

## **Ethnobotanical study of plants used in the treatment of cutaneous infections in urban areas of the region of Grand Casablanca – Morocco-**

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**Abstract:** This work aimed to inventory the medicinal plants used in traditional medicine to treat skin infections by the urban population of the Grand Casablanca region. For obtaining the data, frequent fieldtrips were made to the investigated areas between March and May from 2012 to 2015. The study was conducted with a questionnaire method using a survey sheet submitted at individual interview to a randomly chosen population sample of 2000 persons. Socio-demographic characteristics of the interviewees, used medicinal plants, plant parts used, methods of herbal preparation and administration were then documented. Obtained data showed that among studied populations women and men accounted respectively for 82.70% and 17.30% and a diversity of medicinal plants, traditional and ethnopharmacological knowledge about the uses, preparations and applications maintained among the urban population of the Grand Casablanca region. The results identified 54 species belonging to 34 different botanical families with an important representation of the Lamiaceae family (8 species, 15% of the total inventory). The foliage is the most part of used plants (32.69%) and (22%) of remedies are used raw or mixed with henna (20%) to be applied locally (97%).

**Keywords:** Casablanca (Morocco), Urban Ethnobotany, Traditional Medicine.

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### **I. Introduction**

Since time immemorial, people had naturally recourse to raw plants for traditional preparations or their pure active products as sources of remedies for the treatment of various ailments especially in developing countries [1]. Morocco is one of the countries of the Mediterranean region with climatic conditions that are very diversified and favorable for the development of a rich and varied flora including a very rich potential of endemic Medicinal and Aromatic Plants (MAP), Morocco had also an important medical knowledge based on herbal plants [2]. On the other hand, in Morocco, as in other countries all over the world and specially in emerging countries, the relocation of rural population towards cities was a major phenomenon of the twentieth century that led to rapid changes in the economic, social and cultural fields, and consequently to a change of the relationship between populations and territory with massive migration to cities in search of employment. However, in the healthcare system either in the cities or in the rural communities, medicinal plants continued to have important contributions because of their low cost and the easy availability of plant products in all the markets in the country.

This study focuses on skin diseases that can be bacterial, viral, parasitic or fungal origin because numerous skin diseases are frequently occurring health problems affecting all ages and cause harm in number of ways [3]. So maintaining healthy skin is important for a healthy body and in majority areas of the world, people still rely on herbal medicines for treatment of different skin related problems such as inflammation, boils, skin infections, worms, wounds, swellings, inflammation.

To our knowledge, there has been no reported investigations or published documents in Morocco related to urban ethnobotany, the aim of this article is to identify through surveys data the uses and knowledges of products of traditional pharmacopoeia in order to treat skin infections in the studied urban populations of Casablanca.

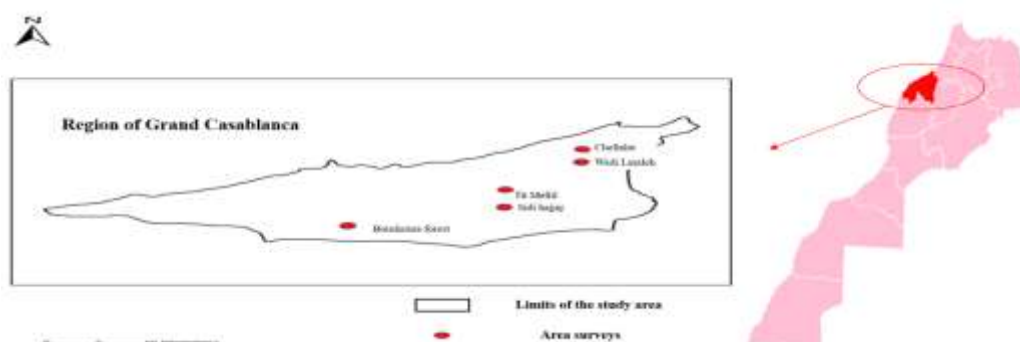
## II. Materials And Methods

### 1. Presentation of the Area Study

Casablanca, the capital of Casablanca-Settat region, the economic, is a financial capital and the first business center in Morocco. It is undoubtedly the largest city and it is located on the Atlantic coast, about 80 km at the south of Rabat, the administrative capital. Casablanca (33° 32' 00" N 7° 35' 00" W) is located on the plain of Chaouia - Ouardigha, one of the main centers of agricultural activity in the country [4]. Its position on the Atlantic Ocean in the west allows it access to marine resources, and in the east and south by the Province of Settat and north by the Province of Ben Slimane. The climate of Grand Casablanca is oceanic: mild, rainy in the winter, humid, and temperate in the summer with no winter frost and high humidity during the year [5].

### 2. Field survey and data Collection Method

Several field surveys were conducted between March and May from 2012 to 2015 in selected areas around Casablanca including Bouskoura forest, WadiLmaleh, Tit Mellil, Chellalat and Sidihejjaj (Figure 1).



