Medicinal plants used against anxiety and hypertension by the indigenous people of Sargodha division and allied areas, Pakistan

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Research

Abstract

Background: Anxiety and hypertension are the most severe forms of human psychiatric conditions. Many plants are blessed with medicinal properties to treat anxiety and hypertension, but very little knowledge is available about such plants used by various ethnic communities of Pakistan. This study presents the first report of on plants used to treat anxiety and hypertension among the local communities of Sargodha division and allied areas, using quantitative ethnobotanical indices.

Methods: Ethno-medicinal data was collected from aboriginal households who still practice their aboriginal system of medicine. Information of each potential plant and its mode of use to treat anxiety and hypertension were documented using indices frequency citation (FR), preference ranking (PR), percentage of respondents having knowledge (PRK) about the use of species and relative frequency citation (RFC).

Results: A total of 57 taxa belonging to 36 families were reported. The highest percentage of life form was herbs (80%). The dominant plant parts were leaves and highest percentage of mode of utilization was paste and decoction. Highest relative frequency citation (RFC) values were *Matricaria chamomilla* (0.23) while high proportion of respondents (PRK) was reported for *Matricaria chamomilla* (23.75%). Highest frequency of citation was noted in *Matricaria chamomilla* (19%).

Conclusions: Our study has revealed an intimate relationship between the indigenous flora and livelihood of the people. We hope that information presented in this paper could be used as a baseline data to scientifically verify therapeutic properties and associated bioactive compounds present in the enlisted plants to treat anxiety and hypertension.

Keywords: Ethnobotany, medicinal plants, decoction, aboriginal communities

Background

Anxiety and hypertension are the serious health issues among various populations at global level, often considered in association with one another. Anxiety is one the common prevailing psychiatric disorder usually in adults but now quite common in young worldwide and prevails as the major public health issue in many countries (Reeves *et*

al. 2011, McEvoy *et al.* 2011). On the other hand, hypertension is also world-wide disorder from which one quarter of all adults suffers and often leads to mortality (WHO, 2015). Investigations unveils that both anxiety and hypertension are associated together. Individuals with anxiety have high risk of hypertension than those without anxiety (Stein *et al.* 2014, Bacon *et al.* 2014). Similarly patients with hypertension have a higher risk of anxiety than those without anxiety (Grimsrud *et al.* 2009, Hamer *et al.* 2010). However, some studies reveal that anxiety is associated with a lowering in blood pressure (Hildrum *et al.* 2007, Hildrum *et al.* 2011). Since the past decade anxiety is one of the most widespread and highly melancholic psychiatric situations; many herbal medicines have been used by the people suffered with this (Weller *et al.* 2008). Dysfunction of several neurotransmitters due to extended stressful situation result in behavioral changes leading to disorders like anxiety and gloominess (Carrasco *et al.* 2003). It is common observation that people with anxiety or hypertension always face unbalanced sleep, sadness, and lack deliberation and concentration (WHO 2010). Hypertension had influenced 33% of the adult populace of Pakistan (Safdar *et al.* 2013). A number of herbal medicines are commonly used for treatment of neurological and psychological disorders (Beaubrun & Gray 2000). Many kinds of therapies are planned to sooth nerves, restoring from sleep and appetite. As a remedy of anxiety and hypertension, plant infusions, decoctions are not only common but inhalations in the form of steam of aromatic plant species is also frequent. Moreover, kneading and rubbing of the person body are also very important in the relaxation of muscle relaxation and consequently reducing the mental stress (Khan *et al.* 2014, Manousi *et al.* 2019). It is also common practice to manage ceremonies and ritual in order to stabilize the psychological conditions (Campos & Cano 1979, Zolla 1990). So far many plants are claimed to be used as a treatment of anxiety and hypertension throughout the world (Ziyyat *et al.* 1997, Di Stasi *et al.* 2002, Raji *et al.* 2013, Mensah *et al.* 2009, Saki *et al.* 2014) but data from Pakistan in particular from Sargodha division and allied areas is least studied regions of Pakistan in this regard (Shah *et al.* 2015).Therefore, this study aimed at documentation of medicinal plants mainly used to manage anxiety and hypertension among the aboriginal communities of Sargodha division and Allied areas by using quantitative approaches.

Materials and Methods

Study area

The study area is located at 72°30′ E longitude and 32°10′ N latitude. Sargodha division is an administrative division of Punjab province of Pakistan and is comprised of four districts *viz,* Mianwali, Bhakkar, Khushab and Sargodha while its allied areas are Karak, Attock, Chakwal, Jhelum, Mandi Bahauudin, and Hafiz abad, Jhang, Layyah and Dera Imail Khan. Geographically, the area is very unique and is blessed with all kinds of geographic features like mountains (Salt Range, Surghar Range, Kirana Hills), deserts (Thal desert) and plateaus (Chakwal and Jhelum plateaus) and valleys (Soon Valley, Namal Valley and Amb Valley) that are rich source of wild fauna and flora. Average temperature of the region ranges from 0 °C (December) to 50 °C (June). The average annual rainfall is about 30.4 cm. People of the area mostly are inhabitants of rural areas and depend on agriculture for their livelihood. Tribal communities of the area who lead usually nomadic life and live in mountainous areas and valleys earn through livestock. The native residents are ethnic Malik, Niazi, Baloch, Arraian and Khattak tribes (Figure 1).

