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Medicinal plants used by traditional health practitioners for paediatric ailments in Thaba 'Nchu, Free State, South Africa

Shudufhadzwani Ndou[a], Brian Ngobeni[b,c] & Idah T Manduna[c,*]

[a]Department of Health Sciences, [b]Department of Clinical Sciences, [c]Centre for Applied Food Sustainability and Biotechnology, Central University of Technology, Free State, Private Bag X20539, Bloemfontein, 9300, South Africa

[*]E-mail: imanduna@cut.ac.za

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Many studies have documented medicinal plants used for various ailments in South Africa; however, few focus on paediatric health. This study documented plants used to treat paediatric ailments in Thaba 'Nchu, Free State Province, South Africa through interviews with 30 traditional health practitioners. A total of 60 plant species were reported, representing 57 genera and 33 families. Fidelity Level (FL) values ranged from 20% to 76.67%, with the highest FL recorded for *B. montana* (76.67%). Informant consensus was highest for bronchitis (ICF = 1.00), with moderate agreement for vomiting, weakness, chest pain, diarrhoea and ear infections. Key plants identified include *P. hottentotta* for bronchitis, *P. reniforme* for vomiting, and several species such as *A. sativum*, *A. afra*, *X. undulatum*, *B. montana* and *H. depressa* for chest pain. These plants are recommended for further pharmacological evaluation.

Keywords: Medicinal plant species, Paediatric ailments, South Africa, Thaba 'Nchu, Traditional health practitioners

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In the Southern African region, the use of plant species for various medicinal purposes has existed since time immemorial[1]. Evidence suggests that the wealth of traditional medicinal knowledge remains prevalent to date and is more deeply rooted in villages among older people[2]. However, literature evidence emphasizes the importance of preserving traditional medicinal wisdom[3], not only to avoid its loss, but also to enhance economic growth through new drug development and benefit sharing with local communities[4]. Aber[5] estimated that 85% of the global population still relies on traditional herbal medicines for vaccination and treatment. The scientific literature further indicates that approximately 25% of all existing drugs to date are derived from medicinal plants[6,7]. South Africa, one of the world's most plant-mega diverse countries with over 20,000 species (about 10% of global flora), still holds much indigenous medicinal plant knowledge in tacit form, including in Thaba 'Nchu (Free State), placing it at risk of being lost[8,9]. Mofokeng *et al.*[10] stated that approximately 10% of the plants found in South Africa are utilized for medicinal purposes, prescribed by traditional health practitioners. Despite the prevalence and the flourishing of conventional medicine in South Africa and neighbouring countries[11], local people remain committed to indigenous herbal healthcare[12], despite the associated religious stigma[13]. Mander *et al.*[14] estimated that the medicinal plants market share in South Africa exceeded R2.9 billion ZAR, equivalent to $168,046,880 USD. From these insights, it is clear that medicinal plants substantially contribute to South Africa's sustainable economic growth and development[10,15,16].Mosito and Masheka[17], noted an old African proverb which states that, "When an elderly person dies in Africa, the entire library also dies", while Dlamini and Ocholla[18], and Khanyile *et al.*[19] concurred that when traditional medicinal knowledge holders pass away, their knowledge vanishes, and therefore, communities that depend upon such knowledge suffer.

The latter demonstrates the great value of medicinal plant knowledge that could be lost if no commitment to record and validate is taken seriously. This highlights the importance of documenting indigenous knowledge associated with medicinal plants in Thaba 'Nchu, Free State Province, South Africa, before it is lost. The World Health Organization (WHO) suggests that approximately 4 billion people worldwide still believe

[*]Corresponding author

in the effectiveness of herbal medicines in treating various forms of ailments including those used to treat childhood diseases[20]. Inadequate healthcare services are considered the main contributing factors to the increased infant mortality[21].Traditional medicine is herein defined as an approach, knowledge, and belief system based on the use of plant species to treat, diagnose, and prevent illnesses, or to maintain wellbeing[22]. Many studies have reported on the use of medicinal plant species in treating various ailments in South Africa[23-25], however, few of these studies focused on childhoodailments[13]. Local people in Thaba 'Nchu, consider the use of medicinal plants for treating distinct ailments in children, as an integral part of their biocultural heritage. Therefore, it is within this context that the current study is aimed at documenting medicinal plant species used in the treatment of paediatric ailments, in Thaba 'Nchu. Furthermore, the current study promotes good health and well-being in Thaba 'Nchu. Even though this study was conducted in Thaba 'Nchu, Free State Province, South Africa, Francis *et al.*[26] emphasize that issues about human health are of global importance, implying the significance of our study on paediatric health.

Materials and Methods

Description of the study area

The current study was conducted in Thaba 'Nchu located east of Bloemfontein, in the Free State province of South Africa, between –29.141339 to –29.238196 South and 26.819016 to 26.830511 East (Fig. 1). The study area encompasses approximately 36.39 km² and a population of around 38,616 people, predominantly Basotho and Batswana. It is located within the grassland biome. Economically, people in this township rely on food production, clothing production, and other small businesses and the area has a high poverty rate. Although the area has conventional healthcare facilities, many rural inhabitants still rely on natural resources, particularly medicinal plants.