**Figure 1.** Study Area in the region of Grand Casablanca

Ethno botanical data were collected through suitable questionnaire (Annex I) and personal interviews of a randomly chosen population's sample of 2000 persons to document uses of medicinal plants to treat skin diseases.

The designed questionnaire included questions to assess socio-demographic characteristics of the interviewees (age, sex, educational level, personal or family income and marital status), data about the used medicinal plants (vernacular identity, used part, preparation mode), the source of the given information, the supply source.

The collected information was listed on the raw data sheets and transferred to an Access database and Dynamic cross analyzes were done using Microsoft Excel 2007.

## III. Quantitative Ethnobotanical Method

After the examination of the survey files, the botanical identification of harvested plant specimens was done using standard taxonomic procedures and literature keys [6, 7] and plants were assigned to a Family, Genus, and Species. The ethnobotanical data analysis was assessed through the following parameters:

### 1. Frequency of Citation (FC)

The use value of a species or its importance in the culture of a community is appreciated by its mentioning rate or its mention frequency by informants[8].

### 2. Informants Consensus Factor (ICF)

In order to indicate the degree of consensus of informants in choosing a plant to treat skin disease, we calculated the Informant Consensus Factor (ICF). The value of this index is between 0 and 1, with high value (> 0.5) indicating only that one or a few species are mentioned by a large proportion of informants for a specific treatment type, while low value (close to 0 value) indicate a great diversity of the mentioned species and that informants do not agree on the plant species to be used to treat a category of disease [9]. The ICF is calculated using the number of use citations ( $N_{Ur}$ ) in each category and the number of plant species ( $N_t$ ) cited through the following formula [10]:

$$ICF = \frac{(N_{Ur} - N_t)}{(N_{Ur} - 1)}$$

$N_{Ur}$ : Number of use report of informants treating this disease

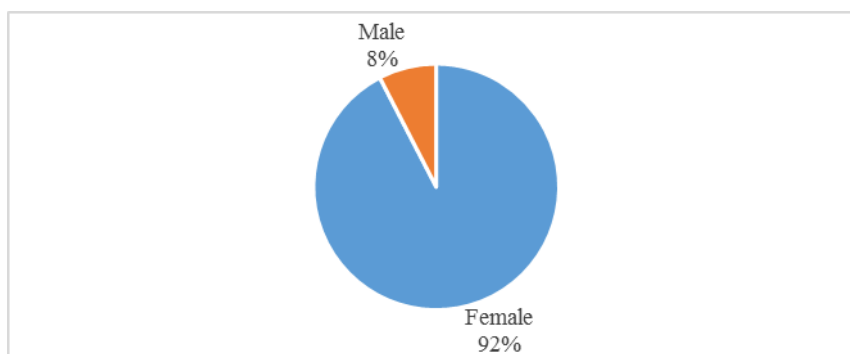
N<sub>i</sub>: Number of taxa used for a particular disease

#### IV. Results And Discussion

##### 1. Frequency of use of Medicinal Plants according to the Profile of the Informants

###### 1.1. By sex

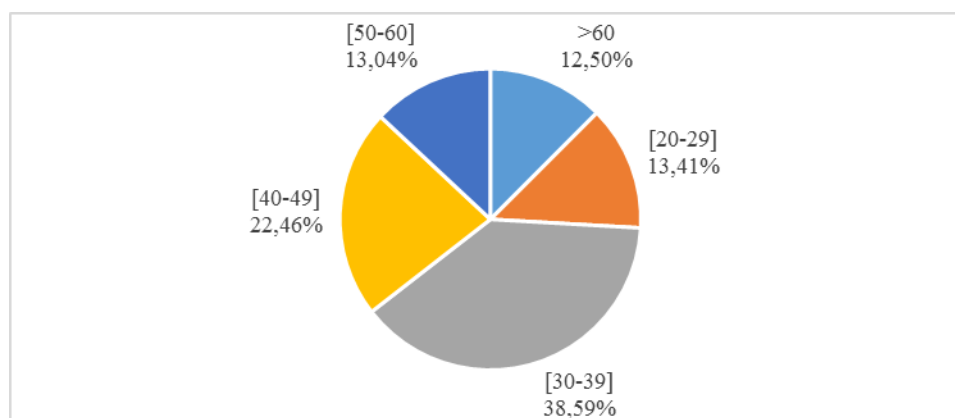
A 44% proportion of the surveyed respondents claimed that they have used herbal therapy to cure skin infections. This high proportion of the respondents having reported using herbal therapy tend to consolidate the estimate of the WHO whereby almost 80% of the population in developing countries use traditional herbal medicine for their primary health care [11]. Furthermore, results showed that both men and women are involved in traditional medicine, however women (1654) practiced the use of herbs for medicinal purposes more than men (346) with respectively 92% and 8% (Figure 2). These results confirm the findings of other ethnobotanical national and international studies which have also shown that women are more traditional herbal knowledge holders [9, 6]. Reported literatures showed that females were more likely than men to make use of herbal remedies and other self-care based forms of alternative medicine and traditional folk medicines [12]. Some others studies have shown that men are the majority users depending on the species studied [13].



