A CLINICO EPIDEMIOLOGICAL STUDY ON FACIAL HYPERPIGMENTATION IN A TERTIARY CARE HOSPITAL IN KANCHIPURAM DISTRICT, TAMILNADU

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M.D. (DERMATOLOGY, VENEREOLOGY & LEPROSY)

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MAY 2020

CERTIFICATE

Certified that this dissertation titled **"A CLINICO EPIDEMIOLOGICAL STUDY ON FACIAL HYPERPIGMENTATION IN A TERTIARY CARE HOSPITAL IN KANCHIPURAM DISTRICT, TAMILNADU"** is a bonafide work done by **Dr. MAHROOF THAMARASSERY,** post graduate student of the Department of Dermatology, Venereology and Leprology, Karpaga Vinayaga Institute of Medical Sciences and Research Centre, Kanchipuram 603308, during the academic year 2017 – 2020. This work has not previously formed the basis for the award of any degree.

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DECLARATION

The dissertation entitled "**A CLINICO EPIDEMIOLOGICAL STUDY ON FACIAL HYPERPIGMENTATION IN A TERTIARY CARE HOSPITAL IN KANCHIPURAM DISTRICT, TAMILNADU**" is a bonafide work done by **Dr. Mahroof Thamarassery** at Department of Dermatology, Venereology and Leprology, **Karpaga Vinayaga Institute of Medical Sciences and Research Centre Kanchipuram 603308**, during the academic year 2017 – 2020 under the guidance of **Prof. Dr. R. Baskaran** M.D, DD (Dermatology), Professor & HOD, Department of Dermatology, Karpaga Vinayaga Institute of Medical Sciences and Research Centre Kanchipuram. This dissertation is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai towards partial fulfillment of the rules and regulations for the award of M.D Degree in Dermatology, Venereology and Leprology (BRANCH – XX).

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DECLARATION

I, **Dr. Mahroof Thamarassery** solemnly declare that this dissertation titled "**A CLINICO EPIDEMIOLOGICAL STUDY ON FACIAL HYPERPIGMENTATION IN A TERTIARY CARE HOSPITAL IN KANCHIPURAM DISTRICT, TAMILNADU**" is a bonafide work done by me at Karpaga Vinayaga Institute of Medical Sciences and Research Centre, Kanchipuram 603308, during the academic year 2017-2020 under the guidance and supervision of **Prof. Dr. R. Baskaran** M.D, DD, Professor & HOD, Department of Dermatology, Karpaga Vinayaga Institute of Medical Sciences and Research Centre Kanchipuram. This dissertation is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai towards partial fulfilment of the rules and regulations for the award of M.D Degree in Dermatology, Venereology and Leprology

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CONTENTS

S NO	TITLE	PAGE NO
1	INTRODUCTION	1
2	AIM OF THE STUDY	3
3	REVIEW OF LITERATURE	4
4	MATERIALS AND METHODOLOGY	33
5	RESULTS	36
6	DISCUSSION	73
7	SUMMARY	77
8	CONCLUSION	79
9	RECOMMENDATIONS	81
10	LIMITATIONS OF THE STUDY	82
11	REFERENCES	83
12	ABBREVIATIONS	98
13	CLINICAL IMAGES	101
14	ANNEXURES	
14.1	PROFORMA	108
14.2	CONSENT FORM	110
14.3	ETHICAL COMMITTEE CERTIFICATE	112
14.4	MASTER CHART	113
14.5	KEY TO MASTER CHART	117

INTRODUCTION

Hyperpigmentary disorders of face are of major concern in both fair skinned and dark skinned individuals in our country.[1,2] A significant proportion of individuals are affected by facial hypermelanoses due to various clinical entities.[1] It is a common complaint among patients consulting with dermatologists.[3] Facial hyperpigmentation, causes cosmetic disfigurement with considerable psychological impact.[2,4,5,6] Awareness of an individual of his embarrassing facial pigmentation can decrease his self-confidence which can in turn decrease his productivity.[7] Several more or less well-defined clinical syndromes leading to facial hyperpigmentation can be recognized, but many transitional forms defy classification.[8]

The causes of the pigmentation are often obscure.[8] Common causes are Melasma, Post Inflammatory Hyperpigmentation (PIH), Periorbital Hyperpigmentation (POH), Facial Acanthosis Nigricans (FAN), Lentigines, Freckles, Erythema Dyschromicum Perstans (EDP), Lichen Planus Pigmentosus (LPP), Riehl's Melanosis (RM), Erythromelanosis Peribuccale Pigmentaire of Brocq (EPP), Poikiloderma of Civatte, Erythromelanosis Follicularis of Face and Neck, Nevus of Ota, Seborrheic Melanosis, Frictional Melanosis, Actinic Keratosis, Morphea, Systemic

Lupus Erythematosus rash, Topical Steroid Abuse, Drug Induced Pigmentation

The differences in skin colour in various races and ethnicity are related to the number, size, shape, distribution and degradation of melanin-laden organelles called melanosomes. These are produced by melanocytes and are transferred to the surrounding epidermal keratinocytes.

Face, the most visible area of the body serves as one's identity and therefore any pigmentary disturbance of the facial skin is of particular cosmetic importance.

Studies have not been conducted in the southern part of the country in connection with the facial hyperpigmentation considering all diseases together. This study, conducted in the dermatology outpatient department of the tertiary care centre, Karpaga Vinayaga Institute of Medical Sciences and Research Centre, Kanchipuram, Tamilnadu will throw a light into the details of facial hyperpigmentation.

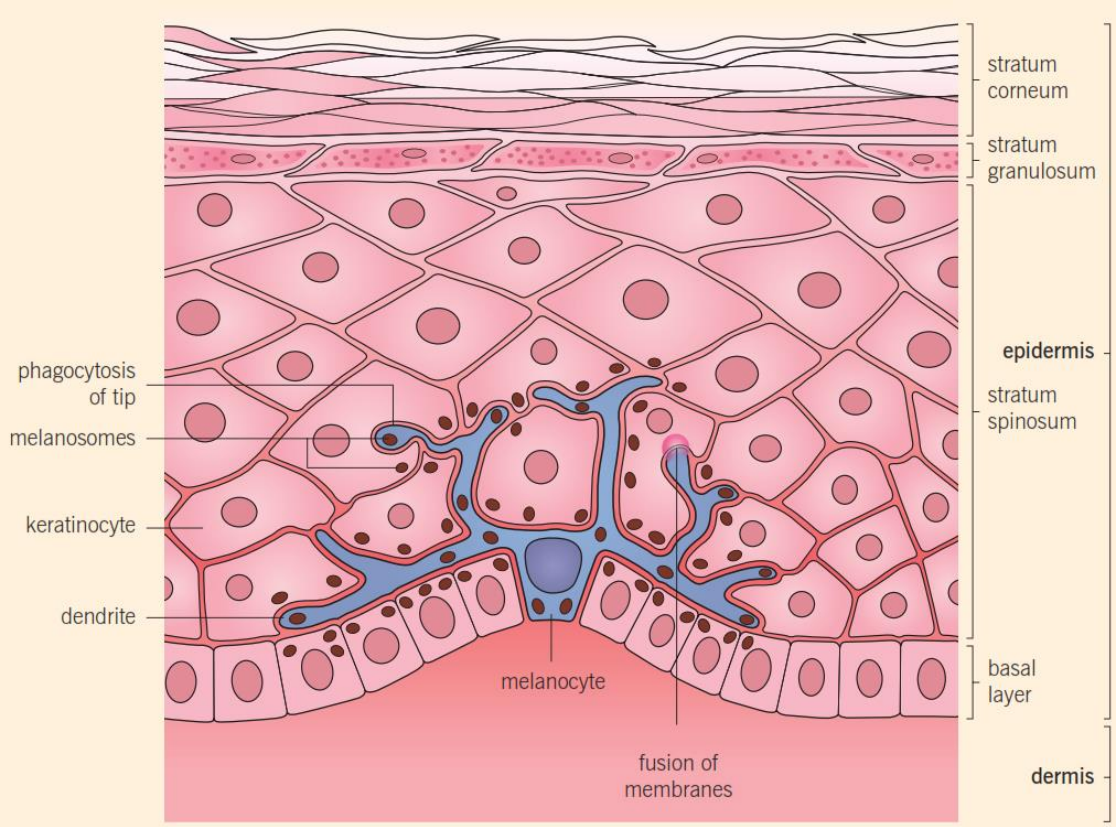
AIM OF THE STUDY

- To describe the clinical profile of patients presenting with facial hyperpigmentation to Dermatology outpatient department of Karpaga Vinayaga Institute of Medical Sciences, Kanchipuram
- To determine the risk factors associated with facial hyperpigmentation among the study participants.