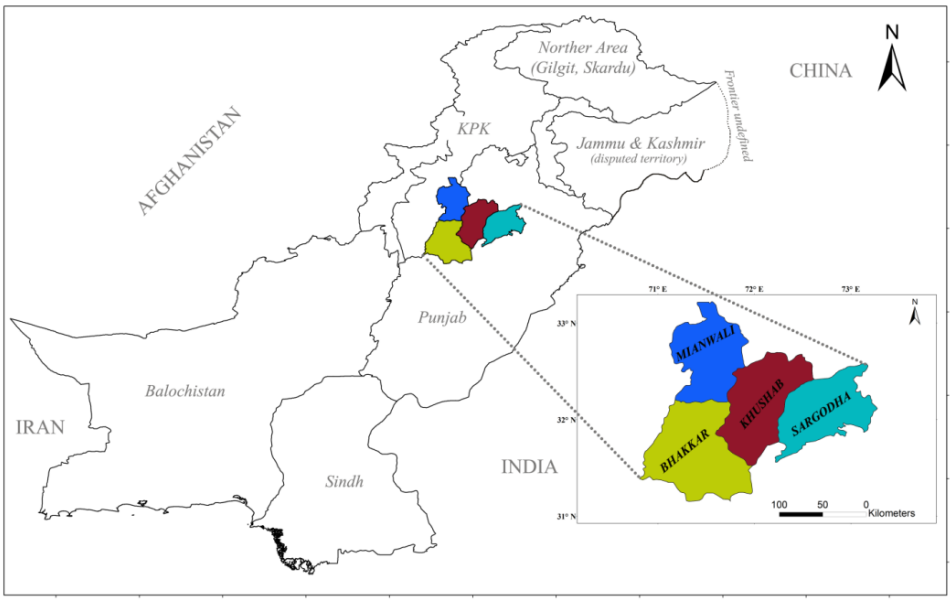

Figure 1. Map showing the location of Sargodha division and allied areas

Methodology

The research study was a part of NRPU program of Higher Education Commission of Pakistan No. No. 20-1599/ R&D/NRPU/HEC/2010 entitled "An annotated checklist of medicinal plants of Sargodha division and allied areas". A total of eighty-two informants including nine traditional healers (Hakeems/tabibs) who agreed to participate in the survey were interviewed using semi-structured questionnaires were designed to illicit interviewee's ideas for exploring medicinal plants used in the treatment of hypertension and anxiety and related symptoms. Questions were related to medicinal plants used in the treatment of anxiety and hypertension and related symptoms, the plants parts used, modes of preparation and administration of herbal remedies, the availability of plant species collected and the place (habitats) from which the species are harvested. The illiterate people living in remote areas were interviewed orally. while literate people were interviewed with the help of questionnaire of Martin (1995). It was noted that most of the ethnomedicinal knowledge was confined to old age and illiterate people between the age group of 65-74. A demographic structure of the population of the surveyed area was made.

Table 1. Demographic characteristics of informants (N= 82)

Age	Number	%age
25-34	8	9.7%
35-44	15	18.2%
45-54	20	24.3%
55-64	17	20.7%
65-74	22	26.8%
Gender		
Male	47	57.3%
Female	35	42.6%
Education		
Illiterate	32	39.0%
Primary	18	21.9%
Middle	15	18.2%
Matric	10	12.1%
Inter	7	8.5%

Of the 82 informants, 53.7% were men and 42.6% women and were between the ages of 25-74 (the majority were in between 65-74 years old). The healers were mostly illiterate while some were educated up to intermediate level (Table 1).

All the mentioned plant species were collected from the study area in their reproductive stage and their vernacular (common names) were confirmed from the local people who were using them since generations. Collected plants were identified following the Flora of Pakistan (Nasir and Ali, 1970-2001). The list of plant species used to cure anxiety and hypertension in the area was checked and updated after verification from the website "Plants of the World Online" (https://powo.science.kew.org/). Voucher specimens were preserved and deposited at the Herbarium SARGU of the Botany Department of University of Sargodha, Pakistan for future reference.

The plants were enumerated alphabetically in tabulated form. Information obtained from informants about plants during the field work were schematically recorded in an excel spread sheet software. The parameters such as voucher specimen number (in the brackets), botanical name, local name, parts used, and family were presented for each species (Table 2). The collected data were examined by using different quantitative techniques to assess the medicinal importance of the plant species in the ethnomedicinal culture of the study area to achieve the objectives of this study. To analyze the data on medicinal plants used for anxiety and hypertension symptoms among the indigenous population of the study area, indices of relative frequency citation (RFC), the percentage of respondent who have knowledge (PRK) and preference ranking (PR) concerning the use of species were used.

The value of RFC is citing percentage of informants who cited the particular species and families of medicinal plants. RFC is calculated by using formula of Vitalini *et al.* (2013): RFC= FC/N

n this formula RFC is the relative frequency of citation and FC is the number of informants who cited the particular species. While "N" the number of total informants who have knowledge about plants. The percentage of respondent having knowledge (PRK) about medicinal plants to cure anxiety and hypertension was calculated by using formula:

$$\text{PRK} = \frac{\text{Number of people interviewed citing species}}{\text{Total number of interviewed people using plants}} \times 100$$

To realize the level of competence of cited plants in the management of anxiety and hypertension, preference ranking (PR) was determined from the participants. A digit (1, 2 or 3), was given to each rank (Al-Adhroey *et al.* 2010).

Results

Socio-demographic characteristics of respondents

The results showed that the herbal medicine is still playing a pivotal role to combat with basic traditional healthcare. The study revealed that the study area was unexplored with regards to medicinal plants that are used to cure anxiety and hypertension. This is the first ethnobotanical investigations documenting plants used to cure anxiety and hypertension.

Among the total 82 informants participated in the study most were of age group of 65-74 years (26.8%) followed by 45-54 years (24.3%), 55-64 years (20.7%), 35-44 years (18.2%) and 25-34 years (9.7%). The proportion between male and female informants 57.3% and 42.6% respectively that reflects that females are unenthusiastic to share their views due to cultural norms in the study area (Table 1).