**Figure 2.** Frequency distribution of users of medicinal plants in relationship with gender in the Grand Casablanca region

###### 1.2. By age

Results showed that the use of medicinal plants in the Grand Casablanca region is claimed in all age groups with different percentages (Figure 3). In surveyed areas the highest age frequency 38.59% of the respondents using plants was between 30 and 39 years of age and the lowest 12.5% was 60 years and older. Among 507 surveyed persons aged between 50 and 60 years, only 141 have declared their use of medicinal plants for skin problems corresponding to 27.8%. Other studies carried out in Morocco have shown that people of higher age than 61 years have a high frequency of plants use [14, 15]. meaning that older people know a lot about plants and their medicinal uses.

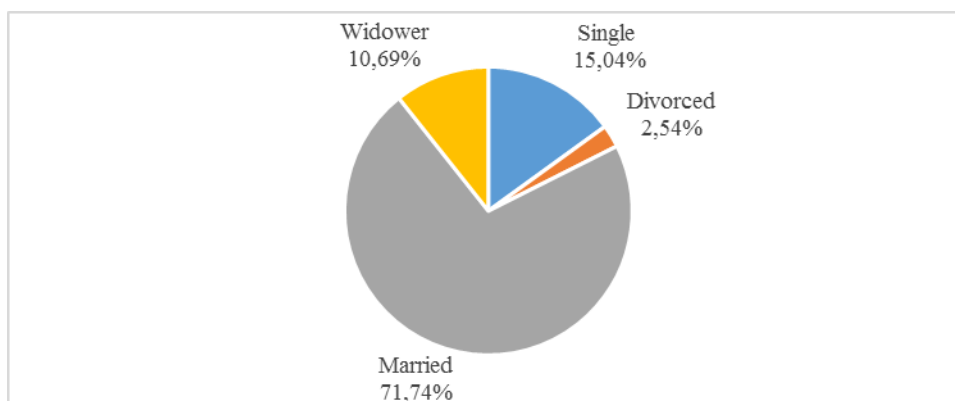


**Figure 3.** Frequency distribution of users of medicinal plants according to age group in the Grand Casablanca region

###### 1.3. By family status

Results demonstrated that 71.74% of the respondents are married and have used herbs in skin therapy (Figure 4). This could be explained by the fact that The use of herbal remedies by family members to treat the

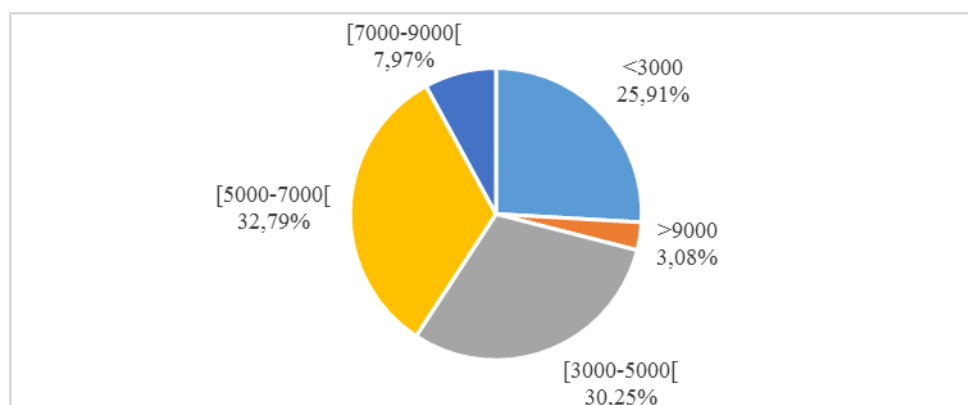
same health problem and probably to seek to minimize the financial charge required by the conventional medicine.



**Figure 4.** Frequency distribution of users of medicinal plants by family status in the Grand Casablanca region

#### 1.4. By income

Collected information pointed out that the therapeutic use of plants concerns all social sections (Figure 5), people with salaries going under 3000,00 MAD /month to 7000,00 MAD /month are the most concerned with the use of plants. Other studies have found that the percentage of use of medicinal plants is noted among those earning less than 1500 MAD/month [9].