REVIEW OF LITERATURE

The major determinant of normal skin color is the activity of melanocytes, i.e. the quantity and quality of melanin pigment production and not the density of melanocytes.[9]

Figure 1. Structure of melanocyte



Melanocyte

To understand the pathology of hyperpigmentation, an appreciation of the structure and function of the melanocyte is required (Figure 1). The melanocyte is a neural crest-derived cell[10], and during embryogenesis

precursor cells i.e., melanoblasts migrate along a dorsolateral pathway via the mesenchyme to reach the epidermis and hair follicles. [11] Additional sites of melanocyte migration include the uveal tract of the eye, the leptomeninges and cochlea of the inner ear. In the hair, melanocytes migrate to the basal layer of the hair matrix and the outer root sheath. [11]

There are two populations of melanocytes in the skin, one in the interfollicular epidermis and the second in the hair follicle.[12] The melanocytes maintain their position within the basal layer throughout life in a normal individual.[13] There is approximately one melanocyte per five or six basal keratinocytes. [14]

Epidermal melanin unit: this is the organization of a single epidermal melanocyte surrounded by several epidermal keratinocytes.[15]

The dendrites of the melanocyte spread among the keratinocytes to reach as high as mid stratum spinosum.[16] One melanocyte can transfer the melanin laden melanosomes to 30 to 40 keratinocytes.[17] This association is called epidermal melanin unit.[18] The interaction of melanocyte with keratinocytes is through cadherins and not through desmosomes.[19]

Melanocytes proliferate, migrate, and undergo maturation during early to mid anagen phase. Melanogenesis and melanin transfer to

keratinocytes occurs throughout anagen phase.[20] Melanocytes finally undergo apoptosis during late catagen phase. [14]

During embryogenesis, melanin producing melanocytes are found diffusely throughout the dermis.[21] They first appear in the head and neck region at approximately 10 weeks of gestation. [22]

Pigment production by melanocytes is increased on exposure to agents that increase intracytoplasmic cAMP which includes cholera toxin, forskolin and dibutyryl cAMP.[11] Various other factors influencing melanogenesis include Melanocyte Stimulating Hormone (MSH), basic fibroblast growth factor (bFGF), endothelin-1 and UV light. α-MSH is the major biologically active form of MSH in humans.[23]

An increase in the intracellular concentration of cAMP leads to an increase in tyrosinase activity and increased eumelanin production.[24]

Ultraviolet exposure to melanocytes causes an increase in the size of the melanocytes and increased tyrosinase activity.[25] Following exposure to UVA irradiation, an immediate pigmentary darkening can be observed, which occurs within minutes and fades over 6–8 hours which is due to oxidation of pre-existing melanin or melanin precursors.[26] Delayed tanning occurs within 48 to 72 hours of exposure to UVB and UVA radiation and

this represents new pigment production via an increase in tyrosinase activity. [11]

Main function of melanocytes is synthesizing melanin in specialized organelles, the melanosomes, and transferring it to the keratinocytes nearby so as to provide protection from UV radiation.[27,28]

Steps involved in melanogenesis includes transcription of proteins required for melanogenesis; melanosome biogenesis; sorting of melanogenic proteins into the melanosomes; transport of melanosomes to the tips of melanocyte dendrites and transfer of melanosomes to keratinocytes.[29] Any deviation in this normal chain will result in hypopigmentation.

Types of melanin

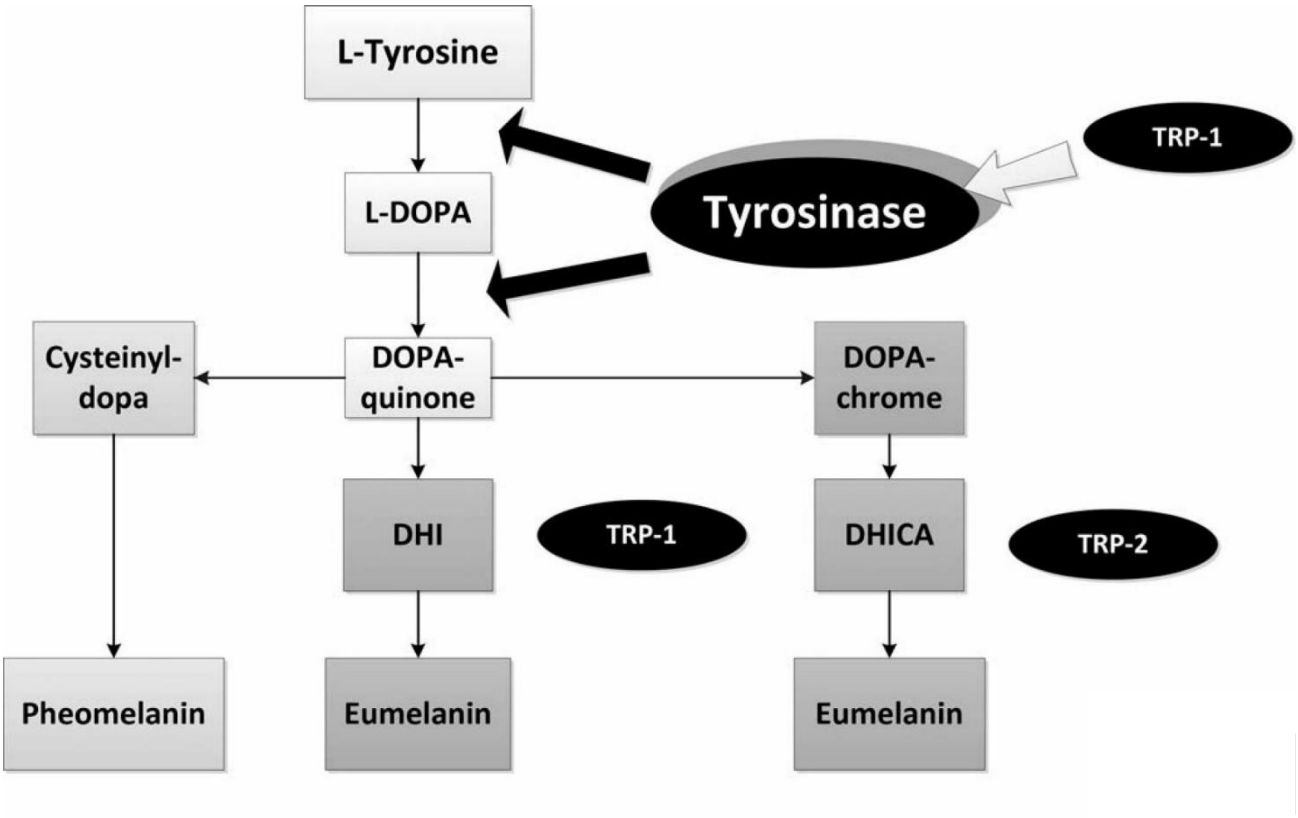
There are two types of melanin:

Eumelanin and Pheomelanin [30]

- Eumelanin
    - Eumelanin is brown-black or dark which is an insoluble polymer.
    - It is the major type of melanin seen in individuals with dark skin and hair.
    - It has better ability to provide photoprotection.

- Pheomelanin
    - A red-yellow soluble polymer.
    - Sulphur containing melanin.
    - Formed by the conjugation of cysteine or glutathione.
    - Pheomelanin is predominantly found in individuals with red hair and skin phototypes I and II. [31]

Figure 2. Steps involved in synthesis of melanin pigments -eumelanin and pheomelanin



Melanogenesis is a complex process with several steps.[32] (Figure 2). The starting material for the production of melanin, is the amino acid tyrosine. The rate limiting step in synthesis of both eumelanin and pheomelanin is the first step, (the catalytic step) oxidation of tyrosine by enzyme tyrosinase.[33] This step is also called Raper–Mason pathway.[34]

Tyrosinase enzyme is also called tyrosine oxidase, DOPA oxidase, monophenol, DOPA: oxygen oxidoreductase.[14] Tyrosinase is a copper-requiring enzyme. Rare copper deficiency disorders can cause hypopigmentation as seen in Menkes Kinke hair disease.[35]

Tyrosinase also catalyzes additional steps in the biosynthesis of melanin, e.g. the oxidation of dihydroxyindole. The activity of tyrosinase is enhanced by DOPA and is stabilized by tyrosinase-related protein 1 (TRP1).

Competitive inhibitors of tyrosinase activity include hydroquinone [36] and L-phenylalanine.[11] Hydroquinone is therefore used to treat disorders of hyperpigmentation such as melasma.

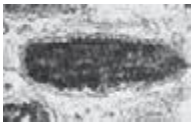
P-protein is a transmembrane protein which is involved in the transport of small molecules across the membrane of melanosomes.[37] P-protein regulates processing and trafficking of tyrosinase, possibly via control of pH or glutathione content within intracellular compartments.[38]

Stages of melanosome formation

The transformation of a non melanized melanosome to a fully melanized melanosome can be divided into four stages [11]. (Table 1).

Melanin pigment is not present in the initial two stages of melanosome synthesis, whereas there is presence of intraluminal proteinaceous fibrils which begin in Stage I and completes in Stage II. Melanin synthesis starts to begin in Stage II melanosomes. Melanin starts to get deposited on the fibrils and in later stages completes to mask all structures in the melanosome.[39]

Table 1. Stages of melanosomes

FOUR MAJOR STAGES OF EUMELANIN MELANOSOME		
STAGES	**DESCRIPTION**	**ELECTRONMICROGRAPH**
I	Spherical; no melanin deposition	
II	Oval; obvious matrix in the form of parallel longitudinal filaments; minimal deposition of melanin; high tyrosinase activity	
III	Oval; moderate electron dense deposition of melanin; high tyrosinase activity	
IV	Oval; heavy deposition of melanin; electron-opaque; minimum tyrosinase activity	

It is the number of melanin laden melanosomes and its ability to transfer those melanosomes to the adjacent keratinocytes that defines the activity of a melanocyte. In people with lightly pigmented skin, stage II and stage III melanosomes dominate while it is stage IV melanosomes that is seen in darkly pigmented skin.[40]

Melanosome transfer

Once the process of melanization is complete, the melanosome migrates via microtubules into the dendrites prepared for transferring into the neighbouring keratinocytes which might be within the epidermis or to the anagen hair matrix.[41] In addition to microtubules, proteins such as kinesin and dynein are involved in the movement of melanosomes. Recent work by Hideya Ando *et al*. shows that melanosomes are transferred from melanocytes to keratinocytes through the processes of packaging, release, uptake, and dispersion.[42,40] (Figure 3 & 4)

