, typical therapies for animal health care becomes financially difficult for resource poor farmers [2].

South African agriculture, livestock plays a key role in the farmers life, they provide farm power, rural transport, manure, fuel, milk and meat, but also a major role in rural economy by providing income and employment to the small hold farmers and other weaker sections of the general public. However, livestock productivity is relatively poor owing to insufficient availability of feed, wide spread disease, poor health care services and inadequate knowledge on the dynamics of the different farming systems existing in the country [3]. Lack of animals healthcare centres and transportation facilities, prohibitive cost of treatments, side effects of several allopathic drugs have led to increased emphasis on the use of plant materials as a source of medicines for a wide variety of live stock respiratory ailments [4].

Ethnoveterinary medicine plays an important role in animal production and livelihood development. It provides valuable alternatives to and complements western-style veterinary medicine [37] and is accessible and easy to prepare and administer, at little or no cost to the farmer [36]. The indigenous knowledge of the veterinary health care system acquired by traditional herbal healers and elderly learned farmers and is orally transformed

from one generation to other. It is less systematic and less formalized and is usually transferred by word of mouth rather than in writing [7].

Respiratory disease is a medical term that encompasses pathological conditions affecting the airways, including nasal passages, bronchi and lungs. They range from mild and self-limiting, such as the common cold, to acute infections such as bacterial pneumonia, respiratory flu, bronchitis, tonsillitis, influenza ,TB and chronic conditions like asthma or chronic obstructive pulmonary disease [8,12]. Bovine TB is a disease caused by a specific type (species) of bacteria called M. bovis. Bovine TB usually affects animals such as cattle, but it can affect practically all mammals causing a general state of illness, coughing and eventual death. It can be transmitted from animals to humans as well as to other animals. In many animals the disease is most often caused by a species of *Mycobacterium* that has adapted to the host animal species [35].The main symptoms of these disorders are often very similar and are manifested in the following ways: Flushing, Cough, Fever, and Headache, throat, ears, or muscle aches, General malaise and Tiredness. Respiratory tract infections continue to be a major health challenge worldwide especially due to the increasingly fast development of resistance to the drugs currently in use [35].

Respiratory disease places a huge economic burden not only for the families of patients, but for communities in general: the burden includes livestock lives and financial costs related to travel to healthcare facilities and medicines [35].

Respiratory diseases can be caused by several reasons, either by the presence of microorganisms or toxins in the environment (or in the saliva or mucus) which generally attack organisms with nutritional deficiencies, weak or immunologically predisposed to suffer any these discomforts [11-19]. To treat respiratory disease, people from many regions around the world (Africa, Asia and Latin America) use traditional medicine which enables them to meet some of their needs in terms of animal health care. In Africa, for example, up to 80% of the populations use traditional medicine for this purpose [12].

However, the local herbalists that use plants for medicinal purposes have no scientific knowledge of the systemic functions of the chemicals in the herbs before administering on patients, so a laboratory screening of these herbs need to be carried out, to validate the medicinal uses of plants and to assess the toxicity level and components of such plants, hence the need for studies on medicinal plants. South Africans have a long history of the use of medicinal plants in treating a variety of illnesses and ailments [25]. Medicinal plants have always played a significant task within the traditional health care system of South Africa. It is estimated that in 1994 between 12 and 15 million or 60% of the people of South Africa used medicinal plant remedies from as many as 700 indigenous species [23]. The average South African consumer of traditional medicine uses 750 g of plant material a year [34].

In the rural Sekhukhune area of the Limpopo Province, South Africa, veterinary professionals as well as a state sponsored animal health care are unavailable. Limited research has, however, been conducted on the importance of traditional healing on animal health care in the communities in Sekhukhune. It is clear, therefore, traditional healing is a practice in this area due to pressure of lack of other options in the community of different animal health care. The conducted an overall study of the traditional healers on human use only of Limpopo and recommended further research with larger sample sizes for each municipality in order to verify their findings [26].

Traditional knowledge of ethnoveterinary medicinal plants and their use by indigenous cultures are not only useful for conservation of cultural traditions and biodiversity but also for community healthcare and drug development in the present and future [15].Documentation of indigenous knowledge and evaluation of the use of plants for a variety of purposes assume greater significance, not just to retain it, but also to keep it alive and make it available for future use because of rapid socio-economic and cultural changes that are taking place across the traditional community of the region [16]. Keeping this in view, the present studies was initiated, with an aim to identify knowledgeable resource person i.e. elderly learned farmers and experienced traditional healers and document their knowledge of on the utilization of ethnoveterinary medicinal plants in Bapedi of Sekhukhune Limpopo Province of South Africa [17].

II. Methods

Description of study area

The study was conducted in five local municipalities Elias Motswaledi, Ephraim Mogale, Tubatse, Fetakgomo and Makhuduthamaga. of the Sekhukhune District, Limpopo Province, South Africa. Geographically Sekhukhune District lies between 24°50′S and 29°50′E (Fig. 1). The district is located in the south east part of Limpopo Province, and covers an area of 13,528 km^2, making it the largest district in the province. A large portion of the district is identified as rural areas. Semenya et al. (2013) [13] noted that the high floristic diversity of the area coupled with high unemployment rate resulted in a heavy reliance of natural resources such as plants to meet livelihood needs. The vegetation of the district was classified by as aris-semi savannas .It is characterized by a mixture of trees, shrubs and grasses. This type of vegetation has provided a diverse flora with rich medicinal plants that the people of the study areas have always used to treat many illnesses. The ethnic group use herbal

medication either alone or in combination with orthodox medicines for the treatment of several infections [36, 37].