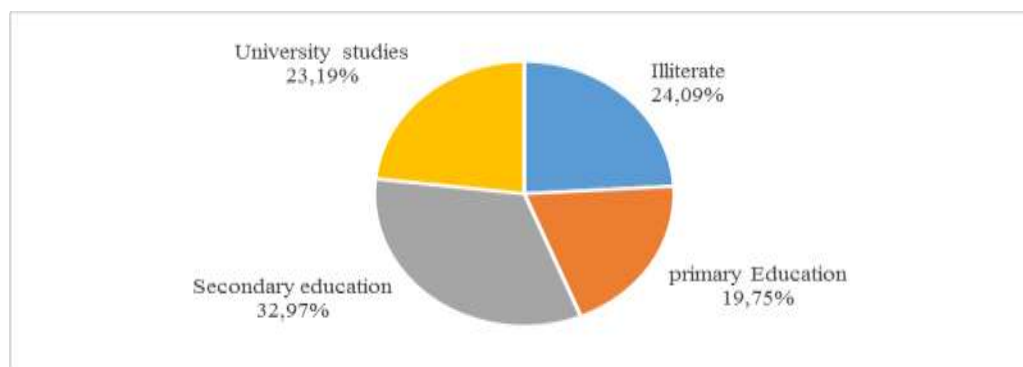


**Figure 5.** Frequency distribution of users of medicinal plants according to the monthly income in MAD /month in the Grand Casablanca region

#### 1.5. By level of education

Regarding the academic level, the results showed that the illiterate and the academics were all users of medicinal plants with roughly the same percentage 24.09% and 23.19% (Figure 6).

This result could be explained by the fact that ethnobotany inheritance is not influenced by the intellectual level of urban people. However, those with a university level are also interested in the use of plants by knowing the therapeutic properties scientifically proven.



**Figure 6.** Frequency distribution of users of medicinal plants by level of education in the Grand Casablanca region

Contrary to the obtained results, others ethnobotanical studies carried in rural areas nationally and internationally, have all shown that educated people have very little interest in the use of plants [13-16].

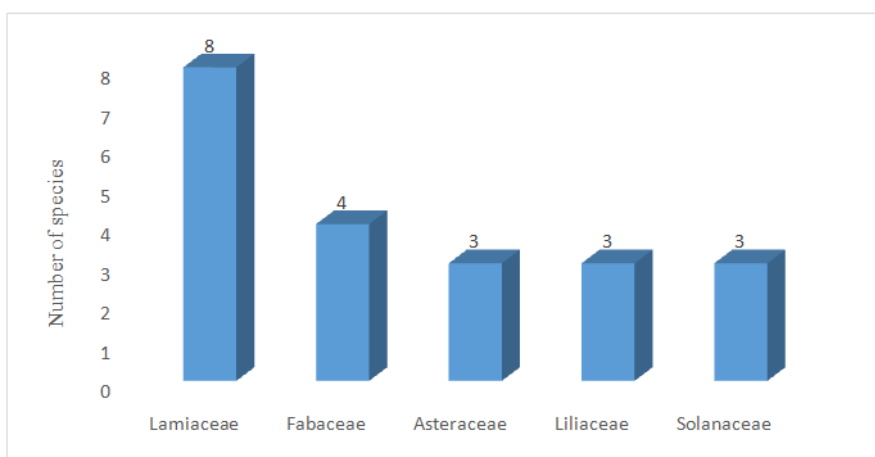
## 2. Floristic Studies

### 2.1. The used Medicinal Plants Species

Our study has shown that the vegetable kingdom tops the products used for medicinal purposes (90%). The floristic analysis of species listed based on 2000 questionnaires developed in Grand Casablanca region, helped to draw up a catalogue of 54 species spread over 34 botanical families used for their medicinal properties against skin infections (annex II). For such species, 7849 lines or mention use have been collected.

### 2.2. The most Presented Botanical Families

During the field survey in our study areas, informants reported ethnomedicinal data on medicinal species belonging to 34 different botanical families, those with the highest number of species being Lamiaceae with 8 species corresponding to 15%, Fabaceae (4 species corresponding to 7.40%), Asteraceae, Liliaceae and Solanaceae with 3 species each is 5.55%. The other remaining families have only one or two species (33 species corresponding to 61.1%) (Figure 7).



**Figure 7.** Frequency distribution of the most cited botanical families in the Grand Casablanca region

### 2.3. Medicinal Plants with very Frequent Use

The information gathered during this survey showed that 20 plants were mentioned by more than 10 informants; *Allium cepa* L. and *Lawsonia inermis* L. came in the top of the list with successively 105 and 102 listing corresponding to a citation relative frequency of 13% for each species (Table 1). On the other hand, the rest of medicinal plants, not reported in the figure, have not been mentioned by some informants.

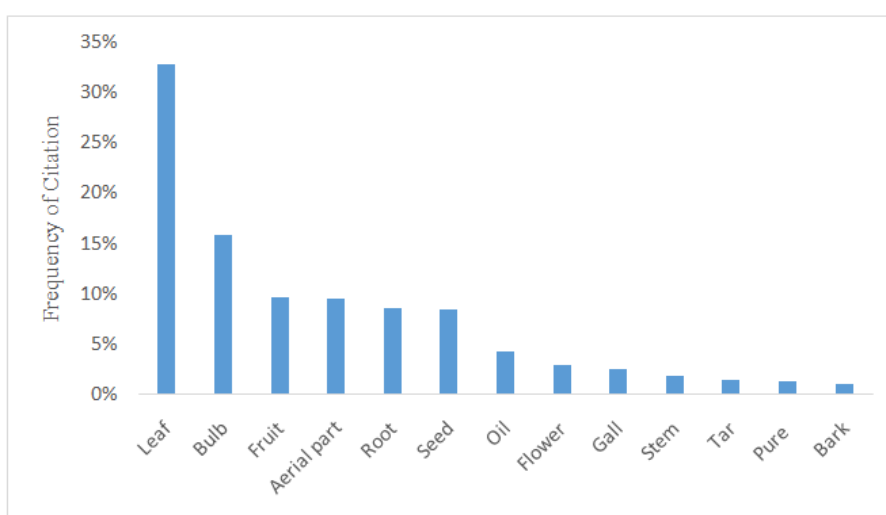
**Table 1:** Frequently plants used in the treatment of skin ailments in the grand Casablanca region