Figure 3. Process of melanosome transfer from melanocyte to keratinocyte

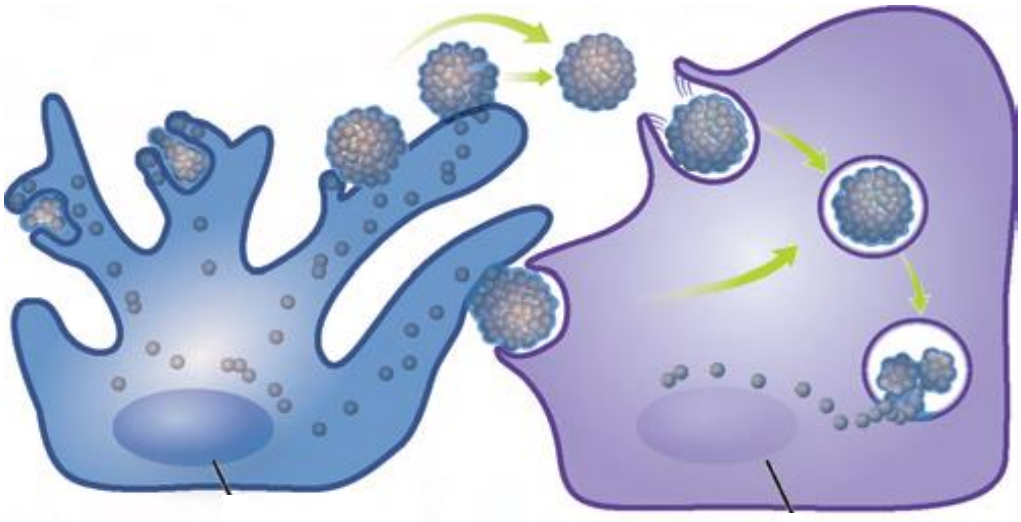
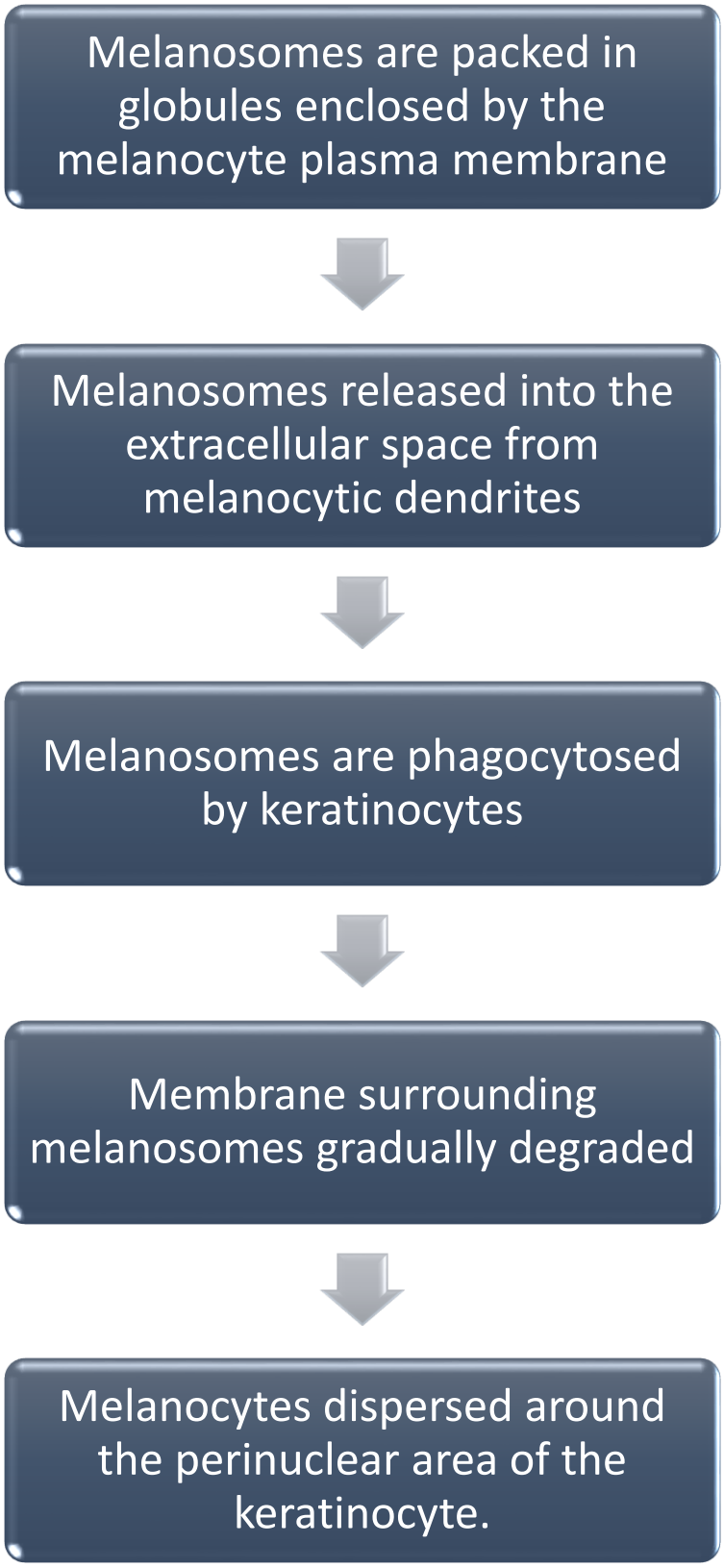


Figure 4. Steps involved in transfer of melanosomes to keratinocytes



Several chromophores are responsible for human skin color out of which melanin is the most important one and others being haemoglobin (in both the oxygenated and reduced state) and carotenoids.[8,43] The thickness of the stratum corneum, the dermal vasoconstriction or vasodilatation and the occasional presence of endogenous or exogenous pigments may also modify the skin color.[44]

DISORDERS PRESENTING WITH FACIAL HYPERPIGMENTATION

Various diseases responsible for facial hyperpigmentation are:

1. Melasma
2. Post Inflammatory Hyperpigmentation (PIH)
3. Periorbital Hyperpigmentation (POH)
4. Facial Acanthosis Nigricans (FAN)
5. Lentigines
6. Freckles
7. Erythema Dyschromicum Perstans (EDP)

8. Lichen Planus Pigmentosus (LPP)
9. Riehl's Melanosis (RM)
10. Erythromelanosis Peribuccale Pigmentaire of Brocq (EPP)
11. Poikiloderma of Civatte
12. Erythromelanosis Follicularis of Face and Neck
13. Nevus of Ota
14. Seborrheic Melanosis
15. Frictional Melanosis
16. Actinic Keratosis
17. Morphea
18. Systemic Lupus Erythematosus rash
19. Topical Steroid Abuse
20. Drug Induced Pigmentation

MELASMA

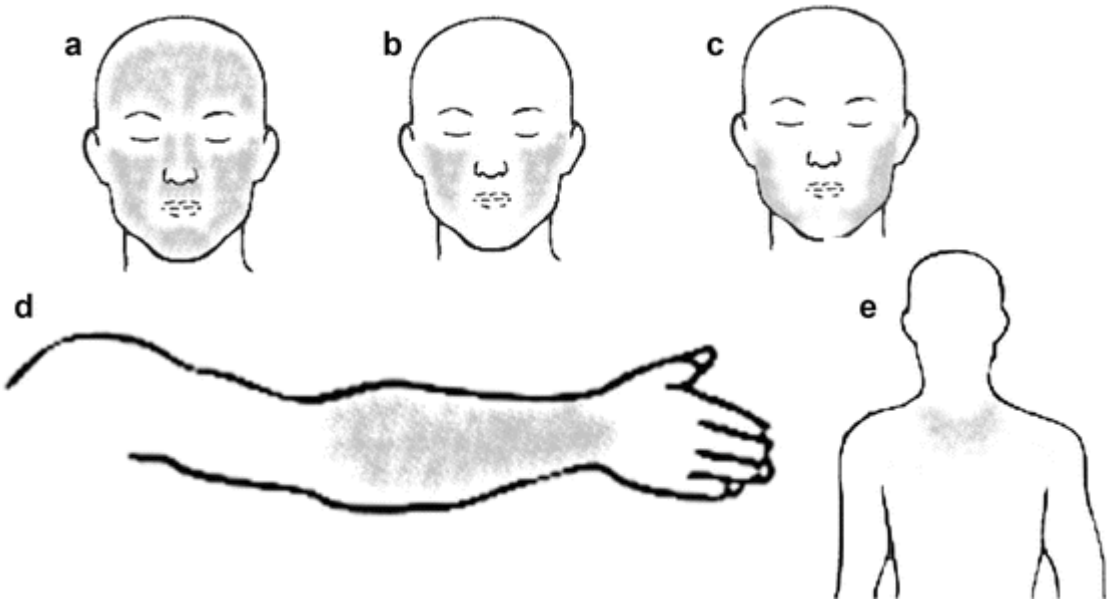
Melasma is a common acquired disorder of pigmentation characterized by symmetric, brownish macules with well defined irregular borders. Melasma most commonly affects the face. It is most prevalent among young to middle aged females with more darkly pigmented skin. Males can also present with melasma. Known exacerbating factors include pregnancy, use of oral contraceptives and sun exposure. [11]

Exact pathology of melasma is still unknown. It is hypothesised that UV radiation exposure induces hyper functional melanocytes within involved skin to produce more amounts of melanin pigment. [45] Hormonal role in development of melasma has been investigated. [46] Studies have shown increased expression of oestrogen and progesterone receptors in the lesional skin compared to uninvolved skin. [47]

Clinical features

Melasma can be clinically classified into 3 varieties based on area of involvement (Figure 5). Areas of hyperpigmentation are symmetrical in three classic patterns and other rare patterns on upper limbs and chest is also possible.

Figure: 5 Clinical types of melasma



Clinical classification of melasma:

a) **Centrofacial** (most common), involving the forehead, cheeks, nose, upper lip (sparing the philtrum) and chin;

b) **Malar**, affecting the cheeks and nose; and

c) **Mandibular**, along the jawline.