Figure 1 South Africa

Figure 2 Sekhukhune District Municipality

The Study area population

The study was conducted in the Sekhukhune district, in Elias Motswaledi, Ephraim Mogale, Tubatse, Fetakgomo and Makhuduthamaga in Limpopo province in South Africa. The surveyed district is inhabited by Black African 98.6%, Coloured 0.1%,Indian/Asian 0.2%,White 1.0% .Black people Northern Sotho 82.2%,Southern Ndebele 4.4%,Zulu 3.3%,Tsonga 2.0%, Other 8.1% mostly from Bapedi ethnic group, as well as few Ndebele. The Bapedi ethnic group constitutes the largest cultural group in the Limpopo Province (South Africa), comprising 57% of the total provincial population (Limpopo Provincial Government, 2012) The study was, however, restricted to the area around Sekhukhune in order to ensure that healer interviewed, livestock owners, elderly were Sepedi speaking and use mountain, bush and river as their closest source of medicinal plants.

Ethnoveterinary survey

Briefly, snow-ball sampling was applied during ethnoveterinary surveys with livestock farmers and traditional healers the main informants in the survey, being identified by community leaders, whose permission was sought before proceeding into the study area. A total of 5 farmers and 30 traditional healers were interviewed between 1 April 2021 and 30 April 2021. According to Patton (1990), snowball sampling is an approach for locating information-rich key informants, who are then contacted and interviewed, following which they in-turn direct the interviewer to other potential respondents [49]. Participants gave their informed consent and volunteer to participate for the publication of all results and any accompanying images before commencing with the interview as required by the University Pretoria`s ethics committee. All interviews were conducted in local languages. Researcher acted as the translators during the conversations between the farmers and himself. After explaining the objectives of the research the farmers and traditional healers were individually engaged in semi-structured interviews supplemented with questionnaires. During the conversations, data on respondent characteristics, livestock respiratory infections, and ethnoveterinary plant remedies used to treat diseases were obtained. Vernacular names of the plant species, plant parts, and methods of preparation of the plant remedies were also recorded. As this was the study of its kind in the Sekhukhune district, the focus was on depth to gain more insight into the situation livestock respiratory diseases and in future with availability of financial resources, relax covid-19 restriction, larger sample sizes will be selected in order to be able to generalize more fully [27].

Data collection

The study was, however, restricted to the area around Sekhukhune in order to ensure that healer interviewed were Sepedi speaking and Use Mountain, bush and river as their closest source of medicinal plants. The vegetation of the district was classified by as aris-semi savannas [32]. It is characterized by a mixture of trees, shrubs and grasses [33]. This type of vegetation has provided a diverse flora with rich medicinal plants that the people of the study areas have always used to treat many illnesses. The ethnic group use herbal medication either alone or in combination with orthodox medicines for the treatment of several diseases [20]. Most of people live in the rural area in Sekhukhune, hence use of plants for common treatment of diseases such as Fever, Coughs, Weight loss, Loss of appetite, Weakness, Night sweats, Dyspnoea, Shortness of breath, Chest pain, signs of chest disease.

Fourteen villages were selected from around Sekhukhune district. Villages further away were not used, due to financial constrain. Face-to-face meetings were held with various traditional healers and livestock owner. The reasons for the one on one meetings were to introduce the project, to determine how active traditional healers were in the area and to enlist them for the study. The traditional healers included in this research were of the Bapedi tribe as they are the dominant cultural group custodians of plants remedies in the Limpopo Province South Africa.

Field survey

This survey focused on the use of traditional plant resources with specific reference to the treatment of respiratory infections on animals. Fieldwork was performed between 01 April 2021 to 30 April 2021. Collectively, 35 participants were interviewed after receiving their prior informed consent. Data was collected from native indigenous health practitioners and local participants (female and males of different ages, experiences and education levels). During field surveys, face to face interviews and semi-structured interviews were also conducted. The questionnaire was explained in Sepedi, the local language. The questionnaire was divided into sections that relate to various aspects of respiratory infections in animals such as local names, medicinal plants use, collection sites, growth forms, plants part used, preparation methods, dosage, combinational uses and toxicity of reported plants. Documentation of data while field survey was evaluated and organized by usage of quantitative and qualitative analysis. In addition, data was compared with previously published research articles on alien plants uses with higher medicinal values for various infections.

Ethical compliance

The present study was carefully designed with strict compliance of bio-ethics and approved by the ethics Committee of University Pretoria, South Africa under the approval No REC029-19. Prior to data collection, a brief group discussion was held with the participants for agreement, to tell the objectives of research and to guarantee the safety of indigenous knowledge. These practices clear the aim of research and develop confidence in participants so they give reliable knowledge without any hesitation. Initially, 50 participants were selected of them were but among them, 5 were hesitant in providing knowledge, and 10 could not be located during the data collection due to personal commitment, leaving a total of 35(male 29 and females 21) participants for data collection. This 5 traditional healers were prepared to identify no more than five medicinal plants and their uses. These healers informed the researcher that they were unwilling to divulge information about certain medicinal plants, the properties of which they considered to be very powerful. They clearly wished to keep this knowledge

to themselves as something belonging to their own private domain. The ability to use plants of such purported potency apparently serves as these healers' speciality trade marks in their communities, conferring upon them the status of being the best among their peers. All plants in this survey are alien listed by the biodiversity action plan for control. The native communities of the area have knowledge about the use of these plants and but not the dangers the can cause to the ecology of their area.