Botanical species	Frequency of Citation
<i>Allium cepa</i> L.	13%
<i>Lawsonia inermis</i> L.	13%
<i>Lepidium sativum</i> L.	7%
<i>Artemisia herba-alba</i> Asso.	7%
<i>Trachypogon dactyloides</i> L.	6%
<i>Citrus limon</i> L.	5%
<i>Marrubium vulgare</i> L.	4%
<i>Salvia verbanaca</i> L.	4%
<i>Quercus infectoria</i>	3%
<i>Solanum lycopersicum</i> L.	3%
<i>Rosmarinus officinalis</i> L.	2%
<i>Allium sativum</i> L.	2%
<i>Argania spinosa</i> L. Skeels	2%
<i>Carpobrotus edulis</i> (L.) N.E.Br.	2%
<i>Olea europaea</i> L.	2%
<i>Zizyphus vulgaris</i>	2%
<i>Tetraclinis articulata</i>	2%
<i>Juniperus oxycedrus</i>	1%

<i>Lavandula officinalis</i> L.	1%
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#### 2.4. Parts of plant used

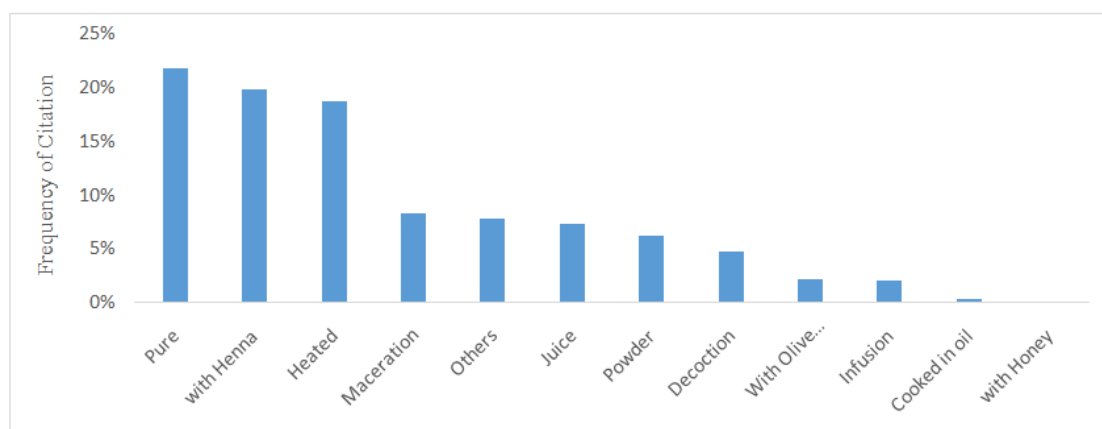
Almost all plant parts, including roots, leaves, stem, fruits, aerial part and seeds, were cited for use in preparing the different remedies (leaves : 33%, bulbs : 16%, fruits :10%, aerial part : 9%, root : 9% and seed : 8 %, less than 15% for all other used parts of plant). However, leaves represented the most common parts used for treating skin ailments in the current study area (Figure 8). Reported studies confirm that the leaves are the most used parts [17, 18, 19]. The high rate of use of leaves can be explained by the fact that they are the storage seat of secondary metabolites responsible for the biological properties [20].



**Figure 8.** Frequency distribution of the different used parts of plants in the treatment of skin ailments in the grand Casablanca region

