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Male Infertility (Case of Varicocele): Ethnobotanical Survey of Traditional Healers in the Cities of Dakar and Mbour, Senegal

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Authors' contributions

This work was carried out in collaboration among all authors. Author KD designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author WD managed the analyses of the study. Author ADF managed the analyses of the study. Authors SIMD, AIM, AS and FN performed the statistical analysis. Author ADF managed the literature searches and approved the final corrections. All authors read and approved the final manuscript.

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ABSTRACT

Background: In recent decades, fertility appears to be increasing, which is a public health problem and involving all health actors. Thus, the varicocele is one of the causes affects about 12% of the male population.
Aim/Objective: The aim of this study is to inventory the plants used against the treatment of varicocele because the populations often resort to phytotherapy.
Methods: It is in this sense that a survey of twenty two traditional practitioners and six herbalists were conducted to identify the plants used in the management of varicocele in the Dakar and Mbour departments.

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Results: Thirty five plants could be identified and divided into thirty three genera and twenty two families. Fabaceae was the most represented family with 5 species followed by Anacardiaceae (4 species), Asclepiadaceae, Combretaceae, Menispermaceae, Rhamnaceae, Rubiaceae and Zingiberaceae each with 2 species, Annonaceae, Asteraceae, Balanitaceae, Cochlospermaceae, Cucurbitaceae, Cyperaceae, Euphorbiaceae, Icacinaceae, Meliaceae, Myrtaceae, Olacaceae, Oleaceae and Rutaceae each with one species. The most frequent plant species against varicocele were : *Khaya senegalensis*, *Securinega virosa*, *Guiera senegalensis*, *Cissampelos mucronata*, *Tamarindus indica* and *Zinziber officinale*. Some species have been mentioned very frequently to fight the varicocele. These are : *Khaya senegalensis* (8.57%), *Securinega virosa* (5.71%), *Guiera senegalensis* (5.71%) etc. Roots (48%) and Leaves (35%) constituted the greatest use in the form of decocted (44%), infused (27%), powder (25%) macerated (2%), for others uses (3%).
Conclusion: The result of this study was shown that medicinal plants are promising in the management of varicocele. Further investigations are needed to explore the bioactive compounds of these herbal medicines, aimed at exploring the bioactive compounds that can be developed as drugs for varicocele.

Keywords: Ethnobotanical survey; medicinal plants; traditional practitioners; varicocele; Dakar; Mbour.

1. INTRODUCTION

Men have always used herbs to solve some health problems [1]. For millennia, diseases around the world have been treated with herbal medicines and animal materials passed down from generation to generation. Among the ills of which humanity suffers, infertility occupies a place of choice and is often a reason for separation of couples in Africa and has been associated to psychological disorders in the West Africa [2]. Infertility can also be defined as failure of couple to conceive after 12 months of regular intercourse without the use of contraception in women <35 years of age ; and after 6 months of regular intercourse without the use of contraception in women ≥35 years of age [3]. It is an estimated that one third of infertility cases comes from man while, one-third are linked to women and the remaining one third is due a lack of compatibility between the two partners. [4]. There are no reliable figures for global prevalence of infertility, [5] but estimates suggest that nearly 72.4 million couples globally experience fertility problems. According to the estimates by World Health Organization [WHO] [6], approximately WHO estimates 60–80 million couples worldwide currently suffer from infertility [7]. Varicoceles are considered the commonest "correctable" cause of male infertility or the commonest "reported" cause of infertility, depending on an individual viewpoint [7]. Reports by the International Committee for Monitoring Assisted Reproductive Technology [ICMART] and, World Health Organization (WHO), infertility is a disease of reproductive system defined by failure to achieve the clinical pregnancy after 12 months or more of regular unprotected sexual intercourse [8]. Lotti and Maggi [9] sees male infertility as common deficiencies in the semen. The quality of semen is used as a surrogate measure of male fecundity. Cooper, et al. [10] This sterility deserves to be handled in a delicate way because in developing countries, the child remains the bedrock of marriage [11]. Thus, it is necessary that male infertility be fought to bring happiness to the couple in their sexuality but also in procreation. Because the infertility of a couple is often seen as a fatality that the latter must fight at all costs for much of his life. Currently, plant-based medications is gaining interest globally following thanks scientific studies based on analytical methods and experimental exploration [12]. Several plants are reported to enhance reproductive processes in laboratory animal models. This has been severally demonstrated in many studies. This include the findings that; grapefruit seed extract demonstrates profertility effects in male rats [13,14,15], extract of *Sesame radiatum* enhances fertility in male Sprague dawley rats [16], *Moringa oleifera* lamark (drumstick) leaf extract modulates testicular toxicity in rats [17], aqueous extract of date (*Phoenix dactylifera*) protects testis [18], *Laurus nobilis* preserves testicular functions in crytorchid rat [18], stem bark extract of *Enantia chlorantha* has testiculo-protective effect on Lead-induced toxicity in adult wistar rat [19] bitter leaf has a modulating role on spermatogenic and steroidogenesis functions of the rat testis [20], *Cissus populnea* extract and *Jatropha curcas* extract has ameliorating effect on the rat testis [21] and *Croton zambesicus* leaf extract has ameliorating capabilities on the testis of rats exposed to pyrethroid-based insecticide [22]. However, many basic science researches have