Table 1 Demographic Data of Participants

Parameters		**Participants(N)**	**N(%)**
Gender	Female	10	29
	Male	25	71
Age	36–46	3	8
	47–57	6	17
	58–68	7	20
	69–79	11	32
	80-90	6	17
	90-100	2	6
Education	No Formal Education	10	29
	Primary	13	37
	Secondary	7	20
	Tertiary	2	6
	Others	3	8
Collaboration with modern medicine	Collaboration	15	43
	Non Collaboration	20	57
Occupation	Herbalists	30	86
	Retirees	4	11
	Housewives	1	3
Residence	Urban	3	9
	Rural	32	91
Marital status	Single	13	37
	Married	15	44
	Widowed	6	17
	Divorced	1	2

Table 2 Medicinal plants use for livestock respiratory infection in Animals

	Scientificname	Family name & **Vernacular name**	Life form	Parts used	Ailment treated	Mode	No Users	Use **value**
1	*Artemisia afra*	Asteraceae **Lengana**	*Shrub*	Entire plant	Cough, Influenza, TB, Pneumonia	Orally	35	1
2	*Dicoma anomala*	**Asteraceae Phela**	*Shrub*	Tuber	Asthma/ TB/cough	Orally	19	0.54
3	*Geigeria aspera*	Asteraceae **Makgonthohle**	Shrub	Leaves	Influenza,	Orally	16	0.46
4	Ozoroa Sphaerocarpa	Anacardiaceae **Monoko**	Tree	Roots	Influenza	Orally	12	0.33
5	Terminalia sericea	Combretaceae **Mogonono**	Tree	Roots	Cough Pneumonia, Influenza, Asthma	Orally	33	0.94
6	*Schotiabrachy petala*	Fabaceae **Molope**	Tree	Bark	Cough	Orally	10	0.27
7	Aloe marlothi	Aloaceae **Kgokgophaya rogwa**	Shrub	Leaves	coughs, TB	Orally	34	0.98
8	*Acacia Karro*	Fabaceae **Mookana**	Tree	leaves	cough,fever	Orally	18	0.52
9	*Aloe aborescens*	Aaphodelaceae **Kgogopa**	Shrub	leaves	Influenza,TB,	Orally	33	0.95
10	*Citrus limon*	Rutaceae **Suru**	Tree	Fruit pearl	Cough, Influenza,fever	Orally	34	0.96
11	*Lippia javanica*	Verbenaceae **Musukudu**	Shrub	leaves	Fever,cold, Influenza,TB	Orally	31	0.89
12	*Maerua angolensis*	Capparaceae **Mogogwana**	Tree	leaves	Influenza,TB	Orally	14	0.4
13	*Drimia elata*	Hyacinthaceae **Sekanama**	Shrub	Root	Colds, Influenza	Orally	12	0.34
14	*Elephantorrhiza Elephantina*	Scarabaeidae **Moshitsane**	Tree	Root	Colds/ Influenza,	Orally	32	0.91
15	*Zanthoxylum capensis*	Rutaceae **Monokwane**	Tree	leaves	TB	Orally	8	0.22
16	*Sclerocarya birrea*	Anacardiaceae **Morula**	Tree	Bark	Cough	Orally	25	0.70
17	*Sutherlandia frutescens*	Legumes **Lerumo lamadi**	Shrub	leaves	Fever,cold, Influenza, Anthrax	Orally	22	0.62
18	Alepidea amatymbica	Apiaceae **Lesoko**	Herb	leaves	Colds,Influenza, Asthma	Orally	7	0.21
19	Pterocarpus angolensis	Fabaceae **morôtô**	Tree	Barks	TB,Cough, Fever	Orally	28	0.79
20	Syzygium cordatum	Myrtaceae **Montlho**	Tree	leaves	TB,Fever,cold, Influenza, Anthrax	Orally	5	0.14
21	Tarchonanthus camphoratus	Asteraceae **Sefahla**	Tree	leaves	Colds,Influenza,Bronc hitis, Asthma	Orally	31	0.87
23	Ziziphus mucronata	Rhamnaceae **mokgalo**	Tree	bark	Cough	Orally	13	0.37
24	Dombeya rotundifolia	Malvaceae **Mohlabaphala**	Tree	Leaves	Cough	Orally	11	0.30
25	Pittosporum viridiflorum	Pittosporaceae **Kgalagangwe**	Shrub	whole	Fever	Orally	15	0.42
26	Senna italica	Fabaceae **Morotwanaditshoshi wa fase**	Shurb	Roots	Fever	Orally	30	0.86
27	*Peltophorum africanum*	Fabaceae **Mosehla**	Tree	Roots/Bark	Fever/Cough	Orally	25	0.71
28	Kigelia Africana	Bignoniaceae **Modukguhlu**	Tree	Bark/ Leaves/Fruits	Fever/Cough	Orally	25	0.72

Table Diseases

	Diseases	No	
1	Asthma	4	0.14
2	Anthrax	2	0.07
3	**TB**	**9**	**0.32**
4	Fever	10	0.36
5	Cough	13	0.46
6	Colds	6	0.21
7	Influenza	14	0.5
8	Pneumonia	2	0.07
9	Bronchitis	1	0.03

Life form

1	**Tree**	**17**
2	**Shrub**	**10**
3	**Herb**	**1**

Table 3 Families

	Family name	No	**FIV**
1	Fabaceae	5	0.29
2	Asteraceae	*4*	*0.23*
3	Anacardiaceae	2	0.12
4	Rutaceae	2	0.12
5	Asphodelaceae	1	0.059
6	Combretaceae	*1*	0.059
7	Verbenaceae	1	0.059
8	Capparaceae	1	0.059
9	Hyacinthaceae	1	0.059
10	Scarabaeidae	1	0.059
11	Legumes	1	0.059
12	Apiaceae	1	0.059
13	Bignoniaceae	1	0.059
14	Myrtaceae	1	0.059
15	Pittosporanceae	1	0.059
16	Rhamnaceae	1	0.059
17	Malvaceae	1	0.059

Data analysis

The collected datasets were captured in MS Excel 2013 and analysed using descriptive and inferential statistics. Different quantitative tools such as Frequency of citation (FC) and relative frequency of citation (RFC), Jaccard index (JI), Chi-square test, Family importance value (FIV), Fidelity Level (FL), Informant Consensus Factor (ICF) and Use Value (UV) were used to analyse the importance of medicinal plants and informants' knowledge about categories of respiratory infections.

