Analysis of ethnomedicinal practices for treating skin diseases in communities on Jeju Island (Korea)

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The aim of this study is to record and analyze the first to the orally transmitted traditional knowledge for the treatment of skin disease in East Asia. Data was collected using participant observations and in-depth interviews. Quantitative analyses were accomplished through the informant consensus factor, fidelity level, and social network analysis. The 68 ethnomedicinal practices recorded from the communities for treating 12 types of skin diseases were classified into 27 families, 30 genera, and 31 species that included plants and animals. The highest degree of consensus from the informants was atopic dermatitis (1.00) and the lowest degree was for herpes labialis (0.67). This study determined 16 species of plants with a FL of 100%. The social network analysis between skin diseases and the medicinal species depicts the four ailment groups. This research suggests the use of social network analysis as a new approach for various interpretations to ethnomedicinal practices within communities.

Keywords: Ethnomedicinal practices, Skin disease, Fidelity level, Informant consensus factor, Social network analysis, Korea

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Traditional medicinal knowledge is considered to be an important system of complementary and alternative medicine. The significance of traditional medicinal knowledge has grown extensively with the announcement of the Nagoya Protocol in October, 20101.

Traditional medicinal knowledge is divided into both recorded and orally transmitted knowledge. With regards to recorded medicinal knowledge, the public sharing of healthcare within local communities poses no threat; however, due to the fact that orally transmitted medicinal knowledge has not been recorded through proper investigative channels, problems related to its identity and the public sharing of medicinal benefits will occur.

Some research in countries around the world has investigate orally transmitted traditional knowledge for treating skin disease, which include India2, and Pakistan3 in Asia, South Africa4, Kenya5, and Nigeria6 in Africa, Argentina7 in the Americas, and Italy8 in Europe.

Jeju Island of Korea has been selected for study as it possesses a wonderful ecological geography and a unique traditional culture. It was designated as a Biosphere Reserve in 2002, a World Natural Heritage in 2007, and a Global Geopark in 2010.

The first reported floral investigation of Hallasan National Park began by Nakai9, who reported 1,433 species, with both Lee and Park et al.10 examining the same area. The latest flora count reported 1,800 species by Kim11 to 1,990 species by Kim et al.12 in 2006.

The investigation of its medicinal plants began first with 405 species being recorded by Do et al.13. In 1968, 494 species were classified by Do14, and 425 species were reported by Yuk15. In 2004, 801 species were reported by Kim. However, a study regarding the treatment of skin disease, through the use of orally transmitted traditional knowledge, has yet to be considered.

Therefore, the aim of this study is to record and analyze the first to the orally transmitted traditional knowledge for the treatment of skin disease in East Asia.
Research area and methods

Natural and social environment of the research area

Jeju Island, as the largest volcanic island in Korea, includes Mt. Halla (1,950 m) and over 360 other parasitic volcanos and is also composed of eight inhabited isles and 54 uninhabited islets. The study area lies between 33° 06' N to 34° 00' N latitude and 126° 08' E to 126° 58' E longitude (Fig. 1). The annual average temperature is 15.3°C and the annual precipitation is approximately 1,500–1,600 mm. The study area is divided into two cities, which include seven counties, five subcounties, and thirty-one villages in its administrative district and measures 1848.85 km² in area\(^6\). The total population in 2011 was 583,284\(^6\).

Research methods

Field investigations were conducted from March 2009 to November 2012. Proper data was collected using participant observations and in-depth interviews, as the informants also become investigators themselves through attending informal meetings, open and group discussions, and overt observations with semi-structured questionnaires\(^ {17}\).

The content of the semi-structured questionnaires was composed of diverse information regarding medicinal species used to treat skin diseases, including local names, used parts, ailments, methods of preparation, manufacturing and administration, dosage, and the usable duration regarding each curable formula\(^ {17,18,19}\).

All specimens were collected during their flowering or fruiting seasons, and were organized utilizing the normal specimen manufacturing method\(^ {18}\). The voucher specimens were deposited for preservation in the herbarium of Jeonju University. The precise identification of species mentioned by the informants was performed in accordance with Lee\(^ {20}\), Lee\(^ {21}\), and Ahn\(^ {22}\). Scientific names were confirmed by the National Knowledge and Information System for Biological Species of Korea\(^ {23}\).