Medicinal plant diversity

It was reported that 57 native plant taxa, belonging to 50 genera and 36 families were used for curing anxiety and hypertension from the local inhabitants of the study area. The major plant families, which contributed the native plants in folk medicine with maximum frequency recorded was Asteraceae (8 species) followed by Lamiaceae (6) species, Apiaceae (4), Plantaginaceae and Fabaceae having (3) species each. While Solanaceae and Combretaceae each were represented by (2) plant species. The remaining 29 families represented by one species each (Figure 2).

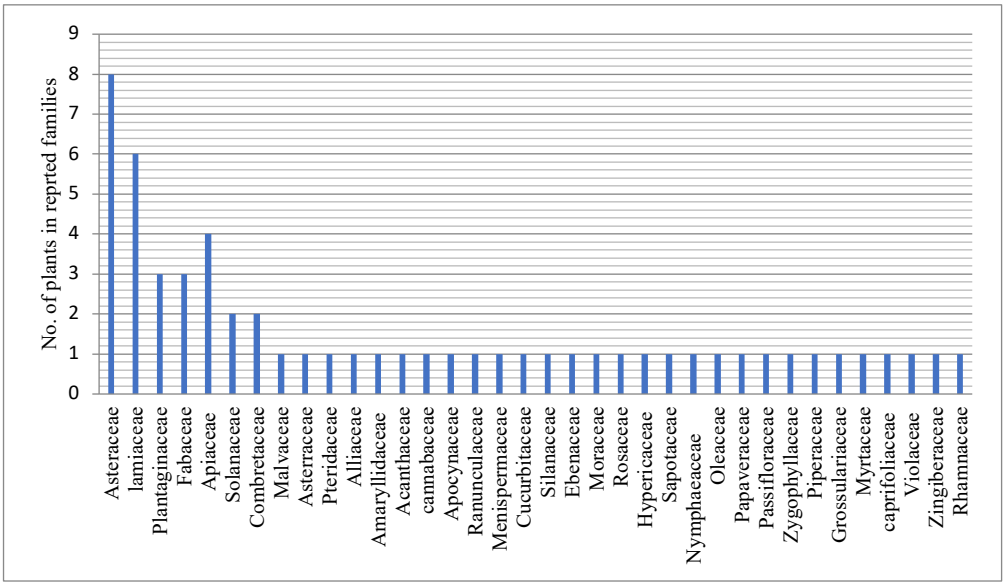

Figure 2. Number of cited plants from respective family

The highest percentage of life form used against anxiety and hypertension in the study area was found to be herbs (80%) followed by trees (15.78%) and shrubs (3.5%) (Figure 3).

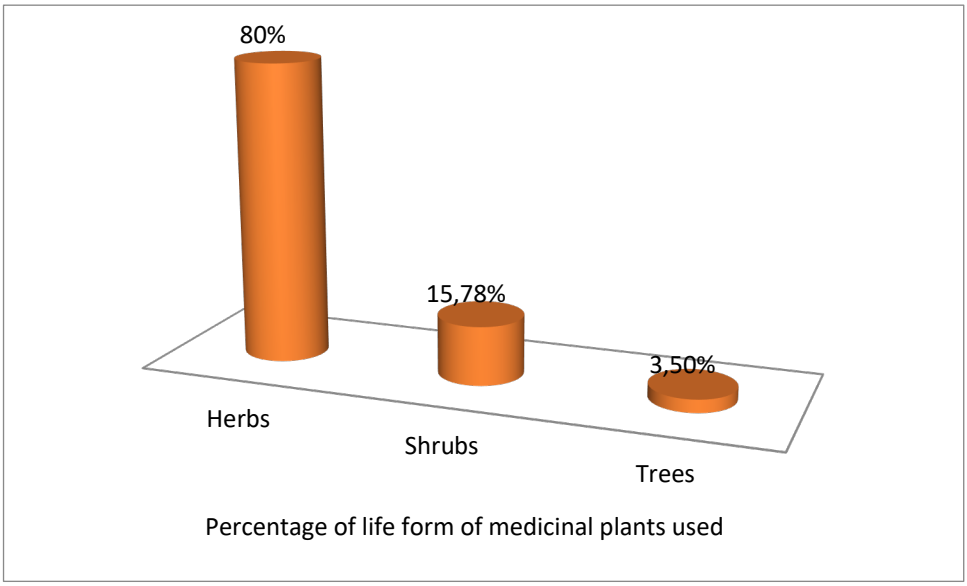

Figure 3. Life form of reported medicinal plants

Quantitative analysis

The quantitative study of morphological parts used by the local inhabitants of the study area revealed that leaves, seeds, fruit, flowers, root, bulb, bark, whole plant and rhizome are the parts that are frequently used for the treatment of anxiety and hypertension. However, the leaves are used more frequently constituting 31.03% of all parts used followed by seed and fruits (20.68%), flower (14 %), root (5.17%), bulb (3%), bark, whole plant and rhizome, (2%) each are included (Figure 4).