Less common sites include the extensor aspect of the forearms and mid upper chest. (d & e)

Lesions often first appear or are accentuated following exposure to UV irradiation or during pregnancy.[48]

On histopathological examination there is

- Increased deposition of melanin in all layers of the epidermis.
- Epidermal melanocytes are normal to increased in number, and they are enlarged with prominent dendrites.
- Increased number of melanophages.
- Lesional melanocytes contain an increased number of melanosomes. [49]

Histologically, melasma can been classified as three variants: epidermal, dermal, and mixed based upon the predominant layer of melanin deposition. [50]

For successful treatment of melasma, strict sun protection – including hats, clothing & broad spectrum sunscreens are necessary. [51]The most common topical regimen is a combination of hydroquinone (2–4%), tretinoin (0.05–0.1%) and a corticosteroid.

The mechanisms of action of hydroquinone include:

(1) Competes with tyrosine as a substrate for tyrosinase, the initial enzyme in the melanin biosynthetic pathway that converts tyrosine to dopaquinone.

(2) Selective damage to melanosomes and melanocytes. [52]

POST INFLAMMATORY HYPERPIGMENTATION (PIH)

PIH is an excess of melanin pigment after inflammation or injury of the skin. Occurs anywhere on the skin surface, including the mucous membranes and the nail unit. PIH is common and has significant cosmetic and psychosocial consequences.[53]

PIH can be epidermal or dermal. In the epidermal form of PIH, there is increased melanin production with or without increased transfer to keratinocytes. Inflammatory mediators like prostaglandins E2 and D2 which enhances pigment production may play a role in the same.

In dermal hyperpigmentation, melanin gets trapped in the dermis via damaged basement membrane, where it is phagocytosed and subsequently resides within melanophages (dermal macrophages). Histopathological examination shows deposition of melanin in free form and in melanophages in upper dermis and in perivascular region.[54]

Clinically PIH presents as asymptomatic hyperpigmented macules with varying color ranging from tan to dark brown (seen in epidermal melanin depostion) or grey–blue to grey–brown (dermal melanin). PIH gets exacerbated by continued inflammation, trauma or exposure to ultraviolet radiation. Various causes of PIH is summarised in Table 2.

Table 2. Disorders associated with Post Inflammatory Hyperpigmentation.

Inflammatory disease	Clinical clues
	COMMON
Acne vulgaris	Head/neck region, upper trunk; <1 cm; perifollicular
Atopic dermatitis	Atopic diathesis; face and extensor extremities in infants, then later flexural involvement; excoriations; atopic pleats; xerosis; lichenification; transverse nasal crease ("allergic salute")
Lichen simplex chronicus	Common locations: posterior neck, ankle, scrotum
Transient neonatal pustular melanosis	Black newborns; pustules precede pigmentation
Impetigo	Favors face; most common in children
Insect bites	Favor exposed areas; usually <1 cm; lower extremities common with flea bites; clustered and sometimes linear patterns ("breakfast–lunch–dinner")
	LESS COMMON
Irritant and allergic contact and photocontact dermatitis	Sites determined by etiologic agent and form of exposure; phytophotodermatitis associated with linear hyperpigmentation in sun-exposed areas
Pityriasis rosea	Favors trunk and proximal extremities; lesions follow skin cleavage lines; oval-shaped
Psoriasis	Scalp/nail involvement; knees/elbows most common sites
Polymorphous light eruption	Extensor upper extremities, mid upper chest, face; seasonal (e.g. spring or early summer)
Discoid lupus erythematosus	Face and conchal bowls, with follicular plugging in latter site; oral lesions; in scarred lesions, central hypopigmentation with rim of hyperpigmentation
Lichen planus	Wrists, shins, presacral; nail/oral involvement
Erythema dyschromicum perstans (ashy dermatosis)	Neck, proximal upper extremities, trunk; round or oval in shape with gray–brown to blue–gray color; long axis can follow skin cleavage lines (similar to pityriasis rosea); less commonly observed in fair-skinned individuals
Fixed drug eruption	Circular; favors perioral, acral and genital sites; recurrence at same site(s) with repeated exposure
Morbilliform drug eruption	Widespread; usually discrete lesions, history of drug exposure
Viral exanthem	Widespread; usually discrete lesions; history of associated symptoms
Morphea	Trunk or extremities; large-sized except in guttate variant; may be linear; associated induration and later dermal atrophy
Atrophoderma of Pasini and Pierini	Trunk; large-sized; depressed with "cliff sign" at periphery no induration
Neurotic (psychogenic) excoriation, acne excoriée	Favors face, scalp, extensor surface of arms, upper back (reachable areas); linear or angular shapes; multiple stages of evolution, from erosions/ulcerations to scars

Mainstay of treatment of post inflammatory hyperpigmentation includes treatment of underlying disease, strict sun protection using broad spectrum sunscreens, topical hydroquinone (2–4%), topical azelaic acid and α-hydroxy acids.[11,55]

PERIORBITAL HYPERPIGMENTATION

Periorbital hyperpigmentation (POH), is also called periorbital melanosis, periocular hyperpigmentation, infraorbital darkening, dark circles, infraorbital discoloration, or idiopathic cutaneous hyperchromia of the orbital region.[56]

POH presents as homogenous ill-defined hyperpigmentation around eyes usually bilaterally symmetrical. POH affect an individual's emotional well-being and it influences one's quality of life. [57] Data regarding periorbital hyperpigmentation is scarce. Periorbital hyperpigmentation is considered to have a genetic basis. [57] An Indian study revealed POH was most prevalent in age group of 16-25 years; commonest cause of POH was constitutional followed by post inflammatory pigmentation.[58] Risk factors associated with periorbital hyperpigmentation according to the same study were inadequate sleep, frequent usage of cosmetics, frequent rubbing of eye and lack of correction of errors of refraction.[59] The study concluded

that there is a strong association of POH with psychological stress, history of atopy and family history. [58]

Various causes for periorbital hyperpigmentation are:

- Hereditary
- Nevus of ota
- Hori nevus
- Post inflammatory hyperpigmentation
- Superficial location of vasculature
- Periorbital edema
- Pigmentary demarcation lines. [57]

Treatment options of periorbital hyperpigmentation include topical depigmenting agents, like hydroquinone, azelaic acid, kojic acid, retinoic acid and procedures like chemical peels, surgical corrections, fillers, botox injections and laser therapy. [57,55]

FACIAL ACANTHOSIS NIGRICANS (FAN)

Acanthosis Nigricans (AN) presents as dark, velvety, and thickened skin, symmetrically distributed over the neck, axillae, and other flexural regions of the body. Acanthosis Nigricans can also involve the face. There is evidences for association between metabolic syndrome and facial AN. Veysey and Ratnavel in 2005 reported a case of facial AN, who had obesity and hyperinsulinemia. [60]

Saumya pande *et al* concluded from their multicentric study that Facial Acanthosis Nigricans could be considered a morphological marker of metabolic syndrome as there were significant association between male patients and positive OGTT, increased WHR, and BMI and FAN.[61]

LENTIGINES

Lentigines are benign pigmented macules in which there is an increased number of melanocytes. The term 'lentiginosis' is applied either when lentigines are present in large numbers or when they occur in a distinctive distribution.[62] Chronic as well as acute sun exposure has important role in the pathogenesis of solar lentigines.[63]

Types of Lentigines:

Generalized lentigines

Lentigines usually being multiple can also appear singly or in small crops at irregular intervals from infancy onwards. Their pathogenesis is not exactly known and in majority of cases no genetic role can be found out.[64]

Unilateral lentiginosis (Zosteriform lentiginosis)

Such lentigines occur on one side of the body. Such lentigines can be zosteriform and therefore occur in dermatomal or Blaschko linear pattern

Eruptive lentiginosis

In eruptive lentiginosis, there is widespread occurrence of several 100 lentigines in short span of time without any systemic abnormalities. [65]

FRECKLES

Freckles or ephelides are common and starts appearing around age of 5 years as light - brown pigmented macules on the light exposed skin of fair skinned people.

Associations of freckles: Cutaneous disorders associated with freckles are hereditary symmetrical dyschromatosis, xeroderma pigmentosum and cutaneous malignant melanoma. [8]

Fractional non-ablative 2940 nm Erb:YAG laser has given satisfactory results in studies. [66]

ERYTHEMA DYSCHROMICUM PERSTANS (EDP)

Erythema Dyschromicum Perstans is also known as Ashy dermatosis or Dermatosis cenicienta (Cinderella dermatosis). Ramirez first described erythema dyschromicum perstans (EDP) in 1957. [11]

EDP is commonly seen in Latin America and Asia. Though it can occur in males and females, causes greater concern in women. May affect any age group, characteristically lesions start in the first or second decade of life. EDP has been reported in children younger than 10 years in India. [67]

Exact etiology of EDP is unknown. A cell mediated immune reaction to ingested particles, or agents inducing contact irritation or to microorganisms is said to be responsible for the pigmentary disturbance in EDP. There are reports of association of EDP with the ingestion of ammonium nitrate, oral X-ray contrast media, and medications like benzodiazepines, penicillin; exposure to various pesticides, fungicides or toxins and even endocrinopathies like thyroid disease; and whipworm and HIV infections. [11]

Clinically patients develop oval or irregular macules, slate-grey to blue–brown in color in a symmetric pattern initially over trunk and later spreading to the neck, upper limbs and face. In the initial stages

erythematous borders might be present. Though usually asymptomatic mild itching might be present over lesions. Disease might rarely resolve spontaneously.