Quantitative analysis

Informant consensus factor (ICF)

The ICF was used to analyze the agreement degree of the informants' knowledge about each category of ailments\(^ {24,25}\). The ICF was calculated using the following formula:

\[
ICF= \frac{(n_{ur}−n_{t})}{(n_{ur}−1)}
\]

where \(n_{ur}\) is the number of use reports of informants for a particular skin disorder, and \(n_{t}\) is the number of species used by all informants for a particular skin disorder.

Fidelity level (FL)

The FL was employed to determine the most important species used for treating certain skin diseases by the local practitioners and the elderly residents living in the study area\(^ {17,26}\). The FL was calculated using the following formula:

\[
FL(\%)=\frac{N_p}{N}\times100/N
\]

where \(N_p\) is the number of informants that mentioned the specific species used to treat certain disorders, and \(N\) is the total number of the informants who utilized the species as medicine for treating any given disorder.

Social network analysis (SNA)

Social network analysis does not focus on the independent characteristics of an individual within the community, but considers the results of the interrelationship among each individual of a community. Social network analysis has been applied within communities for various ethnographical problems, including ethnogenesis\(^ {27}\) and obesity\(^ {28}\).

However, prior to this research, the inter-network analysis had yet to be applied to ethnomedicinal knowledge, included with its ethnographical properties in the results.

Our research newly applied this method in order to attain more network information from the treatment of
ethnomedicinal practices on skin diseases within communities in Korea. The network map of ailments-species was constructed the following:

- Matrix of ailments-species was made from mention numbers of ailments in the specific species.
- After analysis of this matrix was using UCINET (Ver. 6.460), we graphed to network map using NetDraw (Ver. 2.125) software. 

Results and discussion

Demographic characteristics

All informants were randomly selected from community halls, the senior welfare centers, and the traditional markets. The ethnomedicinal practices for skin diseases were recorded by 70 informants (31 men, 39 women) at 17 sites (Fig. 1). The average age of the informants was 79 yrs of age, with a range in age from 54 to 94, with residents living more than 30 yrs in the study area. The ethnographical characteristics of the communities are summarized in Table 1.

Linguistically, the languages of the communities on Jeju Island possess numerous dialects different from the inland communities of the Korean peninsula. In regards to foods, the food traditions in the communities on Jeju Island are quite diverse from foods of the inland communities, particularly in relation to recipes and ingredients.

These two distinctive points of Jeju Island are that the communities on Jeju Island display extreme peculiarity because of geographical separation and their historical background.

Analysis of ethnomedicinal practices for skin diseases

The kinds of skin diseases treated by ethnomedicinal practices were skin-related ailments, burns, furuncle, cradle cap, pruritus, eczema, herpes labialis, rhus allergy, atopic dermatitis, acne, frostbite, and xerocheilia (Table 2). The 12 types of skin diseases recorded in this study were less than in previous research, which classified 14 types of respiratory system diseases, 29 types of digestive system diseases, and 23 types of pain relief treatment in other regions. It has been determined that the communities on Jeju Island possess relatively less ethnomedicinal practices related to skin conditions compared to other health concerns of inland regions in Korea.

The 68 ethnomedicinal practices recorded from the communities were classified into 27 families, 30 genera, and 31 species that included plants and animals (Table 2). Among these species, plants totaled 57 ethnomedicinal practices based on 19 families, 22 genera, and 23 species while animals included 11 ethnomedicinal practices based on 8 families, 8 genera, and 8 species. These usage patterns were different from Korean traditional medicine, in which plants are used relatively much more than animals. Research confirms that the communities have focused on direct nutritional supplements from traditional medicine rather than seek after an actual cure for their skin diseases.

The number of medicinal species and ethnomedicinal practices for skin-related ailments consisted of 16 species (32.6% of the total species) and 31 ethnomedicinal practices (45.6% of the total therapies). Burns utilized eight species (16.3% of the total species) and eight ethnomedicinal practices (11.8% of the total therapies).

Also, the number of informants who mentioned skin-related ailments and cases of burns occupied 42.9%, which totaled 21% of the whole, respectively (Table 2). As a result, the communities tended to use ethnomedicinal practices to care for their overall health instead of as a cure for a long-term condition.