#### 2.5. Mode of Preparation

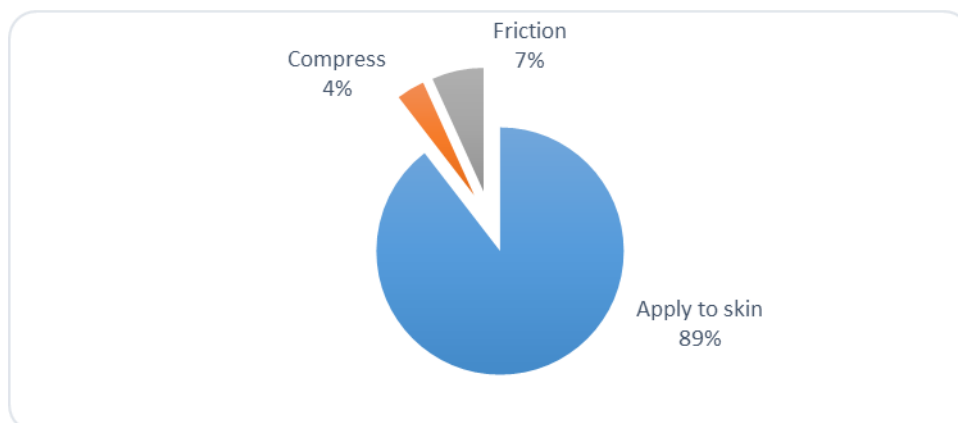
In this study, we observed that the most common use forms was crude raw plants for treatment of skin problems, but to facilitate the administration of the drug, several modes of preparations were cited by surveyed respondents (Figure 9). Indeed, our study showed that the use of plants in mixture with henna is the most frequent mode of preparation (22%), followed by the heating (15.46%) and maceration with less than 10% of cited preparations.



**Figure 9.** Distribution frequency of the different methods of remedies preparation for treatment of skin problems in the grand Casablanca region

#### 2.6. Route of Administration

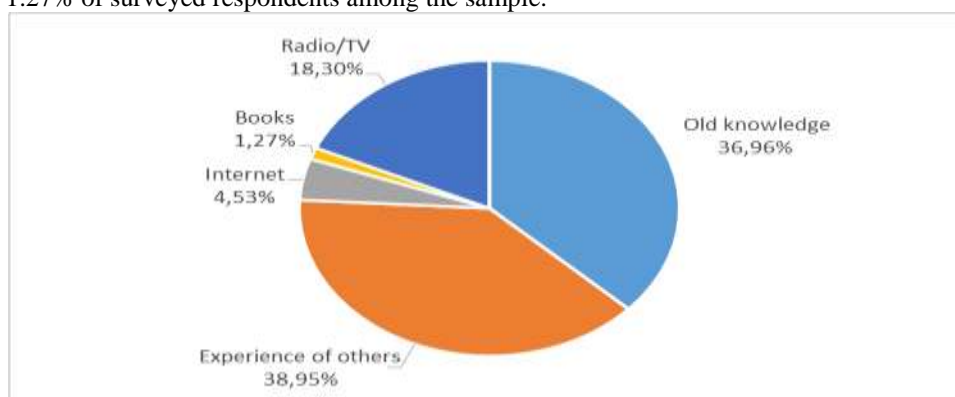
In our study only external applications were reported by the informants in the treatment of various skin ailments. Depending to the type of skin affection, the commonly reported routes of administration are the local drug application (89%), followed by rubbing the plant on the skin (7%), or as a compress (4%) (Figure 10).



**Figure 10.** Frequency distribution of route of administration of plants for the treatment of skin ailments in the grand Casablanca region

### 2.7. Source of Information

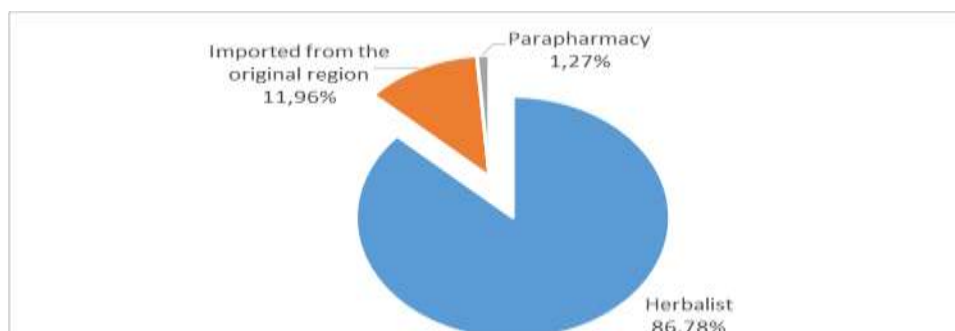
The results in figure 11 illustrate sources of the knowledge of herbal therapy among the sample population. Results tend to show that most knowledge of therapeutic value was transmitted from elderly to the younger generations. Therefore 36.96% of respondents referred to the particular knowledge transmitted by their parents, 38.95% of the study sample claimed to share the knowledge of others. Moreover, audiovisual media as well as books and websites were reported to be sources of the knowledge of herbal therapy for respectively 4.53% and 1.27% of surveyed respondents among the sample.



**Figure 11.** Frequency distribution of different sources of information for the treatment of skin ailments in the grand Casablanca region

### 2.8. Source of Supply

Unlike ethnobotanical studies in the rural areas, the source of supply of plants in the studied areas to almost all of the cases (86.78%) was herbalists (Figure 12). However, some people (11.96%) cling to their origins and rely directly on medicinal plants for treatment. The drugstore was a destination for 1.27% of people who were looking for modern herbal medicine.