Use value (UV)

Use value is calculated to assess all probable usage of plant species. UV of plants gives a quantitative analysis for plant citation. UV tells the relative importance of plant flora recognized locally. UV was analysed according to [40].

$UV = u/N$

Where u is the total participants stating various uses of a plant and N is whole number of participants. UV is usually (1) if the number of usages is greater, and (0) if the usage report for plants species is less. UV not deliver data on multiple or single usage of plant flora is considerably low. UV does not deliver any data on the single or multiple uses of plant species.

Frequency of citation (FC) and relative frequency of citation (RFC)

FC is used for evaluating the most preferred plants or more used plant species. RFC was analysed to intricate the knowledge of traditional flora about usage of therapeutic flora in the study site.

$RFC = FC/N \ (0 < RFC < 1)$

Where RFC is denoted by relative frequency citation, FC (Frequency of Citation) is the number of participants who stated the plant flora and N is whole number of informants [39].

Fidelity level (FL)

To analyse most preferred plant usage for the cure of a specific disease, we used (FL) index adopted by [31]. FFL indicates the importance of one species over other, to cure specific infections. Fidelity level shows the percentage of participants who reported the use of specific plant species for a particular infections (Animals respiratory Infections).

FL (%)= NP/N x 100

Where, Np is the number of participants that declare the usage of species for definite infections, and N is total participants that use plants as a medicines for the treatment of any given infections [41] .

Jaccard index (JI)

Jaccard index (JI) is evaluated by comparison of formerly published studies from local, regional and global level by analysing the percentage of cited plant species and medicinal usage, by using the following formula:

JI = c multiply 100/a + b−c where "a" is the number of species of area A, "b" is number of species of area B, and "c" is number of species common in A and B [42].

Informant consensus factor (ICF)

The Informant Consensus Factor (ICF) value was calculated using the formula: ICF=(Nur-Nt)/(Nur-1), where Nur is the number of use report of informants for each respiratory infection (SI), and Nt is the number of taxa used for a specific respiratory infection (RI) [43] .

Chi-square test

The knowledge of medicinal species distributed between male and female participants between three age categories (69–79, 80-90 and 90-100 years of age) was comparatively analyzed by using Chi-square.

III. Results

Socio-demographic characteristics of participants

Communally 35 participants were selected from several villages of Sekhukhune district, Limpopo, South Africa. The majority of traditional healers were males (71%). Based on age, the participants were divided into seven groups, 36–46 (8%), 47–57 (17%), 58–68 (20%), 69–79 (32%), 80-90 (17%), 90-100 (6%). Participants constitute, 30 herbalists, 4 retirees and 1 housewives. Regarding education, 29% of the participants were uneducated, 37% of the had attended primary school, 20% secondary education level, 6% tertiary education and only 8% of participants had attended universities. The majority of traditional healers (44%) in the study area were married, followed by single (37%), widowed (17%) and 2% divorced. Most of the participants were living in rural areas (91%) and only 9% living in urban areas, the plant flora was herbs 51%, followed by shrubs (23%)followed by trees (18%) and lastly climber (8%). The 28 medicinal plants belonged to 17 families, with Fabaceae (5 species), Asteraceae (4 species) represent the most dominant family in this survey site followed by Rutaceae, Anacardiaceae with 2 species each and the rest with one (table 3).

Informants' knowledge

Our investigations recorded four respiratory illness. The most important of them affect mainly the respiratory system. Seven of these diseases (pneumonia, TB, fever, cough, influenza) were identified as the most frequent respiratory ailments in the bapedi community with covid-19 pandemics worsening matters of health in humans. Local people used 28 different medicinal plant species belonging to 17 families to treat these six respiratory. About 20 % of the 28 species are known by at least ten informants (*Artemisia afra*, Terminalia sericea, Sclerocarya *birrea, Lippia javanica , Sutherlandia frutescens*, Pterocarpus angolensis, *Citrus limon* , Senna italica , Tarchonanthus camphoratus , Aloe marlothi , *Peltophorum africanum* , Kigelia Africana*).* All 28 species were used to treat more than one ailment. Most of the species were used to treat coughing and influenza. Only one medicinal plants were used for Asthma treatment. People often consulted a doctor for these two serious ailments. Table 1 gives the informants' knowledge according to demographic variables. Men cited more plant species as used than women. This might be a residual effect of the higher number of male informants interviewed and high number of female not traceable during interview times. However, it should be noted that the one widowed informant had an important knowledge by citing nine species, nearly two species for each of the four ailments she cited. When comparing traditional healers and simple informants' knowledge on plant species used to treat the most frequent respiratory diseases on animals were the same. This means that both informant groups cite almost the same amount of plants used to treat each respiratory disease. Therefore, difference was only found among the gender setting. No difference was found between traditional healers and simple informants' knowledge, which means that the more these diseases are frequent, the more people get to know plant species

used to treat them. As such, the local population did often not consult traditional healers or the local veterinary surgeon for treating animals.