For plants, 15 used parts were used in therapy, while six used parts of animals were used in treatment. 19 kinds of plant preparations were prepared, with five preparations made for animals (Table 2). The usage recorded is similar to previous research for other diseases.

Among the medicinal species, the most often mentioned plant was Phryma leptostachys var.
Table 2—Species for treating skin diseases in communities on Jeju Island in Korea

<table>
<thead>
<tr>
<th>Family</th>
<th>Scientific name</th>
<th>Korean name</th>
<th>Used part</th>
<th>Ailments</th>
<th>Preparation</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apiaceae</td>
<td><em>Centella asiatica</em> (L.) Urb.</td>
<td>Byeongpul</td>
<td>Leaf</td>
<td>Furuncle</td>
<td>Paste</td>
<td>Topical</td>
</tr>
<tr>
<td>Asteraceae</td>
<td><em>Artemisia princeps</em> Pamp.</td>
<td>Ssuk</td>
<td>Leaf, whole part, young leaf</td>
<td>Skin related diseases</td>
<td>Bath, infusion</td>
<td>Topical</td>
</tr>
<tr>
<td></td>
<td><em>Sigesbeckia glabrescens</em> (Makino) Makino</td>
<td>Jindeukchal</td>
<td>Young leaf</td>
<td>Furuncle</td>
<td>Infusion</td>
<td>Topical</td>
</tr>
<tr>
<td>Balaenopteridae</td>
<td><em>Xanthium strumarium</em> L.</td>
<td>Dokkomari</td>
<td>Leaf</td>
<td>Pruritus</td>
<td>Infusion</td>
<td>Topical</td>
</tr>
<tr>
<td>Cactaceae</td>
<td><em>Opuntia ficus-indica</em> var. saboten Makino</td>
<td>Sonbadakseo</td>
<td>Stem</td>
<td>Eczema</td>
<td>Infusion</td>
<td>Topical</td>
</tr>
<tr>
<td></td>
<td><em>Lonicera japonica</em> Thunb.</td>
<td>Indongdeonggul</td>
<td>Stem</td>
<td>Rhus allergy</td>
<td>Infusion</td>
<td>Topical</td>
</tr>
<tr>
<td>Canidae</td>
<td><em>Canis familiaris</em> L.</td>
<td>Gae</td>
<td>Fat</td>
<td>Burn</td>
<td>Oil</td>
<td>Topical</td>
</tr>
<tr>
<td>Caprifoliaceae</td>
<td><em>Lonicera japonica</em> Thunb.</td>
<td>Indongdeonggul</td>
<td>Stem</td>
<td>Atopic dermatitis</td>
<td>Infusion</td>
<td>Topical</td>
</tr>
<tr>
<td>Colubridae</td>
<td><em>Elaphe dione</em> Pallas</td>
<td>Nurakbaem</td>
<td>Slough</td>
<td>Skin related diseases</td>
<td>Maceration, roast</td>
<td>Topical</td>
</tr>
<tr>
<td>Equidae</td>
<td><em>Equus caballus</em> L.</td>
<td>Mal</td>
<td>Fat</td>
<td>Burn</td>
<td>Oil</td>
<td>Topical</td>
</tr>
<tr>
<td>Euphorbiaceae</td>
<td><em>Ricinus communis</em> L.</td>
<td>Pimaja</td>
<td>Leaf</td>
<td>Rhus allergy</td>
<td>Infusion</td>
<td>Topical</td>
</tr>
<tr>
<td>Fabaceae</td>
<td><em>Glycine max</em> (L.) Merr.</td>
<td>Kong</td>
<td>Seed</td>
<td>Skin related diseases</td>
<td>Maceration, paste</td>
<td>Topical</td>
</tr>
<tr>
<td></td>
<td><em>Allium scorodoprasum</em> var. viviparum Regel</td>
<td>Maneul</td>
<td>Bulb</td>
<td>Cradle cap</td>
<td>Oil</td>
<td>Topical</td>
</tr>
<tr>
<td>Hominidae</td>
<td><em>Homo sapiens</em> L.</td>
<td>Saram</td>
<td>Total</td>
<td>Urine</td>
<td>Raw</td>
<td>Topical</td>
</tr>
<tr>
<td>Lauraceae</td>
<td><em>Neolitsea sericea</em> (Blume) Koidz.</td>
<td>Chamsiknamu</td>
<td>Fruit</td>
<td>Cradle cap</td>
<td>Oil</td>
<td>Topical</td>
</tr>
<tr>
<td>Liliaceae</td>
<td><em>Allium scorodoprasum</em> var. viviparum Regel</td>
<td>Maneul</td>
<td>Bulb</td>
<td>Furuncle</td>
<td>Applying, juice</td>
<td>Topical</td>
</tr>
<tr>
<td>Mustelidae</td>
<td><em>Meles meles</em> L.</td>
<td>Osori</td>
<td>Fat</td>
<td>Burn</td>
<td>Oil</td>
<td>Topical</td>
</tr>
<tr>
<td>Papaveraceae</td>
<td><em>Papaver somniferum</em> L.</td>
<td>Yanggwibi</td>
<td>Fruit, Latex, Stem</td>
<td>Furuncle</td>
<td>Applying, O</td>
<td>Topical</td>
</tr>
<tr>
<td>Pedaliaceae</td>
<td><em>Sesamum indicum</em> L.</td>
<td>Chamkkae</td>
<td>Seed</td>
<td>Pruritus</td>
<td>O</td>
<td>Topical</td>
</tr>
<tr>
<td>Phasianidae</td>
<td><em>Gallus gallus domesticus</em> L.</td>
<td>Dak</td>
<td>Fat</td>
<td>Skin related diseases</td>
<td>O</td>
<td>Topical</td>
</tr>
<tr>
<td></td>
<td><em>Phryma leptostachya</em> var. asiatica H. Hara</td>
<td>Paripal</td>
<td>The yolk of an egg</td>
<td>Acne</td>
<td>O</td>
<td>Topical</td>
</tr>
<tr>
<td>Phrymaceae</td>
<td><em>Phylica angustifolia</em> var. asiatica H. Hara</td>
<td>Paripal</td>
<td>Root</td>
<td>Pruritus</td>
<td>O</td>
<td>Topical</td>
</tr>
</tbody>
</table>