Topical treatment is generally ineffective. Oral corticosteroids, antibiotics, antimalarials, Isoniazid and Griseofulvin, as well as UV light therapy might be effective. Clofazimine and Dapsone are also tried by some workers with satisfactory results.[68,69] Recently topical Tacrolimus was found effective in ashy dermatosis.[70]

LICHEN PLANUS PIGMENTOSUS (LPP)

Lichen planus pigmentosus is an uncommon variant of lichen planus affecting young to middle-aged population with skin phototypes III–V with slight female preponderance.[71] Bhutani *et al* found that there is presence of colloid bodies in biopsy specimen of both LPP and LP. [72]

Clinically LPP presents as irregular or oval, brown to grey–brown macules in sun exposed areas like forehead, temples and neck or over the intertriginous areas. Soles, nails and oral mucosa are usually spared. Usually asymptomatic, mild pruritus might be present. Early lesions do not

have an erythematous border in contrast to Erythema Dischromicum Perstans.

The etiology of LPP is unknown. UV rays are said to be one inciting factor due to the involvement of disease over photo exposed areas. Kanwar *et al* in 2003 reported topical application of mustard oil and amla oil as triggering factors. [73] LPP is the result of an hypersensitivity reaction to an unknown antigen showing a lichenoid inflammation, leading to melanin incontinence which causes superficial dermal pigmentation.[71]

RIEHL'S MELANOSIS (RM)

Riehl's Melanosis (RM) is said to be a pigmented contact dermatitis to substances present in cosmetics and textile items. RM favours sites of application of cosmetics. Lesions may be reticulated. Brown to grey colored due to dermal melanin deposits. Biopsy reveals vacuolar degeneration of basal layer and lichenoid infiltrate in early lesions. Recently a lichenoid immune reaction caused by intrinsic as well as extrinsic factors were postulated to be a cause of Riehl's melanosis.

Repeated contact with low levels of allergens in cosmetic agents and textile products produce a cytotoxic reaction characterized by vacuolar basal cell degeneration and pigment incontinence. [74]

RM is characterized by diffuse, patchy or reticular pigmentation, often with satellite perifollicular pigmented macules and scaly follicular hyperkeratosis. [2]

Sites of involvement depend on the allergen responsible. Lesions due to cosmetics begin on forehead and temples spreading over to rest of the face and even extends to chest, neck, scalp, hands, and forearms. While those due to textiles more often involve anterior aspect of thighs and axillae.

IPL and Qs Nd:YAG lasers are some of the treatment options of Riehl's melanosis.[75]

NEVUS OF OTA (NOO)

Nevus of Ota is a bluish black dermal melanocytosis that affects the sclera and the skin around the eye, distributed along the first and the second branches of the trigeminal nerve. Extracutaneous lesions may be present in the uveal tract, nasopharynx, tympanum and palate. [76]

Nevus of Ota was first reported by Hulke in 1860 and later named after Masao Ota. In 1939 he used the term nevus 'fuscocaeruleus ophthalmomaxillaris. Incidence of NOO is 0.014% to 0.034%. Male-

female ratio is 1:4.8. Most commonly seen among Asians and very rare in other populations.

Associations of Nevus of Ota:

NOO is rarely associated with Nevus of Ito. Bilateral NOO is associated with extensive Mongolian spots. Other associations are Sturge–Weber syndrome and Klippel–Trenaunay syndrome.

Classification of NOO

Tanino has classified Nevus of Ota based on the extent and distribution as: [77]

- Type I. Mild type
    - IA. Orbital
    - IB. Zygomatic
    - IC. Forehead
    - ID. Ala nasi alone
- Type II. Moderate type: over the upper and lower eyelids, periocular, zygomatic, cheek and temple regions.
- Type III. Involves scalp, forehead, eyebrow and nose.
- Type IV. Bilateral type: Both sides are involved.

The basic pathophysiology of NOO is embryonic failure of migration of melanocytes from the neural crest to dermo-epidermal junction which remains inactive and gets activated under hormonal influence. The same is said to be the cause of nevus of lto, blue nevus and mongolion spots. The blue to blue–grey pigmentation of Nevus of Ota is due to melanin-producing melanocytes in the upper dermis whereas the normal location of melanocytes are within the basal layer of the epidermis, hair bulb, and outer root sheath of hair follicles. [78]

Genetic studies have found somatic activating mutations in GNA11 and GNAQ gene which encode for α subunits of G proteins. The same gene mutations are also studied in melanocytic neoplasms of the central nervous system.[79] NOO may extend over time and persist for life. Treatment: Q-switched ruby, alexandrite and Nd:YAG lasers, though post treatment hypopigmentation is commonly reported.[80]

Facial hyperpigmentation in general

Upon reviewing previous literatures regarding facial hyperpigmentation, in the five studies conducted across India during 2012-2016 four studies dealt with facial hyperpigmentation alone and one with both hypo and hyperpigmentation of face [81]. Three of the studies analysed

100 [3] cases each and two studies analysed 118 [1] and 158 [82] cases of facial hyperpigmentation.

Youngest patient with facial hyperpigmentation in three of the studies was 13 years old while in one study it was 12 years and the oldest patient of the studies was 76 year old. All workers unanimously reported that majority of patients with facial hyperpigmentation were females (63% to 80%) and melasma was the most common cause of facial hyperpigmentation ranging from 36% to 55%. Two studies revealed that second most common cause of facial hyperpigmentation was Reihl's melanosis (both 35%)[1,59] and post inflammatory hyperpigmentation (22% & 25% each) were the second most common cause of facial hyperpigmentation in another two studies.[44,82] Whereas one study found that second most common cause of facial hyperpigmentation was periocular hyperpigmentation.[3]

While two studies reported history of 4% to 6% of melasma patients taking oral contraceptive pills[44,82], analysis by Shahana in 2013 interestingly showed nearly double fold increased association of oral contraceptive pills with melasma (12.7%)[59] compared to the other two studies.

Cosmetic usage was found to be associated with facial hyperpigmentation in majority of the studies. Revathy[1] in 2016 reported in a study in Bangalore that 31.4% cases of facial hyperpigmentation were associated with cosmetic usage while Hassan *et al*. in 2013 observed 32.73% association[82] whereas Kavya M from Bangalore in 2014 reported only 22% association[44] of cosmetic usage and facial hyperpigmentation.

Prolonged sun exposure was another commonly associated factor with facial hyperpigmentation. Shahana [59] reported from Telangana that 54% of patients with facial hyperpigmentation had prolonged sun exposure. Hassan *et al*. derived from their study in Jammu & Kashmir in 2013 that all cases of Lichen planus pigmentosus and Riehl's melanosis, 80% cases of drug-induced hypermelanoses, 80% cases of ephelides, 65.75% cases of melasma and 40% cases of post inflammatory hyperpigmentation had exacerbation of facial pigmentation on sun exposure. [82]

MATERIALS & METHODOLGY

Study design: Cross sectional study

Study setting: The dermatology outpatient department of the tertiary care centre, Karpaga Vinayaga Institute of Medical Sciences, Chinnakolambakkam, Kanchipuam district of Tamilnadu

Study duration: 12 months. January 2018 to December 2018.

Study population: Patients with age 13 years and above including both genders presenting to the outpatient department of dermatology, Karpaga Vinayaga Institute of Medical Sciences with facial hyperpigmentation.

Sample size: 100 cases

$N = 4pq/d^2$

p = unknown so considered 50% prevalence;

q = 1-P;

d = clinical variation = 10%

N = 4*50*50 /100 = 100 individuals

Sampling: Convenience sampling technique

Inclusion criteria:

- All males and females of age 13 years or above with non-elevated hyperpigmented skin lesion(s) on face whether treated/treating or have not taken any treatment yet.
- Those who are willing to give consent.

Exclusion criteria:

- Facial hyperpigmentation due to sequela of trauma.
- Elevated skin lesions
- Age less than 13 years
- Those who are not willing to give consent.

Study instruments:

Pre tested validated structured questionnaire

Data collection: Primary data was collected by principle investigator by interview method. Meticulous history taking, general physical examination, systemic examination along with wood's lamp examination was done with consent from the patient. Histopathological examination was done only in relevant cases were clinical diagnosis was in doubt. Relevant details were recorded and tabulated.

Data analysis:

Software: SPSS version 20

Statistical analysis: Descriptive statistics; mean, median, standard deviation and percentages were calculated. The association between variables were calculated by chi square test and correlation coefficient at 5% level of significance.

Ethical issues:

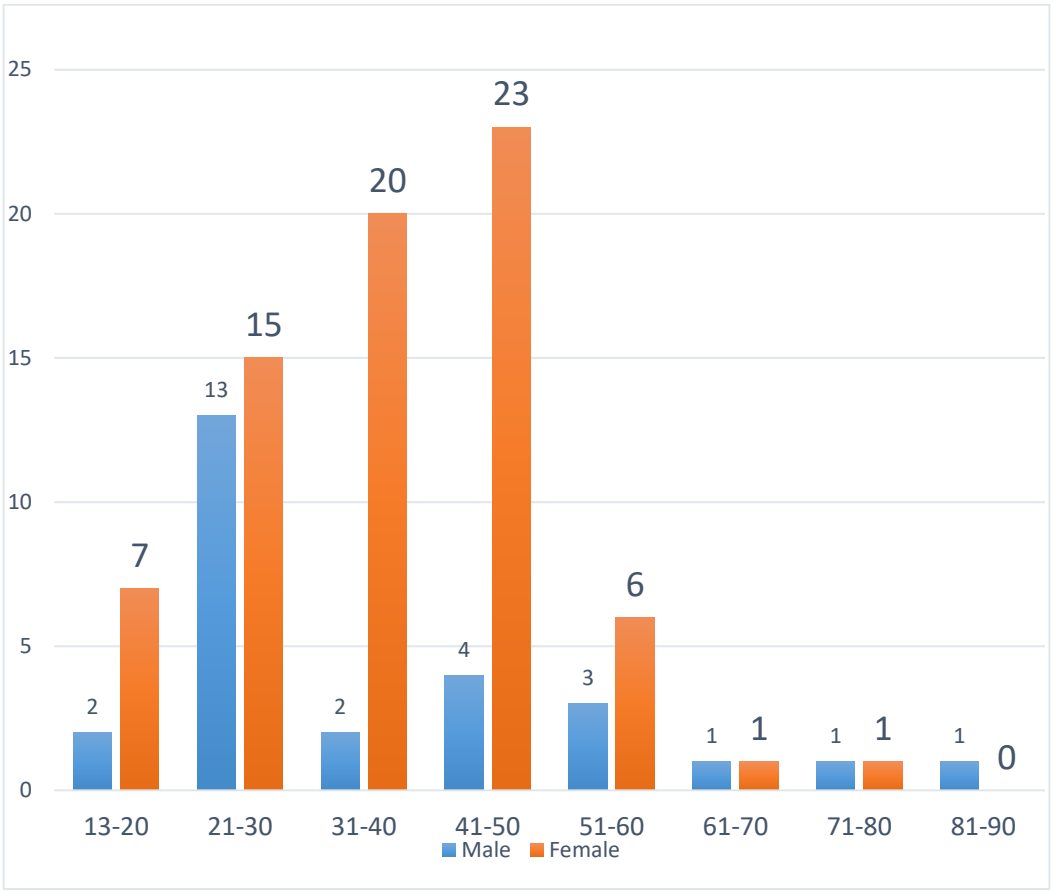
Participants were made aware about the nature and purpose of the study. Willingness and signature of the participants were taken on a consent form. Participants were also informed that all the data provided will be kept confidential and will be used only for the study purpose. Written consents were obtained from all the subjects who participated in the study before the study was started. Institutional ethics committee of Karpaga Vinayaga Institute of Medical Sciences & Research Centre reviewed the study proposal for ethical consideration and approval was given.

RESULTS

Table 3. Age and Sex distribution of study participants:

Age Group	Sex		Total
	Male	Female	
13-20	2	7	9
21-30	13	15	28
31-40	2	20	22
41-50	4	23	27
51-60	3	6	9
61-70	1	1	2
71-80	1	1	2
81-90	1	0	1
Total	**27**	**73**	**100**

Figure 6. Age and Sex distribution of study participants



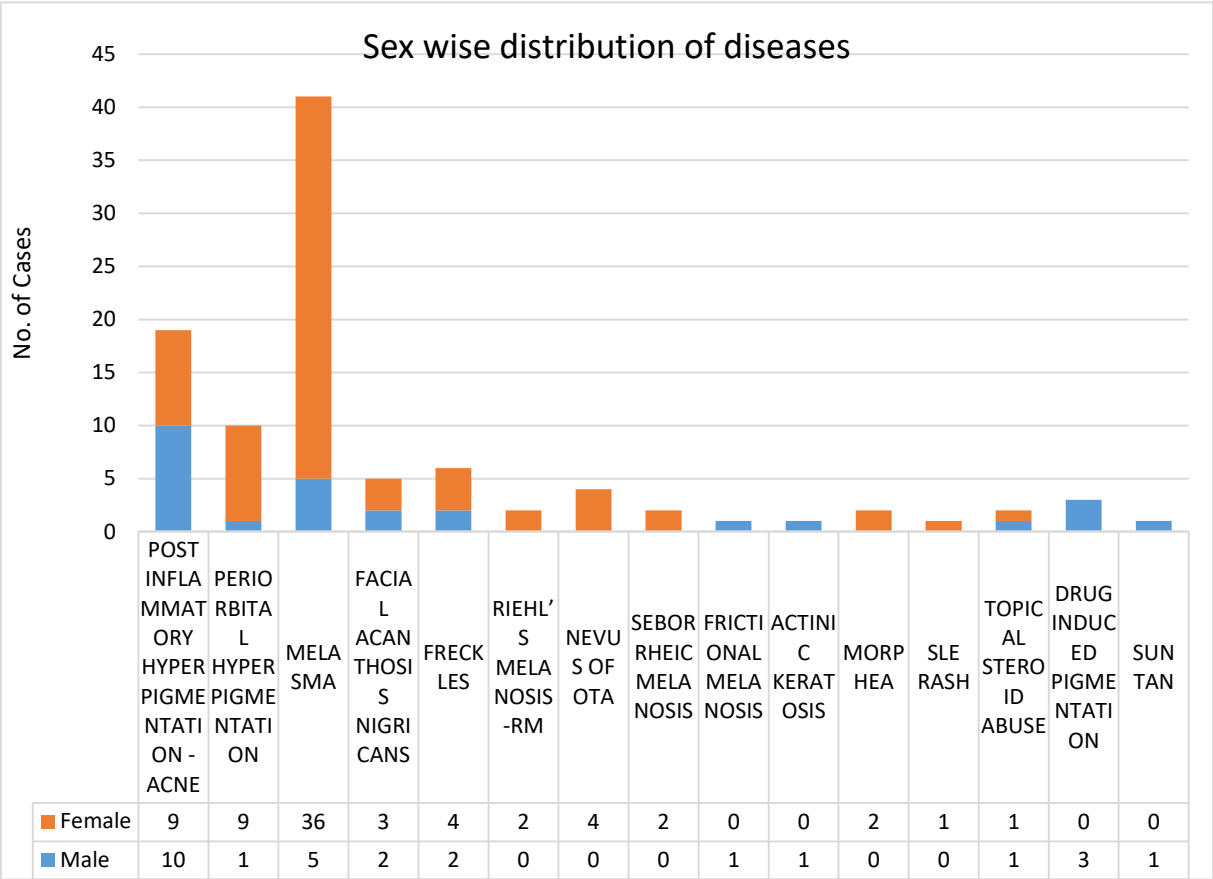
In the study 100 patients were included in which females (73 cases) outnumbered males (27 cases). Male to female ratio was 1:2.7. Youngest patient was 13 years old and eldest patient was 81 years old. Mean age was 37.5 years.

The most common age group was 21 to 30 which had total 28 patients including 13 males and 15 females.

Table 4. Sex wise distribution of various diseases:

Diseases	Male	Female	Total
MELASMA	5	36	41
POST INFLAMMATORY HYPERPIGMENTATION - ACNE	10	9	19
PERIORBITAL HYPERPIGMENTATION	1	9	10
FRECKLES	2	4	6
FACIAL ACANTHOSIS NIGRICANS	2	3	5
NEVUS OF OTA	0	4	4
DRUG INDUCED PIGMENTATION	3	0	3
RIEHL'S MELANOSIS	0	2	2
SEBORRHEIC MELANOSIS	0	2	2
MORPHEA	0	2	2
TOPICAL STEROID ABUSE	1	1	2
FRICTIONAL MELANOSIS	1	0	1
ACTINIC KERATOSIS	1	0	1
SLE RASH	0	1	1
SUN TAN	1	0	1
Total	27	73	100

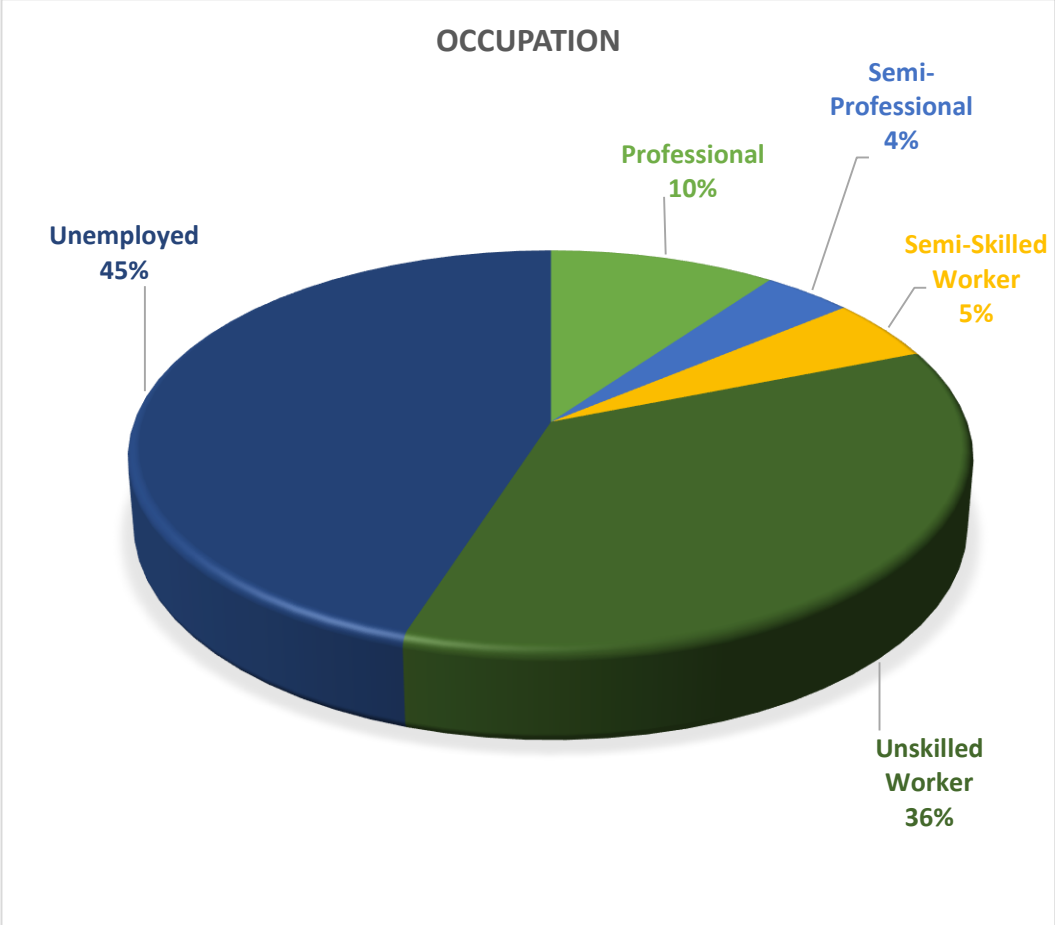
Figure 7. Sex wise distribution of various diseases