Data collection (survey)

The current study was endorsed and approved by the Central University of Technology, Free State's Directorate of Research and Innovation Committee. All departmental and faculty codes of ethics were taken into consideration when conducting face-to-face interviews with all participants. The aim and

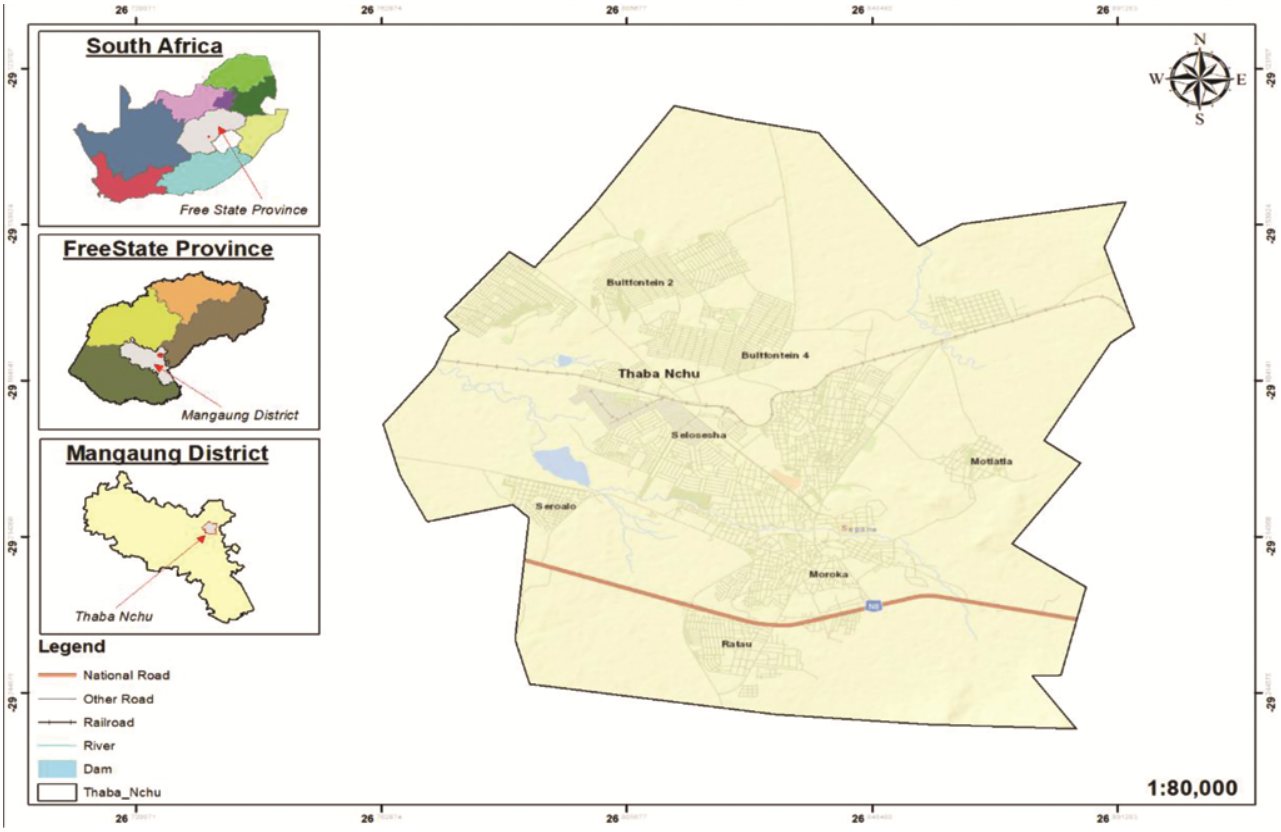

Fig. 1 — Location of the study area (Source: Author)

objectives of the study were explained to all participants using their native Sesotho language. The participating traditional health practitioners were informed of their autonomous rights, including the right to withdraw from participation at any time. It is worth emphasizing that a pilot survey was conducted prior to the commencement of data collection to obtain permission from the local gatekeepers and also to test the reliability of the study questionnaires. After receiving authorization to commence data collection, our two local friends introduced the research team to a well-known traditional health practitioner in the area. A total of 30 traditional health practitioners were selected through the snowball research technique. The selected traditional health practitioners were familiarized with the aim of this study and therefore all consented to participate. To validate their shared information, all participants were asked to answer similar questions during the interview sessions, using semi-structured questionnaires. To enhance the flow of information during the interviews, traditional health practitioners were visited in their homesteads and interviewed individually.

Voucher specimen collection

After the interview, participants were asked to participate in a field-walk survey to identify plant species and collect voucher specimens. Initially, plant species used to treat childhood disorders were identified by their Sesotho or Setswana vernacular names, and subsequently by their botanical names. The plant species of interest were validated using the International Plant Names Index (IPNI) and Plants of the World Online (POWO) databases and authenticated by a trained taxonomist. The collected specimens were prepared and deposited in the herbarium at the Central University of Technology.

Data analysis

The ethnobotanical data were recorded in Microsoft Office Excel, coded, and then analysed statistically using ethnobotanical indices, including Fidelity Level Percentage (FL%), and Informant Consensus Factor (ICF). The above-mentioned ethnobotanical indices are denoted using the following formulas:

Fidelity level

Fidelity level (FL) refers to the percentage of participants who mentioned the use of a certain taxon within the study area, and it is determined using the formula adopted from the study done by Ralte *et al*.[27]

$$FL(\%) = \frac{N_P}{N} \times 100,$$

Wherein FL (%) denotes the fidelity level percentage, NP presents the number of participants who cited a particular taxon for particular uses, and N presents the total number of participants who mentioned all the plants' uses. A high FL value (close to 100%) indicates that a large proportion of participants agree on the use of a particular plant species for the same ailment, suggesting a high level of cultural consensus and potential therapeutic reliability.

Informant consensus factor (*ICF*)

The informant consensus factor (ICF) is calculated using the following formula:

$$ICF = \frac{N_{ur} - N_t}{N_{ur} - 1}$$

Where N_{ur} presents the total number of use reports from all informants for a given category of ailment, and N_t denotes the number of different plant species used to treat that ailment. A high ICF value (close to 1) indicates a strong consensus among informants, implying that relatively few plant species are widely recognized as effective for treating a specific ailment category[27].