shown several medicinal plants that hinder testicular functions.The present study aims to investigate inventory and document the varieties of medicinal plants used in the treatment of varicocele in the departments of Dakar and Mbour in western Senegal.

2. MATERIALS AND METHODS

2.1 Study Area [23]

The survey was conducted in two Departments. The Dakar Department (Fig. 1) has an area of 550 km^2, lies at 14°35'00 " N Latitude and 17°32'00 " W Longitude. It has a microclimate marked by the influence of maritime trade winds; hence the existence of freshness and an almost constant humidity and relatively high in the order of 25% and a total annual rainfall of 610 mm/year ANSD (National Agency of Statistical and Demography), [23]. Mbour department (Fig. 2) has an area of 1725 km^2, lies at 14°24'42 " N Latitude and 16°57'57 " W Longitude. It has a Sahelian climate type and a total annual rainfall of 600 mm/year [23].

2.2 Vegetation Description [23]

The forest heritage of the District consists of a classified domain, a protected area, a hydrographic network with a potential wildlife network. Mbour has a degraded shrubby savanna, the filao strip in the Niayes and the PARFOB plantations in the Bandia Classified Forest and thirteen (13) classified forests with a surface area of 0.944736 km^2, is a grading rate of 14.3%.

2.3 Socio-economic Conditions [23]

Dakar is the most populated region of the country with a very high density, due to the combined effects of natural population growth and migration. It has a young population, mostly male and almost all living in urban areas. This makes it hard to get formal jobs and the informal sector dominates. The city of Mbour, in full economic and demographic growth, faces problems of insecurity and prostitution notably in the town of Saly, very popular with tourists. As a result, the living conditions are becoming more and more difficult and the rural exodus is very accentuated.

2.4 Study Design

This study was conducted using a pre established questionnaire. It covered the period from December 2010 to June 2011. The majority ethnicities encountered were Peulh, Wolof, Mandigo, Serer etc.