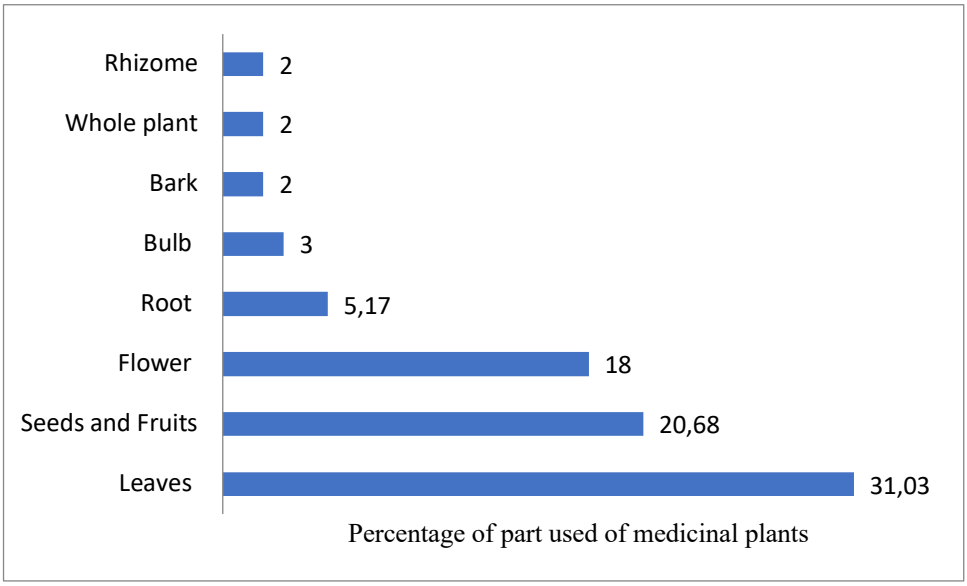

Figure 4. Percentage of part used of reported medicinal plants

Different forms of utilizing plant parts in the study area includes paste (23%), followed by decoction (21%), powder (16%), infusion (14%), juice (10%), fragrance (7 %), raw form (5%), concoction (2%), oil (2%) (Figure 5).

RFC was calculated to find out the most common occurring medicinal plants used against anxiety and hypertension. On the basis of RFC values, the most consumed medicinal plant species includes; *Matricaria chamomilla,* (0.23) followed by the *Zingiber officinale*, (0.21) and *Nicotiana tabacum*.

Percentage of respondents interviewed with knowledge (PRK) about medicinal flora used to treat anxiety and hypertension and the preference ranking (PR) of the botanical taxa is presented in Table 2.

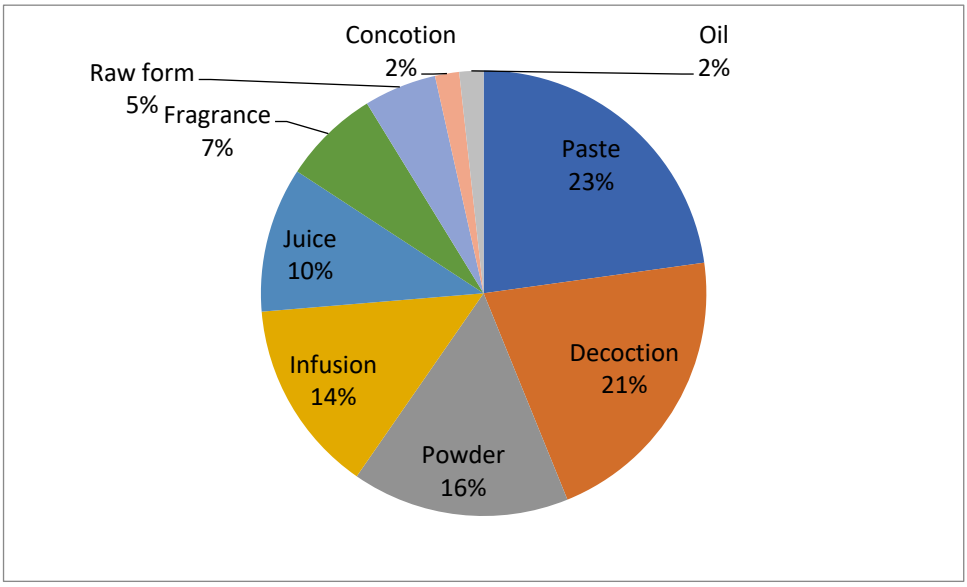

Figure 5. Percentage of mode of utilization of reported plants

The results show that ten plant taxa (*Allium cepa, Allium sativum, Foeniculum vulgare, Fragaria nubicola, Matricaria chamomilla, Mentha piperita, Milletia pinnata, Nicotiana tabacum, Nymphaea lotus, Zingiber officinale*) exhibit highest PR level (3) showing that these plants are most effective in curing anxiety and hypertension while twenty-seven plant species showed lowest PR level (1) Table 2. *Matricaria chamomilla* (23.75 %) exhibited upper most occurrence on the basis of PRK values followed by *Zingiber officinale*, (21.25%), *Nicotiana tabacum*, (20%), *Mentha piperita*, (18.75%), *Allium sativum*, *Foeniculum vulgare, Milletia pinnata, Nymphaea lotus* , (17.5%), *Allium cepa*, (16.35%), *Coriandrum sativum, Cucurbita maxima*, (15%) *Cannabis sativa, Diospyros malabrica, Mentha arvensis , Mentha vulgare , Piper nigrum* , (13.75%*), Mentha spicata, Mimusops elengi , Papaver somniferum* , (12.5%), *Ficus carica, Helianthus annuus , Mentha longifolia , Ribes nigrum, Syzygium cumini, Terminalia arjuna*, (11.25%), *Ocimum basilicum, Peganum harmala,* (10%), *Fragaria nubicola, Passiflora incarnata, Ziziphus jujuba*, (8.75%), *Datura stramonium, Taraxacum officinale, Terminalia bellirica, Viola odorata,* (6.25%), *Chrysanthemum indicum, Olea ferruginea, Valeriana officinalis*, (5%), and 5 species represented (3.75%), 7 species exhibited (2.5%) and lowest percentage (1.25%) were observed for 8 plant species (Table 2).