Results and Discussion

Demographic characteristics of the participants

Figure 2 represents the demographic information of the participating traditional health practitioners (THP). A total of 30 THP participants took part in this study, with female recruits comprising 76.6% and male counterparts made up 23.3%. Therefore, these findings do not accurately reflect the gender status of the Thaba' Nchu population, but it provides a reflection of the traditional health practitioners who agreed to take part in this study. Similar ethnomedicinal studies[3], conducted in other regions, particularly in South Africa, also concurred with our findings that more women practice herbal medicine than men. The dominant age groups recruited were those aged >49<59 years (33.3%), followed by those aged >39<49 years, while the least were the elderly aged >69<89 years, with a combined score of 6.6%. Mortality rates influenced the percentage of elderly participation scores. This was supported by Manyaga *et al*.[28], who reported that the number of older people is gradually decreasing due to increased mortality associated with

population aging. The THP's experiences in herbal healing ranged from 2 to greater than 10 years of medicinal healing experience. However, the majority (30%) of THP have an experience> 8 < 10 years, demonstrating their wealth of traditional medicinal knowledge[29]. Almost all the THP claimed to have received formal education, with those who studied until secondary education constituting 43.3%, followed by primary education (30%), Tertiary Education (10%), with those who had no formal education, constituting 16.7%. Therefore, it is arguable that the relatively high percentage of formally educated THP may reflect the ongoing dynamic transformation of traditional medicinal practices in Thaba 'Nchu. Cornelius and Van Wyk.[30] also asserts that African indigenous culture is not static, but vibrant and dynamic, meaning that African medicinal healing practices evolve and are transmissive.

The inventory of medicinal plants used by the traditional health practitioners in Thaba 'Nchu'

A total of 60 medicinal plant species belonging to 57 genera and 33 families were documented (Table 1). The most represented families were Astaraceae (n=15 species), Amaryllidaceae (n=3 species), Rubiaceae (n=3 species), Apiaceae (n=2 species), Apocynaceae (n=2 species), Asphodelaceae (n=2 species), Geraniaceae (n=2 species), Hyacinthaceae (n=2 species), Malvaceae (n=2 species), Poaceae (n=2 species), Polygonaceae (n=2 species), and Solanaceae (n=2 species).According to Xu and Chang[31], the Astaraceae family is considered one of the most prominent medicinal families, and Michel *et al*.[32] and Garcia-Oliveira *et al*.[33] reported that many species within this family possess therapeutic and pharmacological properties. It is therefore not surprising that traditional health practitioners in Thaba 'Nchu' were using 15 species from this family to treat various childhood diseases, since scientific evidence indicates that over 300 species of the Astaraceae family are of medicinal importance in the Southern African Region[25,33,34].

The frequently used plant species, according to participants' citations, had FL (%) values ranging from 20% to 76.67%. with *B. montana* (76.67%) and *X. undulatum* (66.67%) showing the highest citation frequencies, suggesting strong cultural importance and perceived efficacy (Table 1). Among the reported plants, 25 species were reported to be used in combination with other plants. Although combination therapy is commonly practiced to enhance therapeutic efficacy, the specific pairing patterns observed in the current study were not consistently distributed. This variation was expected as Xaba[35] highlighted that combining medicinal plants augments pharmacological activities and therapeutic potential. Certain plants, particularly *Xysmalobium undulatum*,