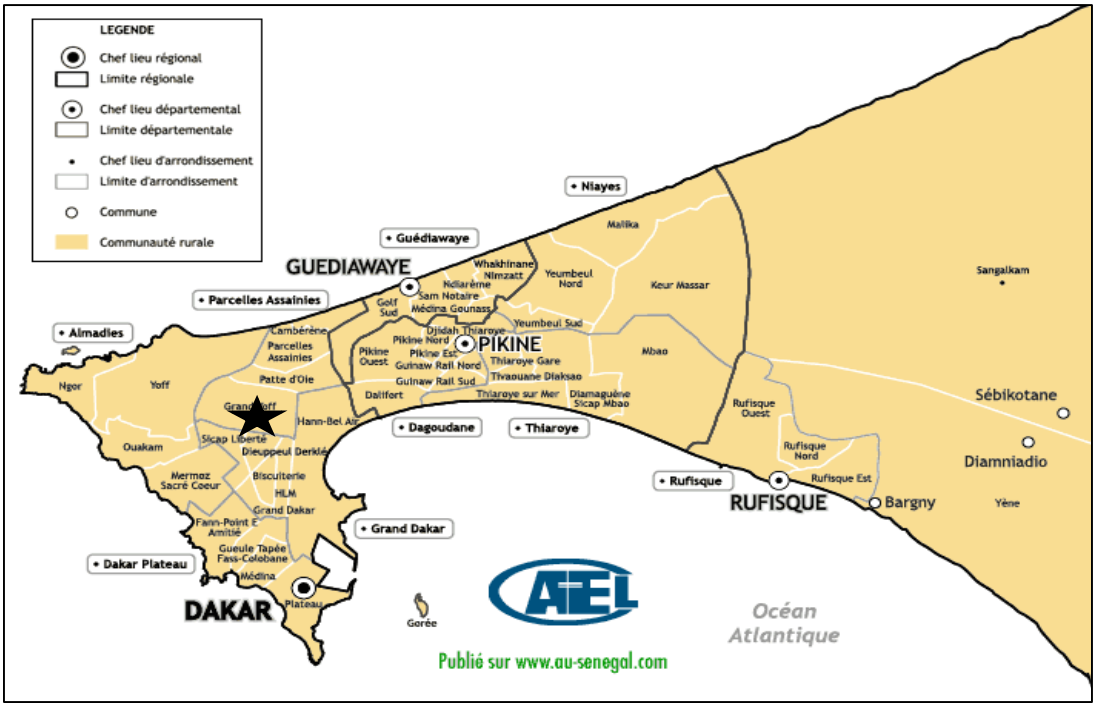

Fig. 1. Map of Dakar department [23]

Fig. 2. Map of Mbour department [23]

2.5 Population of the Study

The study population was composed of twenty two traditional practitioners and six herbalists.

2.6 Collection, Identification and Classification

The unknown species of our interviews had been collected and identified in the laboratory of Botany of Cheikh Anta Diop University by Pr Diatta (Botany Specialist). The classification was made using and the new classification APG III [24], the books of Eklu-Natey [25] and Kerharho [26].

2.7 Statistical Analysis

The data collected were analyzed using both Microsoft Excel and Statistical Package for Social Sciences (SPSS) version 9. Frequency and percentage tables were generated to summarize results for discussion.

3. RESULTS AND DISCUSSION

A total of 35 plant species from 33 genera and 22 families were identified as used in the management of varicocele diseases. The families, botanical names, local names, used parts and preparations (application) are given in Table 1 and classified according to [24,25,27]. Some families are more often referred because they include several species. Thus, Fabaceae families with 5 species; Anacardiaceae (4 species), Asclepiadaceae, Combretaceae, Menispermaceae, Rhamnaceae, Rubiaceae and Zingiberaceae each with 2 species, and Annonaceae, Asteraceae, Zygophyllaceae, Cochlospermaceae, Cucurbitaceae, Cyperaceae, Euphorbiaceae, Icacinaceae, Meliaceae, Myrtaceae, Olacaceae, Oleaceae and Rutaceae are represented by a single species (Fig. 3).

These results are not in agreement with those found by Hadj-Seyd [28] with 35 plant species from 32 genera and 14 families and the most cited families have the Asteraceae. This state of affairs is understandable because the geographical area of studies differs. The reality with regard to the use of plants is thus different according to the Country. The Fabaceae contains many species of plants known for nutritional and medicinal value. These include the *Detarium microcarpum* species that has shown antiinflammatory, analgesic and antimcrobial activity [27,29,30]. The Anacardiaceae plant contains several species that are known to be Antimicrobial, antioxidant, cyclooxygenase enzyme inhibitory, Phenolic composition and acetylcholinesterase inhibitory activities etc. [31,32]. The Asclepiadaceae plant

contains several species that are known to be Antisickling, Antioxidant, Antibacterial and antiepileptic Activities [33]. The foregoing literature findings suggest that plants from the three families contain ingredients that are useful for deseases. The most frequently mentioned plants are: *Khaya senegalensis, Securinega virosa, Guiera senegalensis, Cissampelos mucronata, Tamarindus indica* and *Zinziber officinale*. This widespread use of these plants is confirmed by Houmenou [34] studies that revealed that the *Xylopia aethiopica* (Annonaceae) and *Khaya senegalensis (Meliaceae)* treat the sexual disorders. These results are similar to those of Houmenou [34] who has found 13 plants for the treatment of infertility deseases.

The roots and leaves are the organs used for the medicinal preparations. These results are not according to Hadj-Seyd [27] demonstrate that leaves are mainly treatments traditional and not according of Thirumalai et al. [35] who has found that the part of the plant is the leafy stem. Harvesting tree roots and / or bark appears to have more adverse ecological impacts than leaf