**Figure 12.** Frequency distribution of sources of supply of plants for the treatment of skin ailments in the grand Casablanca region



## 2.9. The Informant Consensus Index

The informant consensus factor (ICF) was calculated for the skin indications reported by the respondents. It gives an estimation of user variability of medicinal plants and in our study translated the consistency of informants/users in the choice of plants to treat skin affections. The high ICF value of 0.93 (> 0.5) demonstrates that a high proportion of respondents use only one or a few plant species to treat a skin infections, *Allium cepa* L. and *Lawsonia inermis* L. were the only plant species used by the respondents to treat various forms of skin affections; these species are particularly interesting for research of bioactive compounds [21].

## V. Conclusion

Our study highlighted the importance of the role of traditional herbal medicine in urban areas of Grand Casablanca, which also appears across the proportion of people still have herbal knowledge and expertise (44% of informants acknowledged medicinal qualities). This shows the commitment to the traditional heritage and trust attributed to popular practice. The conducted ethnobotanical survey found that 54 plants are used by local people interviewed for the care of skin infections. These plants belong to 34 botanical families in which the Lamiaceae family is the most represented (8 species, 15%). The foliage was the most used part with a percentage of 33%. Henna mixture is the most practiced dosage form (22%). The richness of the results shows that it is necessary to save this precious cultural heritage and to validate scientifically the remedies identified by rigorous experimental work.

## Knowledgments

We extend our appreciation to all people who agreed to participate in our survey. We warmly thank Professor M. Fannan from the scientific institute of Rabat for his advance and guidance made in plant identification. Also, special thanks go out to A. Darouich (Phd Student) for his help in data processing.

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Annex II:

Botanical family	Scientific name	Number of citation	vernacular name	Part used	Mode of Preparation	Method of administration
Aizoaceae	<i>Carpobrotus edulis</i> (L.) N.E.Br.	16	Nebtat legzymba (ghassoul)	Leaf	Chopped off	Apply to skin
Apocynaceae	<i>Nerium oleander</i> L.	6	defla	Leaf	with Henna, crushed, Powder	
Aristolochiaceae	<i>Aristolochia longa</i> L.	2	bareztam	Root	Powder, Powder with Henna	
Asteraceae	<i>Artemisia herba-alba</i> Asso.	51	chih	Leaf /Aerial part	Heated, Decoction, with Henna, Heated, Infusion, Powder, Powder with Henna	Apply to skin, washing, Compress
	<i>Atractylis gummifera</i> L.	48	dad	Root	with Henna, Powder with Henna	Apply to skin
	<i>Matricaria camomilla</i> L.	4	babounej	Flower	Decoction, Infusion	Compress
Brassicaceae	<i>Lepidium sativum</i> L.	54	hab rchad	Seed	with baking powder and Ognion, with Henna, with baking powder, with Ognion Heated, Heated, full, Powder, Powder with Henna	Apply to skin
Cactaceae	<i>Opuntia ficus-indica</i> L.Mill.	5	drague	Pericarp	crushed, Chopped off	Apply to skin, Friction
Camelliaceae	<i>Camellia thea</i> Link	5	atay	Leaf	with Henna, Infusion, Powder	Apply to skin
Caryophyllaceae	<i>Corrigiola télépholia</i> Pourr.	7	sarghina	Root	with Henna, Powder	
	<i>Silene</i> sp.	2	tighecht	Stem	with Henna	
Chenopodiaceae	<i>Chenopodium ambrosioides</i> L.	2	mkhmza	Aerial part	crushed, Heated	
Cucurbitaceae	<i>Citrullus colocynthis</i> L. Schrad.	3	hdej lhmir	Fruit	Juice	
	<i>Cucurbita lagenaria</i> Forsk.	1	slawi	Fruit	crushed	
Cupressaceae	<i>Juniperus oxycedrus</i>	11	qetrane/ qetrane rqi	Tar	with Henna, With Olive Oil, Pure	Apply to skin
	<i>Tetralinis articulata</i>	12	azar	Leaf	with Henna, Heated, Decoction	Apply to skin
Fabaceae	<i>Cicer arietinum</i> L.	3	hames	Seed	with baking powder, crushed	Apply to skin
	<i>Lens culinaris</i> Med.	1	ades	Seed	Powder	Apply to skin
	<i>Retama retam</i> (Forsk.) Webb	1	rtam	Stigmate	Powder with Henna	Apply to skin
	<i>Trigonella foenum graecum</i> L.	8	helba	Seed	with baking powder and Ognion, with baking powder, Powder, Powder with Henna	Apply to skin
Fagaceae	<i>Quercus infectoria</i>	20	hasfa	Gall	with Henna, Powder, Powder with Yoghurt	Apply to skin
Juglandaceae	<i>Juglans regia</i> L.	7	swak	Bark	Pure, full, Maceration	Apply to skin
Lamiaceae	<i>Lavandula officinalis</i> L.	11	khzama	Flower / Oil	with Henna, With Olive Oil, Heated, Decoction, Infusion, Powder with	Apply to skin, Compress