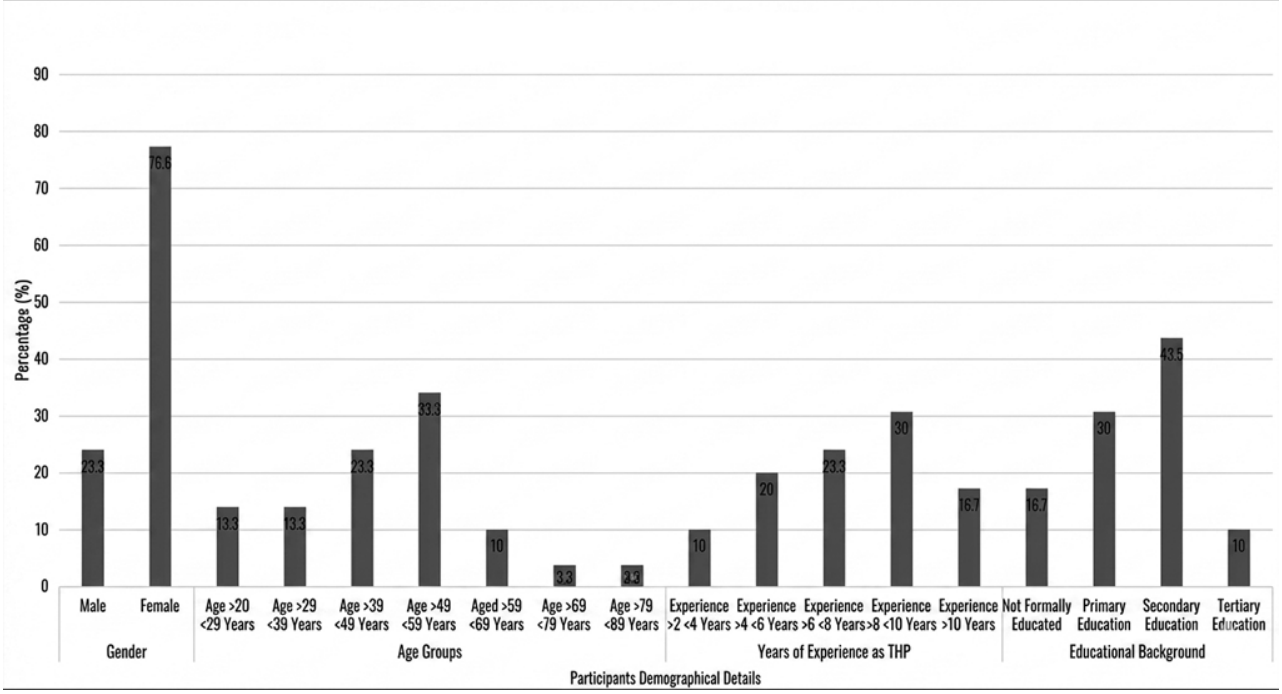

Fig. 2 — Demographic information of the traditional health practitioners

Polygala hottentotta, *Berkheya montana*, and *Hermannia depressa*, were repeatedly cited in combination with multiple species across different ailments, suggesting their role as key or foundational components in multi-plant therapies. For example, *Xysmalobium undulatum* frequently co-occurred with species such as *Commelina africana* and *Dicoma anomala* in treatments for diarrhoea, chest pain, and fontanelles while *Polygala hottentotta* was commonly combined with *Gazania linearis*, *Kedrostis capensis*, and *Solanum aculeatissimum* for ailments including sharp pain, diarrhoea, and bronchitis. Ailment-specific trends were also evident, with diarrhoea treatments often involving combinations of *Xysmalobium undulatum*, *Pelargonium reniforme*, and *Schkuhria pinnata*, and chest pain remedies frequently incorporating *Allium sativum*, *Artemisia afra*, *Berkheya montana*, and *Hermannia depressa*. Previous studies have reported that *X. undulatum* extracts are effective against *Escherichia coli* infection, which may explain why traditional health practitioners use the plant to treat diarrhoea[35]. Similarly, plants belonging to the Polygala genus have been documented for anti-inflammatory properties, thereby supporting their traditional use for the management of chest pains in the study area[36]. These recurring co-occurrence patterns suggest that traditional health practitioners employ deliberate plant combinations to enhance therapeutic efficacy, highlighting potential synergistic interactions among plant species, a practice widely reported in ethnobotanical and pharmacological studies[37].

Table 1 — Inventory of medicinal plants used by traditional health practitioners for paediatric ailments in Thaba 'Nchu, Free State, South Africa

Family Name	Scientific name(s)	Vernacular Sotho Name	Voucher Number	Specific use	Plant part used	Mode of preparation (Route used for administration)	Accompanying plant	FL (%)
Acanthaceae	*Crabbea hirsute* Harv.	Lephakhama	TN[2] SMP13	Fontanelles	Whole plant	Decoction (Oral)	–	3,33
Amaranthaceae	*Achyranthes aspera* L.	Lemanamana	TN[2] SMP1	Fontanelles	Roots	Decoction (Oral)	*Solanum aculeatissiumum*	3,33
Amaryllidaceae	*Allium sativum* L.	Konofolo	TN[2] SMP3	Fontanelles, Sores in the mouth, Ear Infection, Sharp pain, Chest pain	Tuber Leaves	Decoction (Oral)	*Berkheya multijuga Hirpicium armerioides Allium sativum*	23,33
Amaryllidaceae	*Tulbaghia acutiloba* Harv.	Moelela	TN[2] SMP52	Rush	Roots	Decoction Nasal and Rectal	–	3,33
Amaryllidaceae	*Tulbaghia alliacea* L.f.	Sefothafutha	TN[2] SMP51	Fontanelles	Roots	Decoction (Oral)	–	6,67
Anacardiaceae	*Searsia erosa* (Thunb.) Moffett	Tsilabelo	TN[2] SMP47	Diarrhoea	Roots	Decoction (Oral)	–	3,33
Apiaceae	*Alepidea amatymbica* Eckl. & Zeyh.	Lesoko	TN[2] SMP2	Sharp pain, Chest sores, Chest pain, Diarrhoea	Roots	Decoction (Oral)	–	20,00
Apiaceae	*Ipomea crassipes* Hook. var. *crassipes*	Maime	TN[2] SMP31	Fontanelles	Roots	Decoction (Oral)	–	3,33
Apocynaceae	*Gomphocarpus fruticosus* (L.) Aiton f.	Moethimolo	TN[2] SMP26	Weakness/ Tiredness	Roots	Inhalant (Nasal)	–	3,33
Apocynaceae	*Xysmalobium undullatum* (L.) Aiton f. var. *undulatum*	Pohotshehla	TN[2] SMP55	Sharp pain, Ear infection, Fontanelles, Chest pain, Diarrhoea	Roots, Whole plant	Decoction (Oral), Infusion (topical), Infusion (Rectal), Infusion Orally	*Xysmalobium undullatum* and *Commelina africana*, *Xysmalobium undullatum*, *Dicoma anomala Hermannia depressa*	66,67
Araceae	*Zantedeschia aethiopica* (L) Spreng	Mothebe	TN[2] SMP59	Eye infection	Whole plant	Decoction, (Eye Drops/ Local therapy/Topical)	–	3,33
Asphodelaceae	*Aloe grandidentata* Salm. Dyck	Lekgala	TN[2] SMP4	Fontanelles, Kwashiorkor, Sores	Leaves	Decoction (Rectal) Paste (Dermal)	–	10,00

... Contd.

Table 1 — Inventory of medicinal plants used by traditional health practitioners for paediatric ailments in Thaba 'Nchu, Free State, South Africa (Contd.)