Table 1. Shows the inventory of the plants mentioned during the survey

Botanicals and Families name	Locals name	Used parts	Uses
Adansonia digitata (Malvaceae)	Bouye	Fruit	Juice
Aframomum melegueta(Zingiberaceae)	Niamoko	Fruit	Powder
Anogeissus leiocarpus(Combretaceae)	Guediane	Roots	Powder
Balanites aegyptiaca(Zygophyllaceae)	Soumpe	Roots	Decoction
Senna occidentalis (Fabaceae)	Mbatamarè	Leaves	Infusion
Cassia sieberiana(Fabaceae)	Sendjegne	Root, dry fruit	Powder
Cissampelos mucronata (Menispermaceae*)*	Ngolomar	Leaves	Decoction
Citrus limonium (Rutaceae)	Limon	Leaves	Infusion
Cocculus pendulus (Menispermaceae)	Mbum seuheut	Barks	Powder
Cochlospermum tinctorium (Cochlospermaceae)	Fayar	Leaves	Powder
Cyperus maritimus (Cyperaceae)	Gowè	Roots	Decoction
Detarium microcarpum (Fabaceae)	Denk	Roots	Decoction
Gardenia ternifolia (Rubiaceae)	Debuton	Roots	Maceration
Guiera senegalensis (Combretaceae)	Nguer	Leaves and Roots	Maceration
Heeria insignis (Anacardiaceae)	Woswosor	Roots	Infusion
Icacina senegalensis (Icacinaceae)	Bankanasse	Roots	Decoction
Khaya senegalensis(Meliaceae)	Khay	Bark and Roots	Decoction
Leptadenia hastata (Asclepiadaceae)	Thiakhat	Leaves	Infusion
Mitracarpus hirtus (Rubiaceae)	Ndatoukane	Leaves	Decoction next fumigation
Momordica balsamina (Cucurbitaceae)	Mbeurbof	Leaves	Decoction
Mondia whitei (Asclepiadaceae)		Roots	Infusion
Olea europaea (Oleaceae)	Olivier	Roots	Infusion
Parkia biglobosa (Fabaceae)	Ibo	Roots	Decoction
Petroselinum crispum (Apiaceae)	Persil	Leaves	Decoction
Psidium guajava (Myrtaceae)	Goyave	Leaves	Decoction
Sclerocarya birrea (Anacardiaceae)	Beer	Leaves	Decoction
Securinega virosa (Euphorbiaceae)	Keng	Roots	Infusion
Spondias purpurea (Anacardiaceae)	Prumier	Roots and Bark	Infusion
Tamarindus indica (Fabaceae)	Dakhar	Roots	Decoction
Vernonia nigritiana (Asteraceae)	bathie tior	Roots	Infusion
Ximenia americana (Olacaceae)	Ngologne	Bark	Powder
Xylopia aethiopica (Annonaceae)	Diare	Clove	Decoction
Zingiber officinale (Zingiberaceae)	Djingère	Tuber	Decoction
Zizyphus mauritiana (Rhamnaceae)	Sidem	Bark and Leaves	Powder
Zizyphus mucronata (Rhamnaceae)	demmu bukki	Bark and Leaves	Powder

harvesting [36]. The utilization of Leaves in local inflicting less damaged to the medicinal treat them. This is understandable because the pathology involved and geographical area are different. Most of these plant parts was harvested unconventionally, with no reforestation politic for future resource availability. For example, there were signs of severe tree attack, uprooting or cutting of the entire plant. Fig. 4 shows the used for the medicinal preparations.

The decoction (44%) is the most use followed by infusion (27%) and powder (24%) (Fig. 5). Bene et al. (2016) who showed that decoction and grinding are the most important methods of preparation in traditional pharmacopoeia. Some plant species have specificities of action against a given cause. These result are not according to Hadj-Seyd [28] who found infusion (38%) followed powder (32%) and decoction (30%). This difference in medical preparation may be due to the differences between the species found on both sides of the planet. Decoction as boiling method is an effective method of preparing medicinal plant because it preserves the medicine longer when compared to cold water. According to Shehu in traditional medicine, boiling is believed to be efficient in extracting active ingredient and for hygienic reasons. Similarly, the use of *Zizyphus mauritiana* to treat infertility is consistent with data reported by Dubey et al. [37]. Such a similarity in the cross-cultural use of plant remedies is a strong indication of the bioactivity potential of the reported plants. Fig. 4 shows the plant preparation mode.