Informant consensus

Informant consensus values give good indication about particular species that serve for particular livestock respiratory diseases symptoms and about specific medicinal plants used for several health problems. Such information underlines the pharmacological significance of the medicinal plants in the Sekhukhune area. Medicinal plants with higher informant consensus need to be seriously considered for further ethno pharmacological studies, since they are species widely applied by many people and they have been utilized for a long time. Some of the plants that were reported by the informants in the study area are also used for similar health problems in some parts of the country and elsewhere. The fact that some of the reported plants are having similar uses elsewhere can be taken as indication of their pharmacological effectiveness having been tested in different areas by different cultures.

Respiratory infections treated and their vernacular names

Bapedi traditional health practitioners (THPs) reported treating six respiratory infections. These included Fever, influenza, coughing, Asthma ,Pneumonia ,TB,. Bapedi THPs called Fever is Mokomane in sepedi language, the influenza was known as mpshikela, coughing as a Mokgohlwane, Asthma as a Go thibega Mafahla, Pneumonia sehuba ,TB sehuba se se golo.. All was a seasonal-bound disease except TB which occur in immunocompromised people or animal especially calf/children and HIV/Aids people.

Used categories in respiratory infections

In this survey, the respiratory infections were assembled into six groups. The category includes (Figure 3). In this study, the maximum figure of plant was used in handling for Influenza (14 species) followed by Coughing (13 species) and Fever (10 species) and TB(9 species). Other important respiratory ailments treated by plant flora in the area were Colds(6 species) asthma(4 species).,pneumonia(2 species) and Anthrax (2 species) followed by Bronchitis(1 species).

Plant parts used in herbal medicines

Among the different parts of medicinal plants used by traditional healers, the underground parts (root, rhizome, tuber, corn, leaves) were most frequently used to make the prescriptions for healing treatments, while the whole plant and leaves were second and third respectively. The most sustainable use of the plants to ensure viability is to use leaves to avoid the threat of extinction of most of the medicinal plants. Tabuti mentioned that the uses of root and tuber parts can threaten medicinal plant populations or species viability. The interview result on different plant parts utilized revealed that leaves (60,7%) were reported to be the most frequently used plant part to prepare herbal medicine either by singly or mixes by other plant parts. Leaves were followed by roots (14,28%),whole (10,71%) followed by bark and seed with (7,14%) contributed (Fig.5).

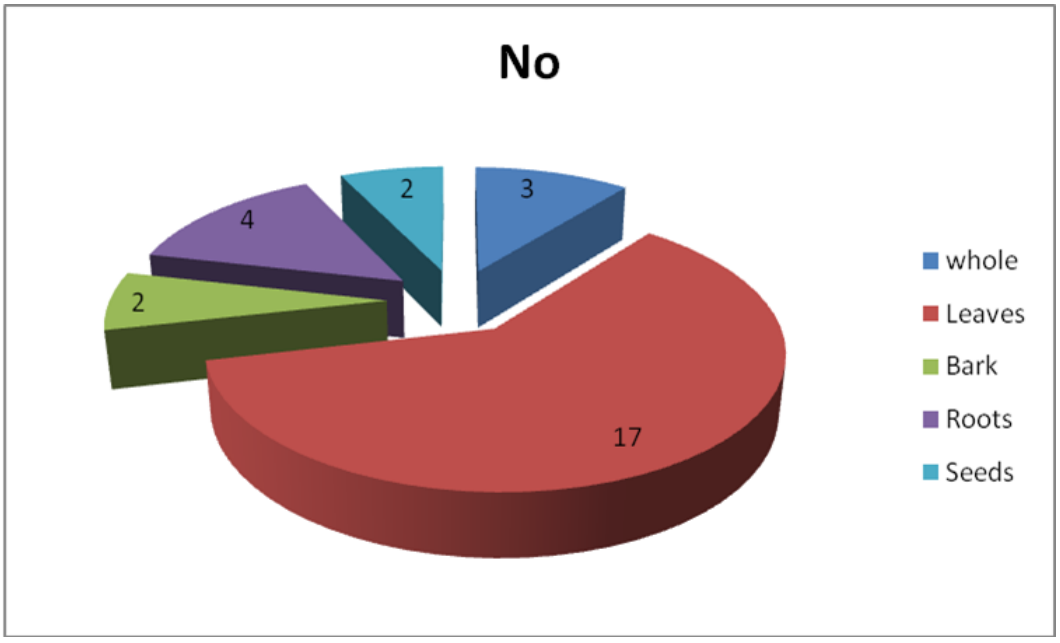

Figure 4 Parts used

Collection sites

Plants were mostly harvested from roadsides (41%), followed by Abandoned land(23%), disturbed habitats(15%),home gardens (10%),mountain 8% and Rivers 3% as sources of medicinal plants (Fig. 6).