Discussion

Traditional knowledge and the use of plant-based medicines have always gained attention since ages in lessening and treating anxiety and hypertension in Sargodha division and allied regions and probably in other rural areas of Pakistan. This is because such plant-derived medicine is quickly accessible and affordable.

The study revealed that old people have vast traditional knowledge regarding the use of plants probably due to their long intimate love for nature. Secondly, the role of males to interact with plants (57.3%) is probably due to the reason that the indigenous society is male dominant and females are confined to houses and engage in household life and consequently, males are preferable over females regarding the transfer of ethnomedicinal knowledge (Berhe *et al.* 1995, Begossi *et al.* 2002, Collins *et al.* 2006). The study further unravel that younger people (25-34 years) in the study area have less medicinal plant knowledge as compared to older ones. The lack of interest of younger generation regarding the ethnomedicinal knowledge is also observed in various other studies (Begossi *et al.* 2002, Caniago & Siebert 1998, Fassil 2003, Gedif & Hahn 2003, Hilgert 2001, Hunde *et al.* 2004, Manandhar 1995, Tsehay 1971, Uniyal *et al.* 2006). This lack of interest of younger generation about the ethnomedicinal knowledge may lead to erosion of traditional knowledge about medicinal plants in the study area. In the survey it was also inferred that the illiterate people of the area have better knowledge and social interaction on the use of medicinal plants as compared to literate ones. The reason is that illiterate people probably have more traditional knowledge and interest as compared to the literate ones and that majority of the people believed in the effectiveness and safety of plants material and herbal medicines used in ethnomedicines.

Table 2. Medicinal plants used against anxiety and hypertension in Sargodha division and Allied areas, Punjab, Pakistan

Botanical name/ Voucher number	Family	Common name	Habit	Part(s) used	Disease treated	Mode of utilization	Recipe	FC*	RFC*	PRK*	PR*	Previous report(s)
Abelmoschus esculentus (L.) Moench AHT-S-01	Malvaceae	Bhindi	Herb	Fruit	Hypertension	Juice	Fruit blended with water is used daily.	2	0.02	2.5	1	
Achillea millefolium L. AHT-S-29	Asteraceae	Bernajasaf	Herb	Leaves	Hypertension	Juice	Extract of crushed leaves taken thrice a day.	1	0.01	1.25	1	Saki *et al.* (2014) Guzmán Gutiérrez *et al.* (2014)
Adiantum capillus-veneris L. AHT-S-26	Pteridaceae	Persioshan	Herb	Whole plant	Hypertension	Decoction	Leaves are boiled in water and this decoction is used	3	0.03	3.75	1	
Allium cepa L. AHT-S-12	Alliaceae	Piyaz	Herb	Tuber	Hypertension	Juice	Add honey to the bulb juice and use twice a day	13	0.16	16.3	3	Tahraoui *et al. (* 2007) Mensah *et al.* (2009) Benitez *et al.* (2010) Gbolade (2012)
Allium sativum L. AHT-S-24	Amaryllidaceae	Lehsan	Herb	Bulb	Anxiety	Decoction	Take crushed form of bulb and add few drops of *Zingiber officinale* juice, boil in water and take half glass or a cup twice daily	14	0.17	17.5	3	Ziyyat *et al.* (1997) Di Stasi *et al.,* 2002 Tahraoui *et al.* (2007) Mensah *et al.* (2009) Gbolade (2012) Inta *et al.* (2013) Raji *et al.* (2013)
Anethum graveolens L. AHT-S-46	Apiaceae	Soya	Herb	Fruit	Hypertension	Decoction	Fruit boil in two glasses of water, take this decoction twice a day	1	0.01	0.12	1	
Bacopa monnieri (L.) Wettst AHT-S-08	Plantaginaceae	Nirabarhami	Herb	Leaves	Anxiety	Infusion	Soak leaves in water over night and drink this infusion.	1	0.01	0.12	1	
Blepharis edulis (Forrsk.) Pers. AHT-S-18	Acanthaceae	Atungun	Herb	Seed	Hypertension	Powder	Grinded form of seed is used	2	0.02	2.5	1	
Butea monosperma (Lam.) Kuntze AHT-S-11	Fabaceae	Dodha	Tree	Seeds	Hypertension	Powder	Grind seeds, use this powder to treat hypertension	1	0.01	1.25	1	
Cannabis sativa L AHT-S-10	Cannabaceae	Bhang	Herb	Leaves	Anxiety	Paste	Paste of leaves with rose water is eaten.	11	0.13	13.7	2	Jabeen *et al.* (2009)
Carthamus oxycantha M. Bieb AHT-S-55	Asteraceae	Pohli	Herb	Seeds	Hypertension	Raw	Seeds are eaten in raw form to cure disease	1	0.01	1.25	1	