(contd.)
asiatica H. Hara (mentioned 58.3% in the total), while for animals was Equus caballus (24.3%). Through continued research, these species can certainly be developed into functional supplements for particular skin diseases.

**Quantitative analysis**

**Informant consensus factor (ICF)**

The informant consensus factor ranges from 0 to 1, where the increasing values indicate a higher rate of informant consensus among the illness category. The category with the highest degree of consensus from the informants were atopic dermatitis (1.00), followed by pruritus (0.91), skin-related ailments (0.86), and burns (0.86). The lowest degree of consensus was for herpes labialis (0.67) (Table 3). These results dictate that ethnomedicinal practices have been applied more often to minor health issues related to the skin.

More often, people suffering from serious skin diseases have been treated in the hospital using conventional medicine or Korean traditional medicine. However, ethnomedicinal practices have been used to treat atopic dermatitis and pruritus.

<table>
<thead>
<tr>
<th>Symptom and ailment categories</th>
<th>Use citations</th>
<th>Taxons</th>
<th>ICF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atopic dermatitis</td>
<td>5</td>
<td>1</td>
<td>1.00</td>
</tr>
<tr>
<td>Pruritus</td>
<td>23</td>
<td>3</td>
<td>0.91</td>
</tr>
<tr>
<td>Skin related diseases</td>
<td>106</td>
<td>16</td>
<td>0.86</td>
</tr>
<tr>
<td>Burn</td>
<td>52</td>
<td>8</td>
<td>0.86</td>
</tr>
<tr>
<td>Furuncle</td>
<td>29</td>
<td>7</td>
<td>0.79</td>
</tr>
<tr>
<td>Cradle cap</td>
<td>15</td>
<td>4</td>
<td>0.79</td>
</tr>
<tr>
<td>Eczema</td>
<td>8</td>
<td>3</td>
<td>0.71</td>
</tr>
<tr>
<td>Herpes labialis</td>
<td>4</td>
<td>2</td>
<td>0.67</td>
</tr>
<tr>
<td>Rhus allergy</td>
<td>2</td>
<td>2</td>
<td>0.00</td>
</tr>
<tr>
<td>Acne</td>
<td>1</td>
<td>1</td>
<td>0.00</td>
</tr>
<tr>
<td>Frostbite</td>
<td>1</td>
<td>1</td>
<td>0.00</td>
</tr>
<tr>
<td>Xerocheilia</td>
<td>1</td>
<td>1</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Fidelity level (FL)**

The FL is useful for identifying the informants’ most preferred species in use for treating certain skin diseases. This information reveals that the informants had a tendency to rely on one specific species for treating one specific ailment rather than for several different ailments. The FL values in this study varied from 1.0% to 100%.