Collection sites of plant in Sekhukhune District

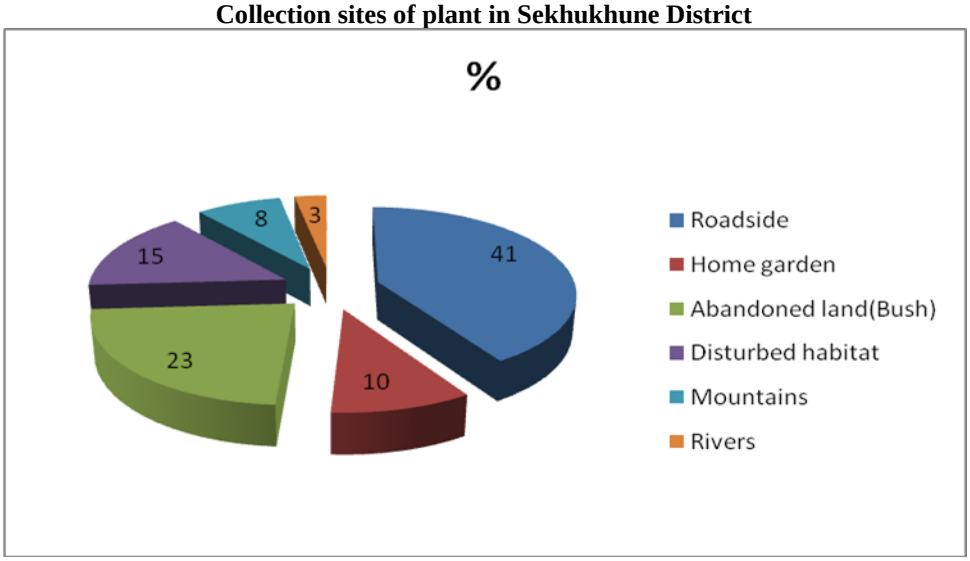

Figure 5 Collection site

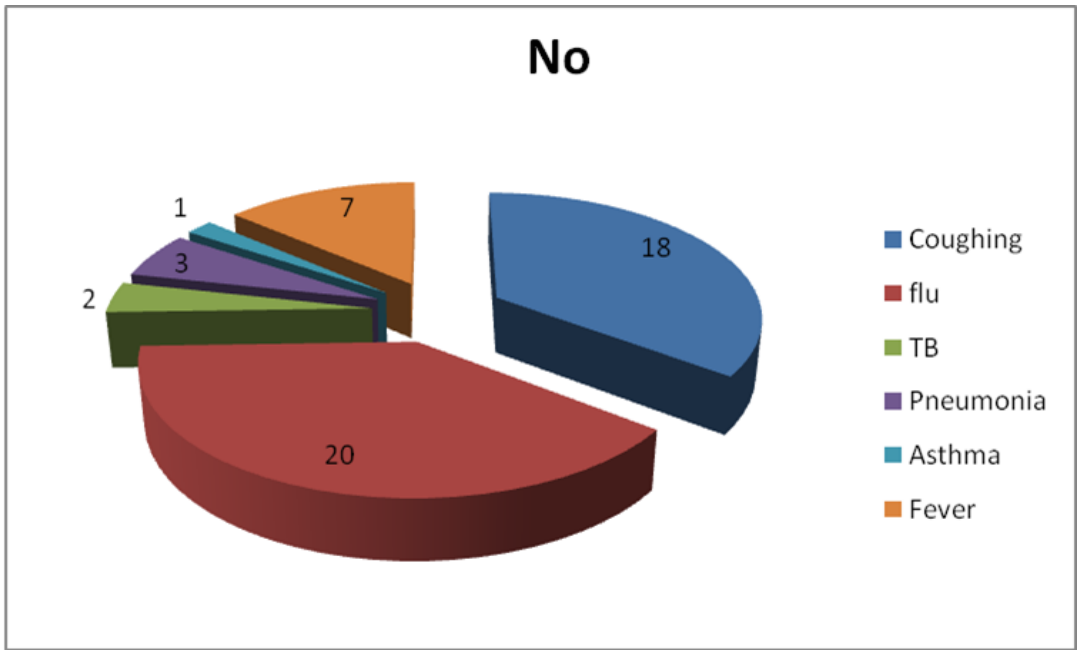

Figure 6 Symptoms of Respiratory infections

Toxicity of plants

Preliminary in vitro screening of some of the few mentioned medicinal plants have been mentioned to validate the common use, findings of the present study. In spite of the wide application of active metabolic compounds for humans and animals they also have a physical condition harmful effect because of much toxins. These substances not only hinder with the growth of parasite also have deadly effects on mammalian cells. It is, therefore, important to validate the toxic effects of medicinal plant products in relation to their side effects .It was noted that 75% of traditional health practitioners reported that medicinal plant remedies were not toxic for mammals. However, 25% reported that some of the plant remedies could induce death, dizziness, diarrhoea, skin irritations and vomiting when overdosed. Aloe marlothi was reported to induce diarrhoea. [15] Skin contact with milky latex from Drimia elata was reported by traditional health practitioners to induce skin irritations and itching. Although the administration in the later was oral compare to the current which is topical the toxicity should be noted when using many plants.

Quantitative ethno veterinary analysis

Fidelity level

High FL was observed for treatment of coughing and flu. The plant used *Artemisia afra* (0.98), Aloe marlothii (0.98), *Citrus limon* (0.96), *Aloe aborescens* (0.95) Terminalia sericea (0.94), *Elephantorrhiza Elephantina*(0.91), *Lippia javanica* (0.89) , Tarchonanthus camphoratus (0.87), Senna italica (0.86),Senna italica (0.86),Pterocarpus angolensis (0.79) (Table 2).

Use value

Plants with the highest UV values were Aloe marlothi (0.98*) ,Artemisia afra* (0.98*), Citrus limon* (0.96*)*.The lowest UV was on Alepidea amatymbica (0.21*) Zanthoxylum capense* (0.22*)* each with a UV value of 0,28 and 0.4 (Table 2). Use value calculation of Syzygium cordatum (0.14*)* was not considered because of less than ten use-report.

Informant consensus factors

The number of use-report revealed that Coughing (0,9) and flu(1) was the most treated, followed by fever(0,3) and Asthma (0,05). The highest ICF values were cited for Coughing (0,9) and flu(1) with *Artemisia afra(1)*Aloe marlothi(98) *Citrus limon*(0,96) , *Aloe aborescens* (0,95), and *Elephantorrhiza Elephantina* (0,91) being the most frequently used species. The category of plants used for the treatment of Asthma showed the lowest ICF value of zero (Table 2).