Catharanthus roseus (L.) G Don AHT-S-41	Apocynaceae	Sadabahar	Herb	Root	Hypertension	Decoction	Fresh roots are boiled in water, take this decoction before breakfast	1	0.01	1.25	1	Moshi *et al.* (2012)
Chrysanthemum indicum L. AHT-S-21	Asteraceae	Gul-e-daudi	Herb	Flower	Anxiety	Powder	Grind the dry flower, add rose water and sugar, take it daily.	4	0.05	5	1	Guzmán Gutiérrez *et al.* (2014)
Clematis patens C. Morren & Decne AHT-S-39	Ranunculaceae	Tulsibeal	Herb	Flower, seed	Anxiety	Fragrance, powder	Fragrance of flower is used; seeds are grinded and taken with water.	3	0.03	3.75	1	
Cocculus hirsutus (L.) W. Theob. AHT-S-15	Menispermaceae	Gilu	Herb	Leaves	Anxiety	Infusion	Leaves are soaked in hot water for whole night, extract of *Viola odorata* is added in it.	2	0.02	2.5	1	
Coriandrum sativum L. AHT-S-53	Apiaceae	Dhania	Herb	Fruit	Hypertension	Infusion	*Coriandrum sativum* is soaked in water for night and drink that infusion after staining.	*12*	0.15	15	2	Di Stasi *et al.* (2002) Prasadacharyulu *et al.* (2015)
Cucurbita maxima Duchesne AHT-S-49	Cucurbitaceae	Halva kudooo	Herb	Fruit	Hypertension, Anxiety	Paste	Boil fruit in water, crush boiled fruit and add sugar in it take this paste early in the morning.	12	0.15	15	2	
Datura stramonium L. AHT-S-.42	Silanaceae	Dhatura	Shrub	Seed	Hypertension	Decoction	One cup of water is added in grinded seeds and boil, then add sugar and drink it.	5	0.06	6.25	1	Tahraoui *et al.* (2007) Sadegi *et al.* (2014)
Diospyros malabrica (Desr.) Kostel AHT-S-31	Ebenaceae	Junglilocaat	Tree	Fruit	Anxiety	Raw	Fruit is eaten in raw form.	11	0.13	13.7	2	
Echinacea purpurea (L.) Moench AHT-S-04	Asteraceae	Purple cone flower	Herb	Flower	Anxiety	Fragrance	Fragrance of flower is used.	3	0.03	3.75	1	
Eclipta prostrata (L.) L. AHT-S-50	Asteraceae	Gul-e-alba	Herb	Leaves	Hypertension	Powder	Grind leaves, take it after every meal.	2	0.02	2.5	1	
Ficus carica L. AHT-S-17	Moraceae	Anjeer	Tree	Fruit	Hypertension	Raw	Eat fruit in raw form	9	0.11	11.2	2	Guzmán Gutiérrez *et al.* (2014)
Foeniculum vulgare Mill AHT-S-51	Apiaceae	Sounf	Herb	Fruit	Hypertension	Paste	Powdered seeds with honey is used with milk daily	14	0.17	17.5	3	Saki *et al.* (2014)

Fragaria nubicola (Lindl. f. ex Hook.) Lacaita AHT-S-43	Rosaceae	junglirasbhari	Herb	Fruit	Hypertension	Juice	Fruit juice is drunk daily	17	0.08	8.75	3	
Glycine max (L.) Merr. AHT-S-14	Fabaceae	Soya	Herb	Leaves	Anxiety	Infusion	Soak Leaf of *Glycine max* and rhizome of *Zingiber officinale* in cold water for 24 hours and drink one glass or a cup daily	3	0.03	3.7	1	
Helianthus annuus L. AHT-S-06	Asteraceae	Surajmukhi	Herb	Seeds	Hypertension	Paste	Honey is added in powdered form of seeds. 1 teaspoon of paste is used twice a day.	9	0.11	11.2	2	Au *et al.* (2008) Guzmán Gutiérrez *et al.* (2014)
Hypericum perforatum L. AHT-S-52	Hypericaceae		Herb	Leaves	Anxiety	Decoction	Boil leaves in water, use this decoction of leaves with honey is taken for 13 days.	2	0.02	2.5	1	Saki *et al.* (2014)
Lactuca serriola L. AHT-S-09	Asteraceae	Kahu	Herb	Seeds	Hypertension	Paste	Make a paste of powdered seeds in vinegar and take 1 tablespoon of this paste with water.	1	0.01	1.25	1	Jabeen *et al.* (2009)
Matricaria chamomilla L. AHT-S-57	Asteraceae	Baboona	Herb	Root	Hypertension	Powder	Grinded form of root is used daily.	19	0.23	23.7	3	Di Stasi *et al.* (2002) Saki *et al.* (2014)
Mentha x piperita L. AHT-S-02	Lamiaceae	Podina	Herb	Leaves	Anxiety	Decoction	Boil the leaves in water for 10 minutes, drink its 2 cups daily.	15	0.18	18.7	3	Di Stasi *et al.* (2002) Saki *et al.* (2014)
Mentha arvensis L. AHT-S-27	Lamiaceae	Podina	Herb	Leaves	Hypertension	Decoction	Boil leaves in water for 15 minutes, take it after adding 1 teaspoon sugar in it.	11	0.13	13.7	2	
Mentha longifolia (L.) L. AHT-S-34	Lamiaceae	Junglipodina	Herb	Leaves	Anxiety	Infusion	Soak the leaves for 2 hours mix the brown sugar and drink this infusion.	9	0.11	11.2	2	
Mentha spicata L. AHT-S-32	Lamiaceae	Podina	Herb	Leaves	Anxiety, Hypertension	Decoction	Decoction of leaves with brown sugar is taken twice a day.	10	0.12	12.5	2	

