



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم

# بسم الله الرحمن الرحيم



**MONA MAGHRABY**



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكرو فيلم



# شبكة المعلومات الجامعية التوثيق الإلكتروني والميكرو فيلم



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# جامعة عين شمس

## التوثيق الإلكتروني والميكروفيلم

### قسم

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**MONA MAGHRABY**

# **Comparative Study Between The Efficacy Of Topical Sildenafil And Topical Minoxidil In The Treatment Of Male Androgenic Alopecia**

*A Thesis*

*Submitted for Fulfillment of Master Degree  
in dermatology, venereology and andrology*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# قالوا

سُبْحَانَكَ لَا عِلْمَ لَنَا  
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ  
الْعَلِيمُ الْعَظِيمُ

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## *List of Abbreviations*

Abb.	Full term
5 $\alpha$ -DHT .....	5 $\alpha$ dihydrotestosterone.
5 $\alpha$ R.....	5 alpha-reductase
ADSCs .....	Adipose-derived stem cells
AGA .....	Androgenic Alopecia.
BCL-2.....	B-Cell lymphoma protein.
CAD .....	Coronary artery disease
cGMP .....	Cyclic guanosine monophosphate
DHEA.....	Dehydroepiandrosterone
DHT.....	dihydrotestosteron
DKK-1 .....	Dickkopf1
DP.....	Dermal Papilla
EDA2R.....	EctodysplasinA2 Receptor
EGF .....	Epidermal growth factor.
ERK .....	Extracellular signal-related kinase
FDA .....	Food and Drug Administration
FPHL.....	Female pattern hair loss.
FT .....	Frontotemporal
GSK3B .....	Glycogen synthase kinase-3B
HDAC9.....	Histone deacetylase 9.
HDD .....	Hair diameter diversity
hDPCs.....	Human dermal papillary cells
HF .....	Hair follicle
HT .....	Hair transplantation
IGF .....	Insulin- like growth factor

## *List of Abbreviations (Cont.)*

Abb.	Full term
IL-1B .....	Interleukin 1 beta
IL1 $\alpha$ .....	Interleukin 1 alpha
MAPK .....	Mitogen-activated protein kinase.
MPHL.....	Male-Pattern hair loss.
NO .....	Nitric oxide
P. acnes .....	Propionibacterium acnes
PDE5.....	Phosphodiesterase type 5
PDGF .....	Platelet derived growth factor
PGD2 .....	Prostaglandin D2
PRP.....	Platelet-rich plasma.
PSA .....	Prostate-specific antigen
PTG .....	Phototrichogram
ROS .....	Reactive oxygen species
SD.....	Standard deviation
TGF-B .....	Transforming growth factor beta
TH.....	Terminal hair
TNF-a .....	Tumor necrosis factor alpha
VEGF .....	Vascular-endothelial growth factor
VH.....	Vellus hair

## INTRODUCTION

Androgenic alopecia (AGA) is a thinning of the hair induced by androgens in genetically susceptible men and women, also known as male-pattern hair loss (MPHL) and female-pattern hair loss (FPHL) in women. Thinning of hair usually begins between 12 and 40 years old in males and females. Inheritance is polygenic (*Gassmueller et al., 2008*).

AGA is the major type of alopecia affecting 60-70% of the population. It is caused by the overproduction of 5 $\alpha$ dihydrotestosterone (5 $\alpha$ -DHT), a potent androgen within the hair follicle, specifically the dermal papilla (DP) cells that are the main regulators of hair growth and are the only site of 5 $\alpha$ -DHT action (*Jain and De-Eknamkul, 2014*).

Sildenafil is a selective inhibitor of phosphodiesterase 5 (PDE5) and was originally developed as an anti-anginal drug due to its vasodilatory and antiplatelet coagulation properties. Sildenafil enhances proliferation of human dermal papilla cells and up-regulates the mRNA expression of vascular endothelial growth factor (VEGF) and platelet-derived growth factor (PDGF) which are responsible for hair growth (*Choi et al., 2018*).

Minoxidil, a vasodilator medication known for its ability to slow or stop hair loss and promote hair regrowth, was first introduced exclusively as an oral drug to treat high blood pressure.

It was however discovered to have the important side effect of increasing growth or darkening of fine body hairs; this led to the development of topical formulation as a 2% concentration solution for the treatment of female AGA or 5% for treating male AGA. The most common adverse reactions of topical formulation are limited to irritant and allergic contact dermatitis on the scalp (*Rossi et al., 2011*).

The exact mechanism of action of minoxidil is uncertain, but it has been suggested that it promotes hair growth by opening adenosine triphosphate-sensitive potassium channels and stimulating the synthesis of VEGF in DP cells (*Blume-Peytavi et al., 2011*).

## **AIM OF THE WORK**

This study aimed to evaluate and compare the efficacy, safety and side effects of topical sildenafil 1% and topical minoxidil 5% in the treatment of androgenic alopecia.