Relative frequency of citation (RFC %)

The RFC represented the prominent species used for respiratory related infections based on the ratio between the number of participants (FC) for a plants and the overall number of participants in the research survey.RFC ranged from 0 to 0.95 and we classified all species into 3 groups: RFC 0. to 0.35(0-49) (8 species); RFC, 0.357 to 0.707(50-99) (9 species); RFC 0.714 to 0.957(100-140) (11 species) (Table 2). According to this ethnoveterinary records, the majority of plants in the third group were reported with high medicinal potential. The highest values were recorded for *Artemisia afra,* Aloe marlothii (0.98) used in the form for Coughing, influenza, Fever and TB. Other high RFC species were *Aloe aborescens, Citrus limon,* Terminalia sericea *Lippia javanica*, Pterocarpus angolensis, Tarchonanthus camphoratus, Senna italica.

Family importance value (FIV)

The analysis of family importance value reported to Fabaceae has the maximum FIV (29%), followed by Asteraceae (23%), Anacardiaceae (12%). Rutaceae (12%).Lowest values of (5,9) were observed for Combretaceae, Verbenaceae, Capparaceae, Hyacinthaceae , Scarabaeidae,Legumes, Apiaceae, Bignoniaceae, Myrtaceae, Pittosporanceae Rhamnaceae, Malvaceae, (Table 3).These medicinal plants are not exploited equally by all the communities on a normal basis and the folk information is consistent as some are use for many other conditions in both human and animals. The review of the literature showed that medicinal plant species share uses fluctuated from different area to area .The lowest degree of similarity was found in the studies reported Vhembe, Waterberg, Eastern Cape on types infections by [5,11–15,18,20].The comparison was based on use of medicinal plants reports in several survey, presenting the usage of therapeutic plants for the cure of different infections in local communities.

Jaccard index (JI)

A comparison of medicinal uses of plants was made by analyzing 30 research papers from aligned countries only looking at species use for medicinal in respiratory infections in 25 and other use as it is impossible to find only use in one research paper. The review of the literature showed that 20 reported medicinal plant species share similar uses fluctuated from 0% [39] to 12.2% while few similar usage from 3.7 [64] to 0% [70] in human only ,as animals use of this plants were never exploited. The lowest degree of similarity was found in the studies reported in Kwazulu natal, Eastern Cape, Free state, Venda, Capricon, Waterberg, Lesotho and Botswana on respiratory infections of us use in ethnoveterinary [5,11, 13,15]. The comparison was based on medicinal plants reports in several study, but in this survey presenting the usage of curative of medicinal plants for the cure of respiratory infections in animals and human by local communities.

Chi-square test

The male participants reported more medicinal plants than women, and it could be stated that males possess more knowledge about the use of medicinal plants than women ,also the respond turn up of male was high than female showing confidence in terms of their medicinal knowledge. The chi-square on the number of species of plants reported by the three age categories showed important differences. Table 2 represents the median for a number of medicinal species reported by the participants 69–79, 80-90 and 90-100 years of age. Scattering

of knowledge was observed in different age groups with the older showing more knowledge and are often reference by other groups that was the reasons to add them to replace some of participants who could not turn up for interview. The significantly higher average number of medicinal plants ($p < 0.05$) were mentioned by participants of 69 to 79 years (37.88) for men and (24.1) for women, respectively. There were no significant variations ($\chi 2 = 13.45$; $P > 0.05$) in the < 36 year age group. Analysis of variance ($p = 0.05$) was used to elucidate the effect of gender, age, and gender to gender interaction on the traditional knowledge of plants in society.

Individual versus combination use

Table 4 most common combinations

Infections	Elias Motswaledi	Ephraim Mogale	Tubatse	Fetakgomo	Makhuduthamaga
TB	Aloe Marlothi+19	Aloe Marlothi+12	Aloe Marlothi+19	Aloe Marlothi+19	Aloe Marlothi+19
Fever	1+5	2+5	6+4	3+1	12+1/11
Pneumonia	19+17	17+12	17+19	17+19	19+17
flu	9+13	9+14	9+15	9+10	9+ Aloe Marlothi
Coughing	19/12+1	19/12+2	19/12+17	19/12+2	19/12+1

Preparations of the remedies constituted 8 individual extracts from 8 species depending on the infection and 27 combinations with 12 species were recorded 5 species with one indigenous species across different municipalities (Table 4).

Species that were used individually include *Artemisia afra***,** Terminalia sericea**,** Ozoroa Sphaerocarpa**,** *Schotiabrachy petala***,** *Geigeria aspera* **,** *Maerua angolensis* **,** *Lippia javanica* **,** Pterocarpus angolensis, *Sutherlandia frutescens***,** *Aloe aborescens***,** *Drimia elata* **,** *Zanthoxylum capense* **,** *Elephantorrhiza Elephantina* **,** *Citrus limon* **,** *Dicoma anomala* were used individually and in combinations. Only prominent combination and common or well known combination were recorded. Traditional health practitioners prefer combinations generally as they say it prevent feather infection and reduced toxicity in those plant that have toxicity.