	POST INFLAMMATORY HYPERPIGMENTATION - ACNE	PERIORBITAL HYPERPIGMENTATION	MELASMA	FACIAL ACANTHOSIS NIGRICANS	FRECKLES	RIEHL'S MELANOSIS-RM	NEVUS OF OTA	SEBORRHEIC MELANOSIS	FRICTIONAL MELANOSIS	ACTINIC KERATOSIS	MORPHEA	SLE RASH	TOPICAL STEROID ABUSE	DRUG INDUCED PIGMENTATION	SUN TAN
Female	9	9	36	3	4	2	4	2	0	0	2	1	1	0	0
Male	10	1	5	2	2	0	0	0	1	1	0	0	1	3	1

Sex wise distribution showed 36 female and 5 male Melasma cases, 10 male and 9 female cases of Post inflammatory hyperpigmentation from facial acne, 9 female and 1 male case of Periorbital hyperpigmentation, 4 female and 2 male cases of Freckles, 3 female and 2 male cases of Facial Acanthosis Nigricans, 4 female cases of Nevus of Ota, 3 male cases of drug induced pigmentation, 2 female cases of Riehl's melanosis, 2 female cases of seborrheic melanosis, 2 female cases of facial Morphea, 1 male and 1 female case of topical steroid abuse, 1 male case of frictional melanosis, 1 male case of actinic keratosis, 1 female case of SLE rash and one male case of sun tan.

Figure 8. Occupation of the participants



In the study majority of the patients were unemployed falling to 45%. This falls in line with the Indian scenario where males go for work more often than females and that in our study majority of patients consisted female gender. The next majority were unskilled workers which fell to 36%. Professional workers were only 10% of the total 100 cases.

CLINICAL PROFILE OF DISEASES

In the study, while analysing the different causes of facial hyperpigmentation the proportion of various diseases were as follows:

Table 5. Proportion of Diseases in the study

Diagnosis	Percentage
MELASMA	41
POST INFLAMMATORY HYPERPIGMENTATION - ACNE	19
PERIORBITAL HYPERPIGMENTATION	10
FRECKLES	6
FACIAL ACANTHOSIS NIGRICANS	5
NEVUS OF OTA	4
DRUG INDUCED PIGMENTATION	3
RIEHL'S MELANOSIS -RM	2
SEBORRHEIC MELANOSIS	2
MORPHEA	2
TOPICAL STEROID ABUSE	2
FRICTIONAL MELANOSIS	1
ACTINIC KERATOSIS	1
SLE RASH	1
SUN TAN	1
Total	100

Among the 100 cases of facial hyperpigmentation, melasma formed the largest group (41 cases). Second largest group was post inflammatory hyperpigmentation from acne (19 cases) followed by periorbital hyperpigmentation which constituted 10 cases.

Table 6. Relation of facial hyperpigmentation with pregnancy:

Diagnosis	Not applicable	Increases	Decreases	No change
Periorbital hyperpigmentation	8	1	0	0
Melasma	20	4	0	12
Other diseases	36	0	0	19

When the female patients were asked whether the facial pigmentation increased during pregnancy, four melasma (11%) patients and one female (11.11%) with periorbital pigmentation noted increased pigmentation during pregnancy whereas 20 female melasma patients replied that they did not notice any visible change during pregnancy. Females with other diseases did not notice any changes associated with pregnancy.

Table 7. Relation of Facial hyperpigmentation with sun exposure

Aggravation of pigmentation on sun exposure	Percent
Yes	61.0
No	39.0
Total	100.0

Relation between sun exposure and aggravation of facial hyperpigmentation was studied which showed the following results: 61 percentage of patients with facial hyperpigmentation remarked they noted visible increase in the pigmentation while exposed to sun where as 39 percentage did not feel any such change.

Table 8. Details of treatment taken for the facial hyperpigmentation

Treatment taken	Percent
No	66.0
Topical only	24.0
Topical + oral	9.0
Oral only	1.0
Total	100.0

While analysing the history of treatment taken so far, 66% had not taken any treatment whereas 34% took some treatment in which 24% had taken topical treatment and 9% took topical treatment along with oral medicine for the facial hyperpigmentation.

Table 9. Details of home remedies taken by the participants

Home remedies used	Percent
No	65.0
Yes	35.0
Total	100.0

Among the 100 patients, 35 patients had tried some form of home remedies whereas majority of patients (65%) did not attempt any form of home remedies. The home remedies included making a paste from crushing various leaves and other objects and applying on face.

Table 10. Details of topical steroid usage for facial hyperpigmentation by the participants:

Topical Steroid Usage	Percent
No	82.0
Yes, plain steroid	8.0
Combination steroids	8.0
Do not know	2.0
Total	100.0

Since topical steroid abuse was a common problem faced by dermatologists over the country, an analysis about the history of topical steroid application and its complication was made.[83]

On analysing the cases, 16 cases gave history of application of topical steroids out of which 8 cases had applied plain steroid and 8 had applied combination steroids. Most common plain steroid was Betamethasone valearate and combination steroid was Betamethasone valearate with Gentamicin and Miconazole nitrate. Easy availability and low price were the factors which led them to usage of Betamethasone valearate. Majority of the patients were provided with topical steroids by pharmacists themselves and most common indication was skin lightening.

Table 11. Details of usage of vegetables and other agents on face

Vegetable application	Percent
No	77.0
Yes	23.0
Total	100.0

Another interesting finding in the study was the application of raw vegetables and other agents on face. Twenty three percentage of the patients admitted that they had tried applying numerous raw vegetables on face in single and combination with other agents and other vegetables.

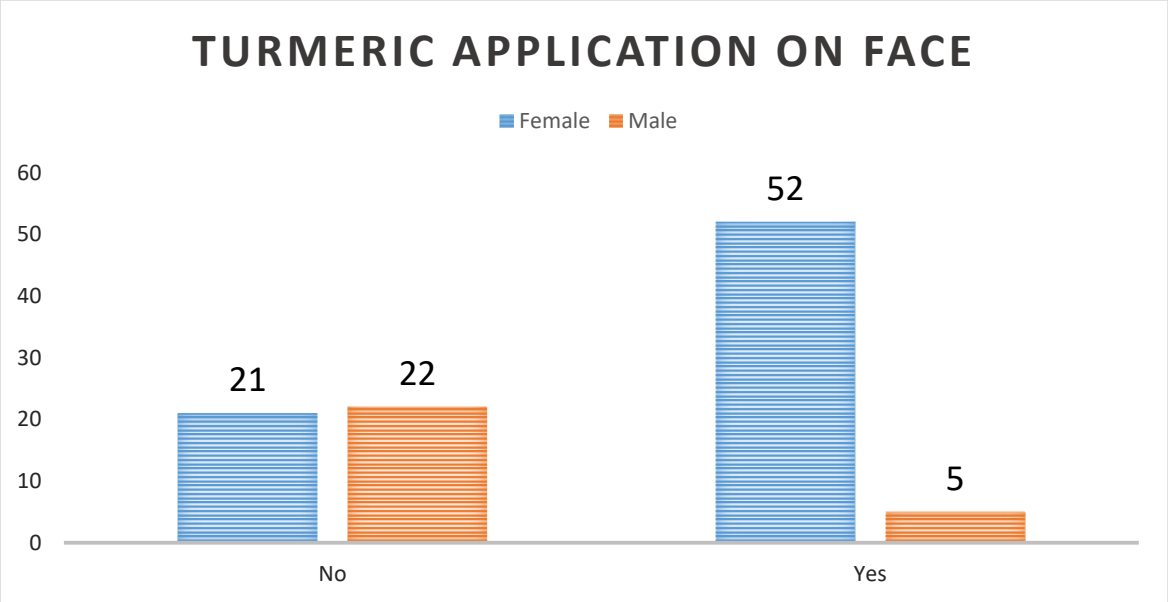
Various combination of vegetables and other agents were tomato alone, tomato + garlic, tomato + lemon + ice, tomato + potato + aloe vera, tomato + potato + lemon + onion + aloe vera + gram flour paste, tomato + sugar scrub + cumin seeds, aloe vera, lemon + honey, lemon + curd, milk + sugar.

There was one patient who has been applying mint leaves (puthina), fuller's earth (multani mitti), green gram powder, green gram flour in alternating combinations since 6 months.

Table 12. Details of turmeric application on face.

Sex	Turmeric application		Total
	No	Yes	
Female	21	52	73
Male	22	5	27
Total	43	57	100

Figure 9. Details of turmeric application on face.



It is a common practice of people of Tamilnadu to apply turmeric on face. In the study an attempt was made to study turmeric usage habit of the participants.