Family Name	Scientific name(s)	Vernacular Sotho Name	Voucher Number	Specific use	Plant part used	Mode of preparation (Route used for administration)	Accompanying plant	FL (%)
Asphodelaceae	*Bulbine narcissifolia* Salm-Dyck	Kgomoyabadisa	TN[2] SMP11	Sharp pain HIV (management; immune boosting)	Roots Leave and stems	Decoction (Oral)	*Dimorphotheca acutifolia, Hermmania depressa*	6,67
Astaraceae	*Metalasia muricata* R.Br.	Teayabarwa	TN[2] SMP58	Swelling, Chicken pox	Roots, Whole plant	Decoction (Oral)	*Scabiosa columbaria*	10,00
Asteraceae	*Afroaster hispida* (Thunb.) J.C.Manning & Goldblatt	Phowa	TN[2] SMP7	Fontanelles	Whole plant	Decoction (Oral)	–	6,67
Asteraceae	*Artemisia afra* Jacq. ex Willd.	Lengana	TN[2] SMP6	Chest pain	Leaves	Decoction (Oral)	–	3,33
Asteraceae	*Berkheya montana* J.M. Wood & M.S. Evans	Mohatollo	TN[2] SMP8	Sharp pain, Fontanelles, Weakness/ Tiredness/ Lethargic, Chest Pain	Roots, Whole plant	Decoction (Oral)	*Allium sativum Galium capense* subsp.*Capense Gunnera perpensa*	76,67
Asteraceae	*Dicomaanamala* Sond.	Hloenya	TN[2] SMP16	Chest pain (Fits)	Roots	Decoction (Oral)	*Dicoma anamala Hermmania depressa Xysmalobium undullatum*	56,67
Asteraceae	*Dimorphotheca acutifolia* Hutch.	Phela	TN[2] SMP17	Fits/ seizure Ear infection	Roots	Decoction (Oral)	–	16,67
Asteraceae	*Erigeron bonariensis* L.	Lehamonyane	TN[2] SMP60	Sores	Leaves	Decoction (Topical)	–	3,33
Asteraceae	*Gazania linearis* (Thunb.) Druce	Tsikitlane	TN[2] SMP24	Fontanelles, Sharp pain Stock Bite	Leaves, Roots	Decoction (Oral)	*Gazania linearis, Melolobium microphyllum, Solanum aculeatissiumum, Polygala hottentotta, Berkheya montana*	13,33
Asteraceae	*Gerbera piloselloides* (L.) Cass.	Tsebeapela	TN[2] SMP25	Ear infection	Whole plant	Decoction (Oral)	–	3,33
Asteraceae	*Haplocarpha scaposa* Harv.	Papetlwane	TN[2] SMP10	Fontanelles	Roots	Decoction (Oral)	–	3,33
Asteraceae	*Helichrysum caespititium* (DC) Harv	Phateangaka	TN[2] SMP29	Chest pain, Weakness/ Tiredness	Whole plant	Decoction (Oral)	–	6,67
Asteraceae	*Hirpicium armerioides* (DC.) Roessler	Shweshwe	TN[2] SMP23	Fontanelles, Sharp pain	Roots	Decoction (Oral)	*Hirpicium armerioides, Solanum aculeatissiumum, Malva parviflora, Achyranthes aspera* and *Pelargonium reniforme, Hirpicium armerioide, Berkheya montana* and *Pentanisia prunelloides*	20,00
Asteraceae	*Schkuria pinnata* (Lam.) Kuntze ex Thell.	Setswamadi	TN[2] SMP46	Diarrhoea, Fontanelles	Roots, Whole plant	Decoction (Oral)	–	10,00
Asteraceae	*Senecio asperulus* DC.	Moferefere	TN[2] SMP20	Fontanelles Swelling	Whole plant, Roots	Decoction (Oral), Infusion (Dermal)	*Senecio asperulus* and *Withania somnifera Senecio asperulus*	6,67

... Contd.

Table 1 — Inventory of medicinal plants used by traditional health practitioners for paediatric ailments in Thaba 'Nchu, Free State, South Africa (Contd.)

Family Name	Scientific name(s)	Vernacular Sotho Name	Voucher Number	Specific use	Plant part used	Mode of preparation (Route used for administration)	Accompanying plant	FL (%)
Asteraceae	*Senecio asperulus* DC.	Makgonatsohle	TN[2] SMP48	Weakness/ Tiredness	Roots	Decoction (Oral)	*Senecio asperulus* and *Berkheya montana*	3,33
Campanulaceae	*Wahlenbergia depressa* J.M. Wood & M.S. Evans	Sephephetho	TN[2] SMP53	Sharp pain	Roots	Decoction (Oral)	–	6,67
Commelinaceae	*Commelina africana* L.	Tabola	TN[2] SMP57	Sharp pain, Weakness/ Tiredness, Rush Fontanelles, Diarrhoea Fits/ seizure	Roots, Whole plant, Leaves and stem	Decoction (Oral), Decoction (Rectal)	*Xysmalobium undullatum*	23,33
Cucurbitaceae	*Kedrostis capensis* (Sond.) A. Meeuse	Sesepasadinoha	TN[2] SMP32	Fontanelles, Stock Bite, Sore throat, Diarrhoea	Tuber, Whole plant	Decoction (Oral)	*Kedrostis capensis, Polygala hottentotta, Gazania linearis, Kedrostis capensis, Dicomaanamala, Xysmalobium undullatum*	20,00
Dipsacaceae	*Scabiosa columbaria* L.	Selomi	TN[2] SMP45	Swelling, Chicken pox	Roots	Decoction (Oral)	*Scabiosa columbaria, Metalasia muricata*	6,67
Euphorbiaceae	*Clutia pulchella* L.	Monyamafi	TN[2] SMP12	Fontanelles	Roots	Decoction (Rectally)	–	3,33
Fabaceae	*Elephantorrhiza elephantina* (Burch.) Skeels	Mositsane	TN[2] SMP19	Loss of appetite ores	Roots	burn Topically	*Elephantorrhiza elephantina, Drimia depressa,*	6,67
Gentianaceae	*Chironia palustris* Burch. subsp. *palustris*	Lepshetlane	TN[2] SMP56	Kwashiorkor	Roots	Decoction (Oral)	–	3,33
Geraniaceae	*Monsonia attenuata* Harv.	Maleleka	TN[2] SMP36	Fontanelles	Bark	Decoction (Oral)	–	3,33
Geraniaceae	*Pelargonium reniforme* Curtis	Kgwara	TN[2] SMP38	Diarrhoea, Chest sores, Fontanelles, Vomiting	Roots, Whole plant	Decoction (Oral)	–	66,67
Gunneraceae	*Gunnera perpensa* L.	Qobo	TN[2] SMP27	Fontanelles	Roots	Decoction (orally)	*Gunnera perpensa, Galium capense, Berkheya montana*	3,33
Hyacinthaceae	*Drimia depressa* (Baker) Jessop	Moretele	TN[2] SMP18	Sores	Roots	burn Topically	*Drimia depressa, Elephantorrhiza elephantina*	3,33
Hyacinthaceae	*Eucomis autumnalis* subsp. *Clavata* (Mill.) Chitt	Mathethebale	TN[2] SMP22	Sharp pain, Diarrhoea	Roots	Decoction (Oral)	–	6,67
Lamiaceae	*Salvia repens* Burch. ex Benth.	Mosisidi	TN[2] SMP44	Sores in the mouth	Roots	Decoction (Oral)	*Allium sativum, Sorghum caffrorum, Salvia repens, Rumex lanceolatus, Bulbine narcissifolia*	3,33
Leguminosae	*Melolobium microphyllum* (L.f.) Eckl. & Zeyh.	Mofahlatoeba	TN[2] SMP9	Sharp pain	Whole plant	Decoction (Oral)	*Solanum aculeatissiumum, Polygala hottentotta, Berkheya montana, Gazania linearis*	3,33
Malvaceae	*Hermannia geniculata* Eckl. & Zeyh.	Selepe	TN[2] SMP40	Fontanelles	Roots	Decoction (Oral)	–	3,33
Malvaceae	*Malva parviflora* L.	Tikamotse	TN[2] SMP35	Fontanelles, Swelling, Sores	Roots, Whole plant	Powder (Inhalant), Paste (Topical)	*Solanum aculeatissiumum, Salix mucronata*	10,00
Moraceae	*Morus alba* L.	Mmalebere	TN[2] SMP37	Loss of appetite	Roots	Decoction (Oral)	–	3,33