Mentha vulgaris L. AHT-S-47	Lamiaceae	Podina	Herb	Leaves	Hypertension	Infusion	Soak the leaves for 5 hours in water, take this infusion after adding sugar.	11	0.13	13.7	2	
Pongamia pinnata (L.) Pierre AHT-S-40	Fabaceae	Sukh chain	Tree	Seed	Hypertensi on	Oil	Massage the head with this oil	14	0.17	17.5	3	
Mimusops elengi L. AHT-S-36	Sapotaceae	Maulsari	Tree	Flower	Anxiety	Juice	Juice extracted from flowers after adding sugar is used	10	0.12	12.5	2	
Nicotiana tabacum L. AHT-S-07	Solanaceae	Tambakoo	Herb	Leaves	Hypertension	Fragrance	Crush the dry form of leaves, burn them and fragrance of its smoke is used.	16	0.2	20	3	
Nymphaea lotus L. AHT-S-30	Nymphaeaceae	Nelopher	Herb	Flower	Hypertension	Paste	Paste of flower with rose water is eaten.	14	0.17	17.5	3	
Ocimum basilicum L**.** AHT-S-37	Lamiaceae	Tulsi	Herb	Leaves	Hypertension	Decoction	Boiled dried leaves along with milk and sugar to make tea and use once a day.	8	0.1	10	2	Saki *et al.* (2014) Guzmán Gutiérrez *et al.* (2014)
Olea ferruginea Royle AHT-S-38	Oleaceae	Kahu	Shrub	Leaves	Anxiety	Paste	Paste of crushed leaves with sugar is taken twice a day.	4	0.05	5	1	
Papaver somniferum L**.** AHT-S-44	Papaveraceae	Aphium	Herb	Fruit	Hypertension	Paste	Paste of grinded fruit with rose water is taken daily.	10	0.12	12.5	2	Sadegi *et al.* (2014)
Passiflora incarnata L. AHT-S-54	Passifloraceae	--------	Herb	Flower	Anxiety	paste	Boil flowers in small amount of water to make a paste and take it after adding sugar.	7	0.08	8.7	2	Saki *et al.* (2014)
Peganum hermala L. AHT-S-13	Zygophyllaceae	Hermal	Herb	Seed	Hypertension	Powder	Grind Seed, take this powder daily	8	0.1	10	2	Ziyyat *et al.* (1997) Tahraoui *et al.* (2007) Saki *et al.* (2014)
Piper nigrum L. AHT-S-33	Piperaceae	Kali mirch	Herb	Seed	Hypertension	Powder	Grind seed, take with honey or brown sugar daily.	11	0.13	13.7	2	Inta *et al.* (2013)
Plantago lanceolata L. AHT-S-28	Plantaginaceae	Ispaghol	Herb	Seed	Hypertension	Paste	Paste of grinded seeds with juice extracted from *Coriandrum sativum* is taken	1	0.01	1.2	1	
Plantago major L. AHT-S-03	Plantaginaceae	Takhumbartang	Herb	Leaves	Hypertension	Juice	Juice extracted from crushed leaves is used to treat the disease.	2	0.02	2.5	1	

Ribes nigrum L. AHT-S-56	Grossulariaceae	Monakaa	Herb	Fruit	Anxiety	Paste	Dry the pulp of fruit of *Syzygium cumini* and add *Ribes nigrum* and *Nymphaea lotus* after grinding the pulp and eat.	9	0.11	11.2	2	
Solanum nigrum L. AHT-S-35	Solanaceae	Mako	Herb	Leaves	Hypertension	Infusion	Soak leaves in water for night, take this infusion daily	3	0.03	3.7	1	
Syzygium cumini (L.) Skeels AHT-S-25	Myrtaceae	Jaman	Tree	Fruit	Hypertension	Powder	Powdered form of dry fruit is used	9	0.11	11.2	2	
Taraxacum officinale F.H. Wigg. AHT-S-05	Asteraceae	Dandelion	Herb	Flower	Anxiety	Paste	Paste of grinded flower with *Allium cepa* juice is taken after breakfast.	5	0.06	6.2	1	
Terminalia arjuna (Roxb.ex DC.) Wight & Arn. AHT-S-20	Combretaceae	Arjun	Tree	Bark	Hypertension	Decoction	Boil in water, also add milk in the decoction, take it for 7 days.	9	0.11	11.2	2	
Terminalia bellirica (Gaertn.) Roxb. AHT-S-48	Combretaceae	Baherra	Tree	Fruit	Hypertension	Decoction	Boil fruit in water, one cup of this decoction is taken once a day.	5	0.06	6.2	1	
Valeriana officinalis L. AHT-S-23	Caprifoliaceae	Miki	Herb	Root	Anxiety	Infusion	1 glass infusion of fresh leaves is used daily.	4	0.05	5	1	
Verononia athelmintica (L.) Willd. AHT-S-16	Apiaceae	Kali zeri	Herb	Seed	Hypertension	Paste	Seeds are grinded and make paste with vinegar and eat	2	0.02	2.5	1	
Viola odorata L. AHT-S-18	Violaceae	Banafsha	Herb	Flower	Hypertension	Fragrance	Fragrance of flower is used.	5	0.06	6.2	1	
Zingiber officinale Roscoe AHT-S-22	Zingiberaceae	Adrak	Herb `	Rhizome	Hypertension	Concoction	Bulbs of *Allium sativum* and *Allium cepa*, and the rhizome of *Zingiber officinale* is boiled in water one glass is taken twice daily.	17	0.21	21.2	3	Gbolade. (2012)
Ziziphus jujuba Mill. AHT-S-19	Rhamnaceae	Unaaab	Trees	Leaves	Hypertension	Infusion	Leaves are soaked in water and drink this infusion.	7	0.08	8.7	2	

FC*; Frequency Citation, RFC*; Relative Frequency of Citation, PRK*; Percentage of Respondents having Knowledge about medicinal plants, PR*; Preference Ranking of cited