					Henna, Pure	
	<i>Marrubium vulgare</i> L.	33	meriwt	Leaf /Aerial part	with baking powder and Ognion, with Henna, Infusion, Powder, with Henna, with baking powder, with Ognion, with Ognion Heated, crushed, Decoction, Infusion, Powder with Henna, full, Powder with baking powder	Apply to skin, Compress, Fumigation
	<i>Mentha spicata</i> L.	5	naânae	Leaf /Aerial part	crushed	Apply to skin, Friction
	<i>Ocimum basilicum</i> L.	2	Hbaq	Leaf	crushed	Apply to skin
	<i>Origanum compactum</i> Benth.	4	zaâtar	Leaf	Decoction, Infusion	Apply to skin, Compress
	<i>Rosmarinus officinalis</i> L.	18	azir	Leaf	with Henna, Heated, Decoction, Powder with Henna	Apply to skin
	<i>Salvia officinalis</i> L.	1	salmia	Leaf	With Olive Oil	Apply to skin
	<i>Salvia verbanaca</i> L.	29	khiyata	Leaf/ Aerial part	Powder, with Henna, crushed, Decoction, Powder with Henna	Apply to skin
Lauraceae	<i>Cinnamomum cassia</i> Blume.	2	qerfa	Bark / Oil	with Honey, Pure	Apply to skin
	<i>Cinnamomum camphora</i> Nees	8	kafour lbeldi	Pure	with Henna, With Olive Oil, with Smen	
Lemnaceae	<i>Allium Cepa</i> L.	17	Lbesla/ lbesla lhamra	Bulb / internal Scale	with baking powder, Heated, Heated With Olive Oil, heated with baking powder, Cooked in oil	Apply to skin
Liliaceae	<i>Allium sativum</i> L.	105	Touma	Bulb	with Henna, Pure, Chopped off, full	Apply to skin, Friction
	<i>Aloe succotrina</i> L.	1	sabbar	Pericarp	full	Apply to skin
Lythraceae	<i>Lawsonia inermis</i> L.	102	henna	Leaf	With Lemon Juice, with baking powder, with Vinegar, Maceration, Powder, Powder With Lemon Juice	Apply to skin
Myrtaceae	<i>Eugenia caryophyllata</i> Thunb.	3	qrenfel	Floral button	With Lemon Juice, Pure, Powder	Apply to skin
	<i>Myrtus communis</i> L.	4	rihane	Leaf	with Henna, Infusion	
Oleaceae	<i>Olea europaea</i> L.	15	wrak zitoune/ zâ loûde	Leaf, Oil	Decoction, Powder With Olive Oil, Pure	Apply to skin
Papavéraceae	<i>Papaver rhosae</i> L.	2	âker lfassi	Pure	with Henna, Pure	Apply to skin
Plantaginaceae	<i>Plantago coronopus</i> L.	26	messassa	Leaf	with baking powder and Ognion, with Henna, crushed, Decoction, Powder	Apply to skin
Punicaceae	<i>Punica granatum</i> L.	2	kchour remane	Pericarp	With Olive Oil, Powder with Henna	Apply to skin
Renunculaceae	<i>Nigella sativa</i> L.	1	sanouj	Oil	Pure	Apply to skin

<b>Rhamnaceae</b>	<i>Zizyphus vulgaris</i>	13	zafzouf	Leaf / Flower	with baking powder and Onion, with baking powder, with Onion, crushed, Powder With Olive Oil	Apply to skin
<b>Rubiaceae</b>	<i>Citrus limon L.</i>	42	lhamed	Fruit	with Henna, Chopped off, Juice	Apply to skin, Friction, Compress
<b>Rosaceae</b>	<i>Rosa damascena Mill.</i>	4	lward	Flower	with Henna, Infusion	Apply to skin, Compress
<b>Rubiaceae</b>	<i>Rubia tinctorum L.</i>	1	lfowa	Root	Powder with Henna	Apply to skin
<b>Rutaceae</b>	<i>Citrus aurantium L. var. amara Link.</i>	1	ranj	Fruit	with Henna	Apply to skin
<b>Sapotaceae</b>	<i>Argania spinosa L. Skeels</i>	17	zit argane	Oil	Pure	Apply to skin
<b>Solanaceae</b>	<i>Mandragora autumnalis Bertol</i>	1	bayd lghoul	Root	With Lemon Juice	Apply to skin
	<i>Solanum lycopersicum L.</i>	20	maticha	Fruit	with Henna, Heated, Chopped off, full, Juice, Slice	Apply to skin, Friction
	<i>Solanum tuberosum L.</i>	8	btata	Stem	Chopped off, Slice	
<b>Verbenaceae</b>	<i>Verbena officinalis L.</i>	8	baymout	Root	with Henna, Powder, Powder with Henna	Apply to skin
<b>Zingiberaceae</b>	<i>Curcuma long L.</i>	5	kharkoum ark	Stem	Powder	Apply to skin