... Contd.

Table 1 — Inventory of medicinal plants used by traditional health practitioners for paediatric ailments in Thaba 'Nchu, Free State, South Africa (Contd.)

Family Name	Scientific name(s)	Vernacular Sotho Name	Voucher Number	Specific use	Plant part used	Mode of preparation (Route used for administration)	Accompanying plant	FL (%)
Myrtaceae	*Eucalyptus gomphocephala* DC.	Bloukomo	TN[2] SMP21	Chest pain	Leaves	Decoction (Topically)	–	6,67
Poaceae	*Cynodon dactylon* (L.) Pers.	Mohlwatsepe	TN[2] SMP14	Eye infection	Leaves	Decoction (Topical)	–	3,33
Poaceae	*Sorghum caffrorum* (Retzius) P. Beauv.	Mabele	TN[2] SMP50	Sores in the mouth	Leaves and Stem	Decoction (Oral)	–	3,33
Polygonaceae	*Polygala hottentotta* C. Presl	Lehlokwanalatsela	TN[2] SMP39	Sharp pain, Fontanelles, Weakness/Tiredness, Diarrhoea, Bronchitis, Stock Bite	Roots, Whole plant	Decoction (Oral)	*Polygala hottentotta, Berkheya montana, Gazania linearis, Xysmalobium undullatum, Polygala hottentotta, Solanum aculeatissiumum, Polygala hottentotta, Gazania linearis, Kedrostis capensis*	33,33
Polygonaceae	*Rumex lanceolatus* Thunb.	Kgamane	TN[2] SMP42	Sores in the mouth	Roots	Decoction (Oral)	–	3,33
Punicaseae	*Punica granatum* L.	Garenate	TN[2] SMP41	Diarrhoea, Vomiting	Fruits	Maceration (oral)	–	10,00
Rosaceae	*Leucosidea sericea* Eckl. & Zeyh	Cheche	TN[2] SMP33	Diarrhoea	Whole plant	Decoction (Oral)	*Leucosidea sericea, Xysmalobium undullatum*	3,33
Rubiaceae	*Anthospermum rigidum* Eckl. & Zeyh.	Phakisane	TN[2] SMP5	Eye infection, Tiredness	Whole plant	Decoction (Eye Drops/ Local therapy/Topical)	–	6,67
Rubiaceae	*Galium capense* Thunb. subsp. *capense*	Mabone	TN[2] SMP15	Fontanelles	Roots	Topical	–	3,33
Rubiaceae	*Pentanisia prunelloides* (Klotzsch ex Eckl. & Zeyh.) Walp.	Setimamollo	TN[2] SMP34	Sharp pain, Swelling, Sores	Roots	Decoction (Oral), Decoction (Dermal) (Topical)	*Pentanisia prunelloides* and *Berkheya montana*	13,33
Salicaceae	*Salix mucronata* Thunb.	Moduane	TN[2] SMP43	Swelling	Whole plant	Decoction and Infusion (Dermal)	–	3,33
Scrophulariaceae	*Hebenstretia dura* Choisy	Tshitabaloi	TN[2] SMP28	Weakness/ Tiredness	Whole plant	Decoction nasal and Topical	–	3,33
Solanaceae	*Solanum aculeatissiumum* Jacq.	Thola	TN[2] SMP49	Fontanelles, Chest pain, Diarrhoea, Weakness/ Tiredness, Sharp pain	Whole plant, Roots	Inhalant (Nasal)	–	43,33
Solanaceae	*Withania somnifera* (L.) Dunal	Moferangope	TN[2] SMP54	Fontanelles, Tiredness, Weakness/ Tiredness, Diarrhoea	Whole plant Roots	Decoction (Oral)	*Withania somnifera, Senecio asperulus*	10,00
Sterculiaceae	*Hermmania depressa* N.E.Br.	Seletjane	TN[2] SMP30	Chest pain (Fits), Diarrhoea, Vomiting HIV (immune boosting)	Roots, Whole plant	Decoction (Oral)	*Hermmania depressa, Dicoma anamala, Xysmalobium undullatum, Hermmania depressa* and *Pelargonium reniforme, Hermmania depressa, Dimorphotheca acutifolia*	26,67