Analysis shows that among the reported 36 plant families, highest number of the medicinal plants species belong to family Asteraceae (9 species). The reason for dominance of family Asteraceae is due the presence of large number of bioactive compounds in this family that are quite effective against anxiety and hypertension (Thomas *et al.* 2009). Among all the studies plants habit, herbs have highest percentage of use (80%) against both anxiety and hypertension. The reason for the dominance is the better adaptation of herbs in the study area as compared to shrubs and trees (Mesfin *et al.* 2012). Moreover, herbs are easily accessible as compared to other species habits like trees and shrubs. It was observed that the dominant plant parts to cure anxiety and hypertension were leaves with (31.03%), followed by seed and fruits (20.68%). This may be due the vital position of leaves in plant body as due to photosynthetic region the leaves are rich source of secondary metabolites which are source of medicine for human (Bhattarai *et al.* 2006). Moreover, the use of leaves are more clean and clear part of plant than lower or underground (root, stem, root etc.) parts that are suspected to be more contaminated (Giday *et al.* 2003**,** Zheng & Xing 2009). Frequent use of leaves is less harmful for plant life, in addition to this leaves are available more abundantly and frequently after vegetative growth as compared to seeds and fruits which are available after vegetative growth. Highly used mode of utilization is paste (23%), followed by decoction (21%), crushing the used parts with sugar or honey as additive to make a paste is common practice and according to the perception of the natives of the study area, preservation timing of ingredients is enhanced by this practice.

Literature survey revealed that some of the cited plants species have been reported for curing anxiety or hypertension either with similar or dissimilar use reports. Ziyyat *et al.* (1997) studied 73 plants of oriental Morocco. Among these plants two species viz. *Allium sativum*, *Peganum harmala* have the same uses. Di Stasi *et al.* (2002) reported 114 remedies with similar use viz. *Allium sativum*, and 1 with use dissimilar use viz. *Coriandrum sativum* which are reported for hypertension*,* one plant with similar use viz. *Mentha piperita* and one with dissimilar use viz. *Matricaria chamomilla* reported for anxiety. Tahraoui *et al.* (2007) reported 64 plants of southeastern Morocoo with four plants with similar use viz. *Allium cepa*, *Allium sativum*, *Datura stramonium, Peganum harmala*. Au *et al.* (2008) described 94 species of Hakka herbal plants from Guangdong China, including one plant species with dissimilar use viz. *Helianthus annuus* Jabeen *et al.* (2009) reported 245 plants from the Margalla Hills National Park, Islamabad. two plant with similar use viz. *Cannabis sativa, Lactuca serriola* against anxiety.

Mensah *et al.* (2009) reported 33 plants species used by the Esan people of Edo State, Nigeria, with two plant species with similar use viz. *Allium sativum, Allium cepa* against hypertension.

Benitez *et al.* (2010) catalogued 229 plants used against 100 different Human health problems with one plant species with similar use viz. *Allium cepa* against hypertension. Gbolade (2012) worked on 70 plants in Edo State of Nigeria with three plant species with similar use viz. *Allium cepa, Zingiber officinale* and *Allium sativum* against hypertension. Moshi *et al.* (2012) visited the Kagera region of northwestern Tanzania to describe 49 plant species. Including one plant species against hypertension with dissimilar use viz. *Catharanthus roseus*. Inta *et al.* (2013) studied the 93 medicinal plants of the Yunnan in Thailand. One plant with similar use viz. *Allium sativum* and one with dissimilar use viz. *Piper nigrum* against hypertension. Raji *et al.* (2013) documented 34 ethnomedicinal plants of Sokoto, Northwest Nigeria including one antihypertensive plant species with similar use viz. *Allium sativum.* Saki *et al.* (2014) have quoted 12 plant species among them 8 plants species with the same use viz. *Hypericum perforatum, Achillea millefolium, Foeniculum vulgare, Matricaria chamomilla, Mentha piperita, Ocimum basilicum, Passiflora incarnata, Peganum harmala.* Guzmán Gutiérrez *et al.* (2014) reported 92 plants of Mexico with four plants with dissimilar use viz. *Achillea millefolium, Chrysanthemum indicum, Foeniculum vulgare, Ocimum basilicum* and onr plant with similar use viz. *Helianthus annuus* against anxiety. Sadegi *et al.* (2014) worked on of 64 medicinal of Saravan region, Baluchistan, Iran. They mentioned one plant viz. *Papaver somniferum* against anxiety with dissimilar use, while one plant with similar use viz. *Datura stramonium.* Prasadacharyulu *et al.* (2015) reports eight Anxiolytic Natural Medicines (ANM) of eight medicinal plants with one plant species with dissimilar use viz. *Coriandrum sativum* against anxiety. However, the current study revealed that there is a dire need to document and explore the indigenous knowledge in this context. Further research is needed to explore the detailed phytochemical composition of these reported taxa.

Conclusions

This research summarized the ethnobotanical uses of native plants against anxiety and hypertension in Sargodha region and allied areas. Natural plants no doubt represent a part of the natural heritage for the people of entire region. Currently, there is no commercial pharmaceutical industry specialized in the production of indigenous plants in the Sargodha division and allied region. The main reason is the lack of scientific knowledge about the native plants, particularly proper identification, conservation status and ethnobotanical uses. The study will increase

the awareness, particularly of the new generations, about the native plants in the natural environment of the region. The outcome of the present study would be helpful to better understanding the potential value of native plants. This concise information will help the local people, researchers, traditional healers and academicians to identify and use the appropriate indigenous plants for different developmental studies. Moreover, the similarity in the use of the same species in different cultures over a long period indicates that these plants may be effective in curing anxiety or hypertension and difference between the part used and mode of utilization of medicinal plants provides fresh ethnomedicinal knowledge.

Based on the present study it is concluded that ethnic communities of Sargodha division and allied areas of Pakistan still practice herbal remedies to cure anxiety and hypertension. But the lack of interest and unawareness of new generations is the major reason of erosion of such precious knowledge. There is need to document the ethnomedicinal knowledge for conservation of biodiversity and cultural heritage. Moreover, screening of documented plants for development of new drugs is recommended to confirm the activity of plants and their mechanism of action.

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