Generally, a FL of 100% for a specific species indicates that all of the use-reports mentioned the
same species for a specific treatment. This study determined 16 species of plants with a FL of 100%, even without considering species that were mentioned more than two times (Table 2). Skin conditions which contained a higher number of species assessed to a FL of 100% were skin-related ailments (6 species) and burns (4 species).

Special attention was given to important species (N, Np) with a FL above 100%, regarding the viewpoint of the number of times mentioned and the consensus level for the specific ailment, like *Solanum tuberosum* L. (17, 17), *Papaver somniferum* L. (12, 12), *Neolitsea seicea* (Blume) Koids. (6, 6), *Lonicera japonica* Thunb. (5, 5) and *Duchesnea indica* (Andr.) Focke (5, 5) (Table 2). Through further clinical study, these species possess a much higher potential in being used in the development of new drugs for skin diseases.

**Social network analysis between skin diseases and medicinal species**

SNA has originally analyzed social phenomenon and trends through the network of components. Our research has attempted to analyze the interrelationship between skin diseases and the medicinal species recorded in the communities.

Considering Fig. 2, the main aggregate consists of four groups: skin-related ailments, burns, furuncle, and cradle cap. First, the results expose that people trend to use the same medicinal species for treating these four different conditions. Second, the residents are inclined to use exceedingly more ethnomedicinal practices for the treatment of these four conditions than any other disease.

Herpes labialis and atopic dermatitis are distinctly separated from the main aggregate. This data explains that people do not plentifully use ethnomedicinal practices to treat these conditions.

Among the medicinal animals utilized for treating skin conditions, the fat of *Meles meles*, the fat of *Equus caballus*, the fat of *Canis familiaris*, and the urine of *Homo sapiens* are applied for treating burns. The fat of *Equus caballus* and the fat of *Gallus gallus domesticus* are applied for Rhus allergy, while whole part of *Hirudo nipponica* is utilized for herpes labialis.

In the case of medicinal plants, except for *Lonicera japonica* Thunb. for treating atopic dermatitis and *Oryza sativa* var. *terrestis* Makino for the treatment of herpes labialis, the whole plant is used together to treat skin diseases.

In regards to the pattern of total distribution, most medicinal species are indiscriminately utilized for treating skin conditions.
Conclusion

This research is regarded as the first study to record and analyze ethnomedicinal practices used in the treatment of skin conditions within the communities in East Asia. After the National Health Care System legally admitted Korean traditional medicine, the end results nearly brought about the disappearance of ethnomedicinal practice in Korea. Also, the fast urbanization of the rural communities in Korea has greatly accelerated the loss of ethnomedicinal practices.

In this research, recording 68 ethnomedicinal practices as being used to treat 12 skin diseases, has been very inspiring. Particularly, the present application of various medicinal species is evidence as to which ethnomedicinal practices are continuously being transmitted within the communities on Jeju Island. However, this situation will be not sustainable because the communities of the research area consist of an aging society. This fact pinpoints the necessity for appropriate alternatives to be taken to preserve these ethnomedicinal practices.

The custom of communities on Jeju Island is considerably different and life is isolated from the inland regions of the Korean peninsula. For this reason, the 68 ethnomedicinal practices and 16 species of plants with a FL of 100% recorded in this study area is relatively less than those compared to other health concerns of inland regions in Korea.

The results of the ICF analysis expose that the ethnomedicinal practices have been applied more often to minor health issues related to skin conditions. Particularly, the results of the SNA application in this study provide various networks related to skin diseases and medicinal species. This approach will draw in new conclusions beyond the boundary lines of results obtained from existing research for ethnomedicinal practices. Our research suggests the use of social network analysis as a new approach for various interpretations to ethnomedicinal knowledge within communities around the world.

Acknowledgment

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