Fontanelles = meningitis, encephalitis, hydrocephalus, hypoxic-ischemic injury, trauma, and intracranial haemorrhage (-) = None

Informant consensus factor and plant use modalities

Findings on the informants' consensus regarding the plants used to treat particular ailments, the number of plants used to treat these ailments, the plant parts used in their preparation, and the administration modes are presented in (Table 2 & Fig. 3). There was consensus among the informants, particularly regarding the medicinal plant species they used to treat certain illnesses in children (Table 2). The ailments that showed high consensus among informants in terms of plant usage were those with informant' consensus factor value that ranged between *ICF* > 0.50 and *ICF* < 1.00 (Table 2). Therefore, our findings showed that the informants are highly in agreement with each other, particularly on the plants used for ailments such as bronchitis (*ICF* = 1.00), and slightly corroborated with each other in terms of plants used for treating vomiting (*ICF* = 0.71),

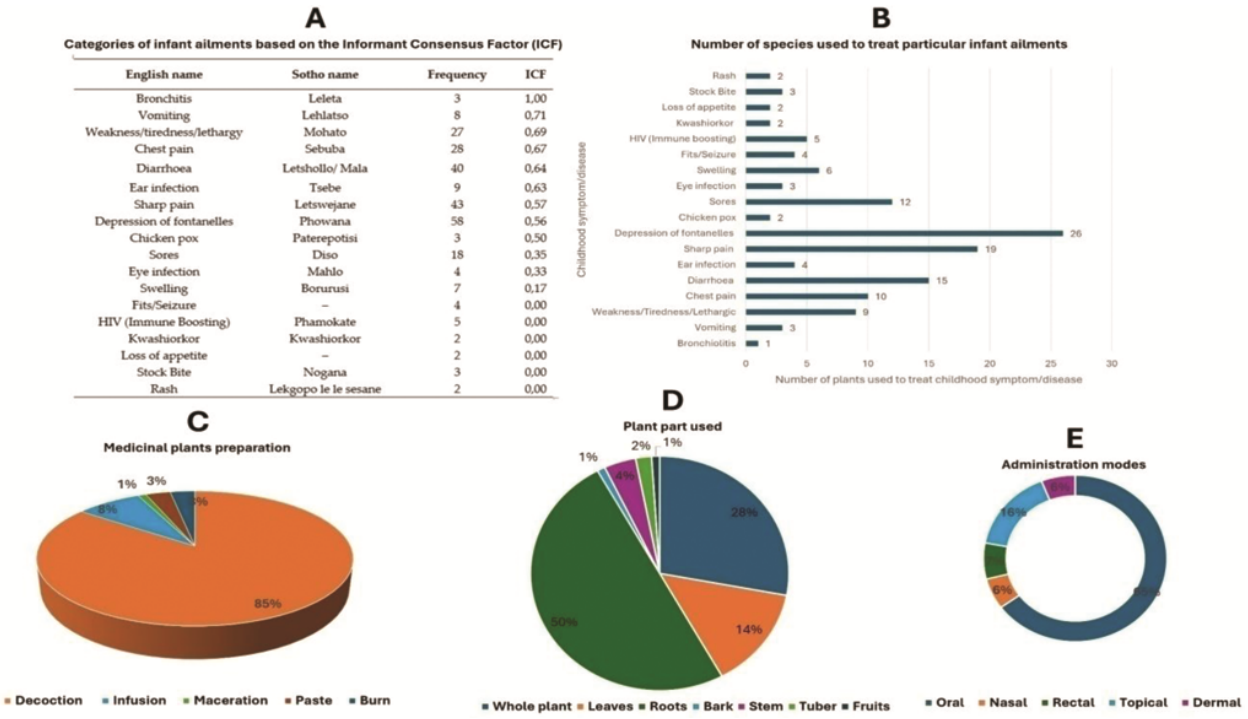

Fig. 3 — Plant parts used, preparation mode, and administration modes for medicinal plants used for childhood ailments in Thaba 'Nchu

Table 2 — Pediatric ailment categories, their Informant Consensus Factor (ICF) values and number of medicinal plants used for each category

English name	Sotho name	Frequency of mention	ICF	Number of plants used
Bronchiolitis	Leleta	3	1.00	1
Vomiting	Lehlatso	8	0.71	3
Weakness/tiredness/lethargy	Mohato	27	0.69	9
Chest pains	Sebuba	28	0.67	10
Diarrhoea	Letshollo/ Mala	40	0.64	15
Ear infections	Tsebe	9	0.63	4
Sharp pain	Letswejane	43	0.57	19
Depression of fontanelles	Phowana	58	0.56	26
Chicken pox	Paterepotisi	3	0.50	2
Sores	Diso	18	0.35	12
Eye infections	Mahlo	4	0.33	3
Swelling	Borurusi	7	0.17	6
Stork Bites	Nogana	3	0.00	3
Rash	Lekgopo le le sesane	2	0.00	2
Loss of appetite	-	2	0.00	2
Kwashiorkor	Kwashiorkor	2	0.00	2
HIV (Immune boosting)	Phamokate	5	0.00	5
Fits/seizures	-	4	0.00	4