Mode of preparation Administration and dosage

In traditional herbal medicine systems, herbal remedies are prepared in several rather standardized ways which usually vary based upon the plant utilized, and sometimes, what condition is being treated. Some of these methods include: infusions (hot teas), decoctions (boiled teas), tinctures (alcohol and water extracts), and macerations (cold-soaking). Others include preparing plants in hot baths (in which the patient is soaked in it or bathed with it), inhalation of powdered plants (like snuff), steam inhalation of various aromatic plants boiled in hot water, and even aromatherapy. All preparations were prescribed orally with a tin cup (300 ml) goats/sheep and two litre for large animals like cows or donkey (Table 2). The preferred vehicle for administration of pounded/powdered oral medicine was either warm water or cooked and allowed to cold down and other mixed with food or administered as feed. Same medicinal remedies were taken until a animals health show a positive signs. The improvement of symptoms was perceived as independent indicators of a successful treatment of respiratory. The traditional health practitioners reported powder and juice administered orally as a method of choice that will not destroy active compounds, ultimately resulting in high efficacy. Explanations such as speeding-up the extraction process, extracting active compounds and cytotoxic evaluation of compounds are central goals in phytomedicine studies [74]. The preparation methods depended on types of infections symptoms such as Coughing, flu and fever.Medicinal plants are subjects to phytochemical screening worldwide. All traditional health practitioners used water, which is limited to extract non-polar and intermediate polar compounds. The aqueous extracts may result with limited biological activities. Nevertheless, the nontoxic solvent such as acetone was excellent in extracting a wide range of compounds [91] .The dosage administered was consistent with previous studies of human and but the application only twice time as animals in rural move to the bush early and return late. This suggests that traditional health practitioners have some model dosage measurement of remedies being administered for a particular set of infections on different types of animals.

Comparison with other studies in neighbouring regions

In the present survey, some plants were used alone to treat the particular infection, while in some cases plant parts were mixed to treat diseases. This present study reported 28 plants from 14 families for respiratory infections on animals from Sekhukhune, Limpopo South Africa.

IV. Results And Discussion

Qualitative ethno veterinary analysis

Fidelity level

Plant species such as *Zanthoxylum capense* and Alepidea amatymbica were not necessarily important in management of respiratory infections due to a low number of use reports [38].Plants with one use report such as Syzygium cordatum were not computed for Fidelity Level (FL) due to very few use-report in respiratory. Important plant species with high FL values and with a considerable number of use-report were *Artemisia afra*(1), Aloe marlothii (0,98) , *Citrus limon* (0,96) *Aloe aborescens* (0,95) and Terminalia sericea (0,94).These plants need further antimicrobial studies against pathogens of respiratory infections.

Use value

The plants with the highest Use Value (UV) were considered important due to high use-reports. Despite being considered important, [38] noted that the UV cannot distinguish if the plant is used for single or multiple purposes. Despite that, the FL values indicated the importance of plant species to various respiratory infections.

Informant consensus factor

Artemisia afra, Aloe marlothii , *Citrus limon* , *Aloe aborescens* and Terminalia sericea showed the highest Informant Consensus Factor (ICF) (1) due to common observation of traditional health practitioners. This implies that there was a 100% degree of agreement that species above was used to treat common cold, to acute infections such as bacterial pneumonia, bronchitis and chronic conditions like asthma or chronic obstructive pulmonary disease. *Artemisia afra* was the most preferred species to for respiratory infections was use with due to the highest number of use-report Aloe marlothii , *Citrus limon* , *Aloe aborescens* and Terminalia sericea was the most preferred and most available species to for respiratory infections where forced feeding of leaves was administered to animals .Plant species with high ICF value indicate further pharmacological investigations [38].This could lead to promising bioactive compounds that may serve as alternative antibiotics that counter resistance.

Limitations of the study

The limitation of this study was the low level of literacy to complete the questioned by traditional healers and due to financial resources. It is worth mentioning that after an exhaustive literature search, as well as consultations with the relevant local government officials, we learned that currently there is no official documentation that indicates the total number of healers in either the studied municipalities or districts. It was certainly fortunate for this study that a little of literature already existed on ethnobotanical knowledge in the Sekhukhune area, since this facilitated an analysis of the spatial distribution of knowledge. However, some features of the data obtained from these studies make them less than optimal for inclusion into the analysis. Common problems were a low number of informants, a clearly non-exhaustive sampling of plants, and results that were skewed toward one use type. The covid 19 also had an impact on the study as limited informant were included.

V. Conclusion

The ethnoveternary medicinal plants were mainly collected from the wild stands for their stands for their leaves, the healers in consultation with government officials should take care not to eradicate the medicinal plant species altogether. Awareness creation among the traditional healers and community at large is important in order to preserve the indigenous medicinal plant species [4-5].The difficulties of living conditions, poverty, geographic isolation and the lack of medical services in rural mountainous areas are some factors that encourage the use of traditional medicine by the population of Sekhukhune district to treat their respiratory ailments. This was confirmed by the results of our field survey, which shows that the use of traditional medicine in this region depends on professional status of the population and the remoteness from health care and animals health care facilities.The study suggests that there is a vast amount of indigenous knowledge on ethnoveterinary medicinal plant and this knowledge plays an important role for the treatment of different animal ailments in the study districts. The healers have a very high intention to keep their traditional knowledge secrete and none of them was ready to transfer their knowledge either freely or on incentive bases to other people; they need to convey their knowledge only to their selected scions after getting very old. The knowledge is passed from generation to generation in an oral manner. Without being properly documented this information it could easily be lost or distorted. Commonly reported plant species need to be tested for their antimicrobial activities *in vitro* and validated their active ingredients in order to recommend effective preparations and treatments to this community.

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Authors' contributions

All authors read the final manuscript and agreed to its submission.

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Availability of data and materials

Not Applicable.

Ethics approval and consent to participate

Verbal consent was taken from participants before carrying out the study as most if the participants were illiterate. Present study was carefully designed with strict compliance of bio-ethics and approved by the University of Pretoria ethics committee.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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