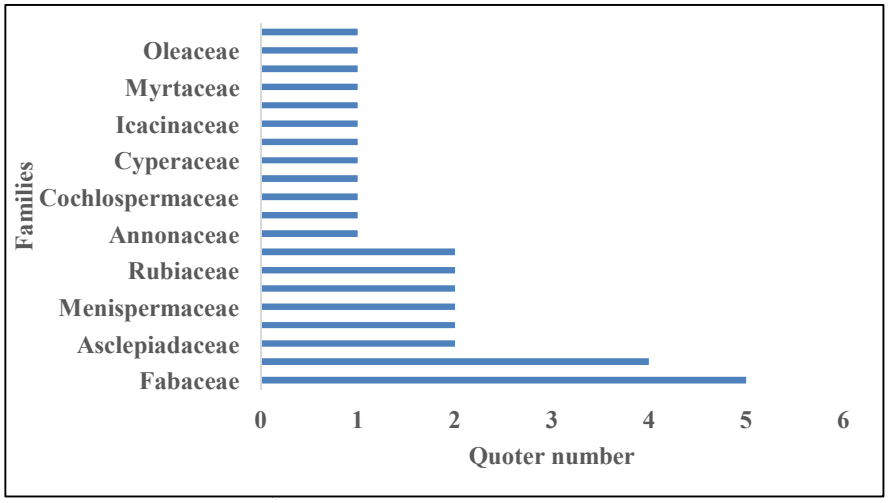

Fig. 3. Families classification plant cited

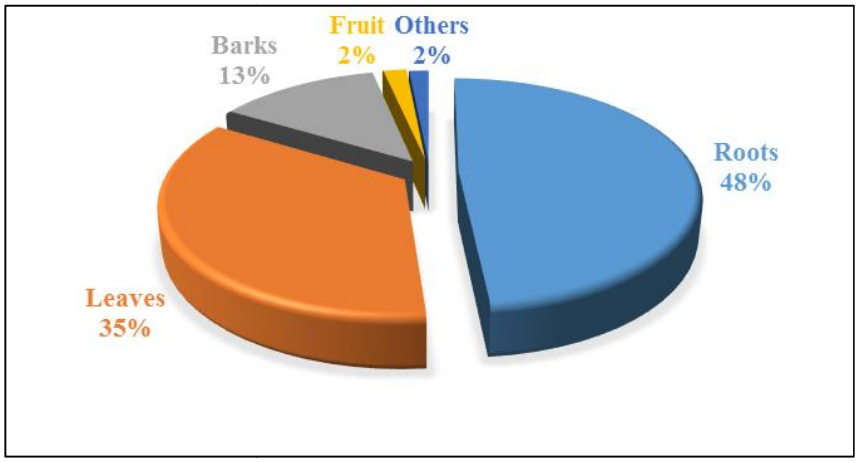

Fig. 4. Percentage uses of plant parts

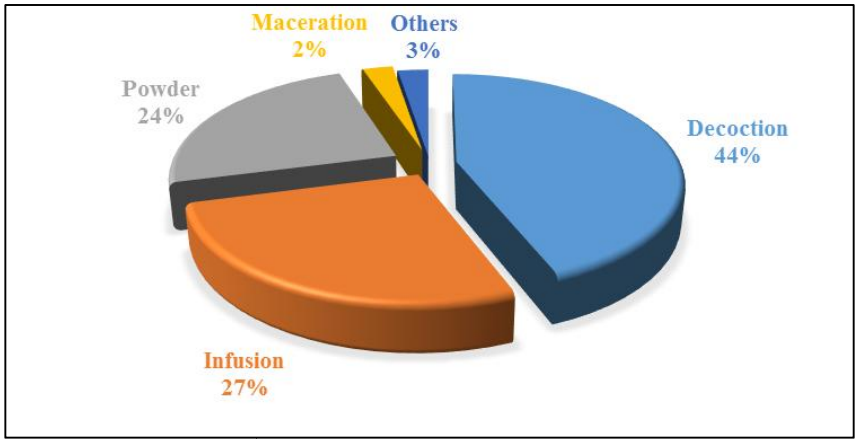

Fig. 5. Plant preparation mode

4. CONCLUSION

A total number of Thirty five plants could be identified and divided into thirty three genera and twenty two families. Plants from the family Fabaceae, Anacardiaceae, Asclepiadaceae and Combretaceae were the most frequently used plants. The most commonly used plant part was roots for the management of varicocele desease. The plants were used to manage several affections but the most commonly mentioned were inflammation with *Detarium microcarpum*, *Icacina senegalensis*, *Khaya senegalensis*, *Momordica balsamina*, *Guiera senegalensis* and *Mitrocarpus hirtus* plants species. For oligospermia there are *Olea europa*, *Khaya senegalensis*, *Gardia ternifolia*, *Cissampelos mucronata*, *Zingiber officinale*, *Tamarindus indica*, *Cocculus pendulus*. *Khaya senegalensis* is used for two affections. The mode of application used by traditional medicinal practitioners (TMPs) was predominantly by decoction drink. The ethno-pharmacological information provides a solid basis for further research aimed at identifying and isolating bioactive components that can be converted into drugs for the management of male infertility.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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