lethargy/weakness (*ICF* = 0.69), chest pain (*ICF* = 0.67), diarrhea (*ICF* = 0.640), and ear infection (*ICF* = 0.63), respectively (Table 2). This provides sufficient validity concerning the effectiveness of the reported medicinal plants in treating these ailments. Ramarumo *et al*,[38] highlighted that the sharing similar uses of medicinal plants among different indigenous medicinal practitioners provides necessary validity for their efficacy. Thus, implies that the majority of informants independently utilized *P. hottentotta* to treat bronchitis, followed by use of *P. reniforne* for vomiting and *A. rigidum, H. dura, S. aculeatis siumum*, and *W. somnifera* for tiredness. *A. sativum, A. amatymbica, X. undullatum, A. afra, B. montana, H. caepititium, P. reniformme, E. gomphocephala* and *H. depressa* were used for treating chest pains, whereas, *S. erosa, X. undullatum, S. pinnata, C. africana, K. capensis, P. reniforne, E. autunnalis, P. hottentotta, P. granatum, L. sericea*, and *H. depressa* were for diarrhoea, with ear infections treated using *A. sativum, D. acutifolia and G. piloselloides* (Table 1). In this regard, it is arguable that these medicinal plants are of significant cultural value.

The medicinal use of some plant species in the treatment of multiple paediatric ailments implies that while they are distinct species, they however, contain either similar or different biologically active compounds that provide the same therapeutic and pharmacological effects[39]. This has been shown for example, in studies that reported on the therapeutic potential and pharmacological properties of *Zingiber officinale* in treating numerous ailments[40]. As in this study, it is common for African traditional health practitioners to use either different or similar medicinal plants to treat single or multiple ailments. For instance, the use of *Mimusops zeyheri* was reported for the treatment of ulcers, erectile dysfunction, and throat soreness in the Vhembe Biosphere Reserve[1]. Similarly[41] emphasised the medicinal uses of *Kedrostis capensis* (Sond.) A. Meeuse for the treatment of stomach pain and heart disease in the Free State Province, South Africa. Table 2 also presents the recorded number of medicinal plants used in the treatment of particular childhood conditions. Traditional health practitioners within the studied area use many plant species to treat ailments, including depression of fontanelles ($N_{Species} = 26$), followed by sharp pain ($N_{Species} = 19$), diarrhoea ($N_{Species} = 15$), sore ($N_{Species} = 12$), and chest pain ($N_{Species} = 10$). The use of diverse medicinal species to treat similar diseases by different traditional health practitioners demonstrates the wealth of medicinal knowledge held by practitioners at the studied sites. Furthermore, this supported assertions by[42] that the potential of distinctive medicinal plants to produce similar therapeutic effects implies that those species possess bioactive compounds responsible for such ethnopharmacological activities.

The most frequently used medicinal plant part was the root (50%), followed by the whole plant (28%), leaves (14%), and the least used parts were stem (4%) and tuber (2%), followed by bark and fruits, both constituting 1% each (Fig. 3a). Therefore, the findings of our study differ from those of Seleteng-Kose[43] who observed that the Basotho tribe primarily utilizes leaves for general medicinal purpose. The reliance on roots for remedy preparation by traditional health practitioners suggests an unsustainable pattern of plant use, which may contribute to the endangerment or potential extinction of certain species in the region, highlighting the need to train and educate traditional healers on sustainable harvesting practices to ensure conservation for future generations. Similar to previous scientific studies that reported on the African traditional medicinal preparation and administration[44], an overwhelming percentage of traditional health practitioners in the studied area indicated that they prepared their paediatric medication through decoction (85%) (Fig 3b) and administered to children orally (65%) (Fig. 3c). Decoction remains a preferred method of remedy preparation because boiling enhances the extraction of water-soluble bioactive compounds thereby increasing the potency of the plants. Oral administration remains dominant because it enables systemic absorption of active compounds, making it suitable for treating common conditions such as gastrointestinal and respiratory illnesses[45].

Conclusion

This study successfully documented important indigenous knowledge on the use of medicinal plants for managing paediatric ailments in the Thaba 'Nchu region of the Free State Province, South Africa, thereby contributing to the safeguarding of valuable biocultural heritage. *Berkheya montana*, *Xysmalobium undullatum, Pelargonium reniforme, Dicoma anomala* were the most used to treat various childhood diseases in the study area. Additionally, plants with notable high-consensus include *Polygala hottentotta* and *Pelargonium reniforme*, which

emerged as key taxa for ailments bronchitis, vomiting, chest pain, and other childhood disorders, and are thus strong candidates for further pharmacological and toxicological investigation. The study further showed that the informants concurred on the usage of the same plants in treating bronchitis, vomiting, lethargy/ weakness, chest pain, diarrhoea, and ear infection. The documentation of these plants provides an important foundation for future drug discovery and scientific validation for traditional remedies, particularly given the consensus observed for several species. The predominant use of roots in the preparation of herbal remedies for treating childhood ailments raises concerns regarding the sustainability and conservation of medicinal plant resources, which calls for the promotion of sustainable harvesting practices and conservation strategies. Overall, the study emphasizes the need for strengthened collaboration between traditional health practitioners, researchers, and healthcare institutions to ensure the documentation, sustainable use, validation, and conservation of medicinal plant resources for current and future generations.

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Author Contributions

SN and BN conducted the field survey, cleaned and analysed the data. BN and IM supervised the research. SN wrote the paper. BN and IM reviewed the manuscript.

Conflict of Interest

The authors declare no conflict of interest.

Informed Consent

Informed consent was sought and obtained from all participants prior to the commencement of the survey.

Ethical Statement

Approval was obtained from community representatives and the indigenous knowledge holders prior to the commencement of the survey.

Use of artificial intelligence (AI)

The authors declare that there was no use of generative AI

Data Availability

All the information collected and analysed in this study is presented in the article.

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