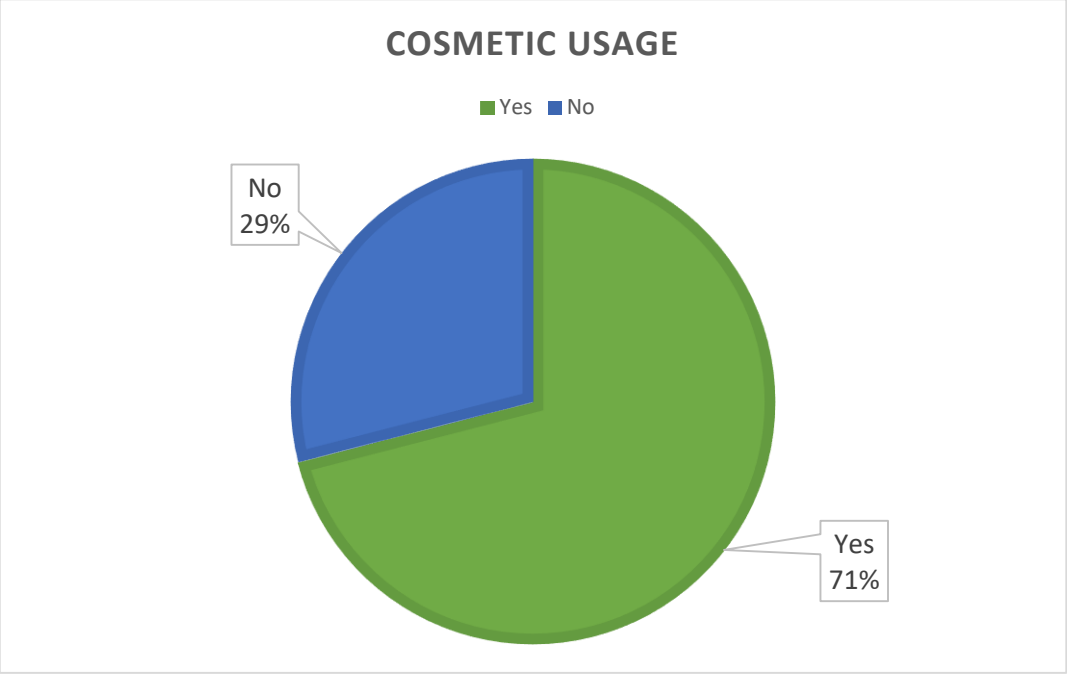
It was found that 57% of the patients including both males & females had the habit of application of topical turmeric either for their present skin problem or otherwise. When females alone were considered, 52% of females had history of topical application of turmeric. The reason for application of turmeric on face included social practices, for general skin health and some applied specifically in the belief that it will help for lightening the skin pigmentation. Some of the previous studies had shown statistically significant positive effects on skin health from turmeric usage.[84] Turmeric application on face obscured wood's lamp findings in some patients for which they were asked to wash face properly for re-examining.

Table 13. Details of cosmetic usage on face

Diagnosis	Usage of Cosmetics			Total	p Value
	No	Yes			
		Cases	%		
POST INFLAMMATORY HYPERPIGMENTATION - ACNE	8	11	58	19	**0.034**
PERIORBITAL HYPERPIGMENTATION	4	6	60	10	
MELASMA	8	33	80	41	
FACIAL ACANTHOSIS NIGRICANS	2	3	60	5	
FRECKLES	0	6	100	6	
RIEHL'S MELANOSIS	0	2	100	2	
NEVUS OF OTA	1	3	75	4	
SEBORRHEIC MELANOSIS	0	2	100	2	
MORPHEA	0	2	100	2	
SLE RASH	0	1	100	1	
TOPICAL STEROID ABUSE	0	2	100	2	

p value is <0.05 (0.034) which is statistically significant.

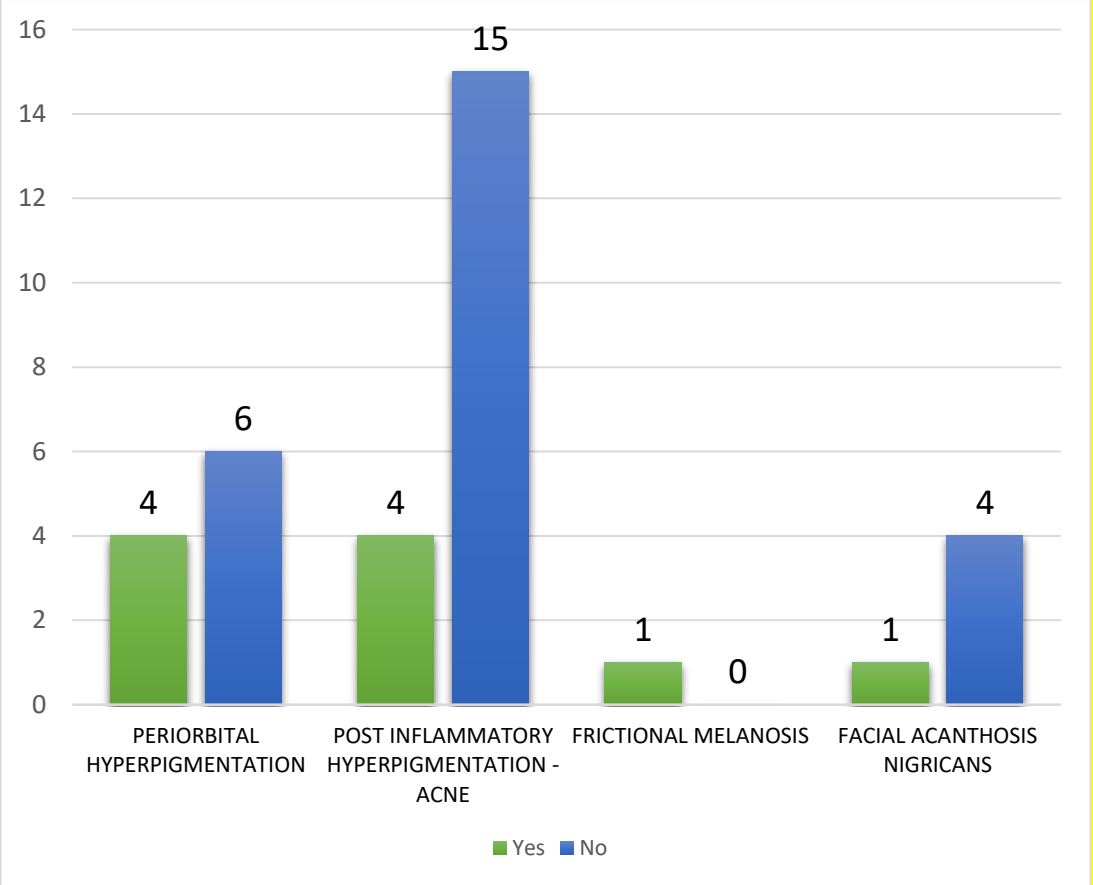
Figure 10. Details of cosmetic usage on face



Majority (71%) of the patients had used some form of cosmetics on face. Various cosmetics that were documented in the study were: Adapalene Cream, Aloe Vera Cream, Ayur Sunscreen, Blackberry Facewash, Blackrose Hair Dye, Fair & Lovely fairness cream, Gokul Powder, Gokul Sandal, HHlite Cream, J&J Talcum Powder, Kasturi Manjal, Lakme Facewash, Neem Facewash, Olay fairness cream, Ponds Age Miracle, Ponds Baby Cream, Ponds Facewash, Ponds Powder, Ponds White Beauty, Skinlite, Vicco Turmeric,

'Fair and Lovely' topped the list followed by 'Ponds age miracle'. Interestingly, one patient in the study regularly used 'Fair and Lovely' fairness cream on a daily basis for 25 years.

Figure 11. Relation of frequent rubbing of face with facial hyperpigmentation



Frequent rubbing of face being one of the risk factor of facial hyperpigmentation, was analysed in the study which showed 100% of frictional melanosis (1 case), 40% of periorbital hyperpigmentation, 21% of acne pigmentation and 20% of facial acanthosis nigricans had the habit of frequent rubbing of the face.

Table 14. Drug history of the participants

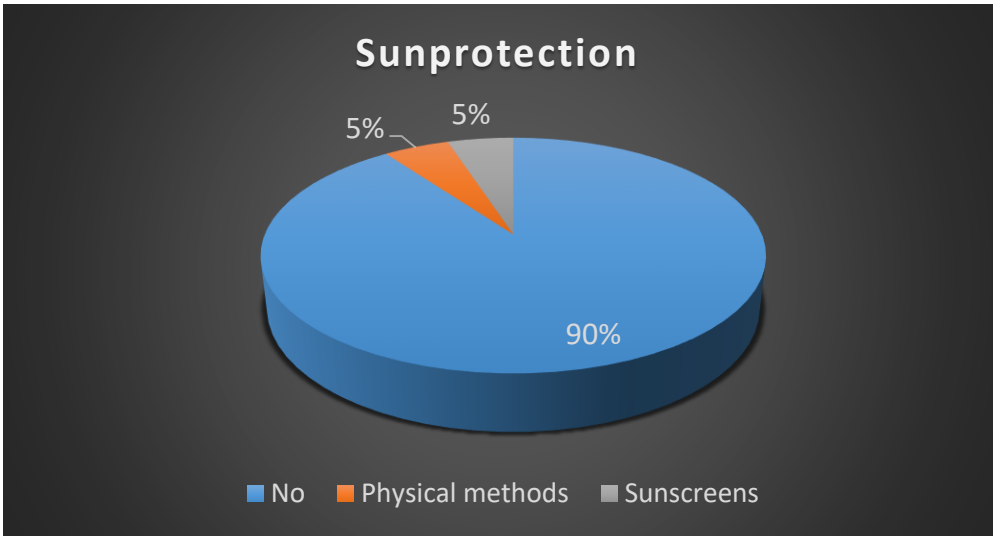
Disease	Nil	Oral Contraceptive Pills (Females)	Thyroid drugs	Leprosy treatment	Total	p Value
PERIORBITAL HYPERPIGMENTATION	9	0	1	0	10	**0.002**
MELASMA	32	5	3	1	41	
FRECKLES	2	4	0	0	6	
DRUG INDUCED PIGMENTATION	0	0	0	3	3	
Total		9	4	4	17	

While considering drug history, only 17 patients gave positive history of drug intake. Details of antidiabetic and antihypertensive drugs were not included in the study. In 9 patients of periorbital pigmentation, one patient was on thyroid medication. In melasma patients, out of the total 41 patients, 78% (32 patients) did not give any drug history whereas 14% (5 of 36 cases) of the female melasma patients gave history of oral contraceptive pill usage and 3 patients (7%) and 1 patient (2.5%) gave history of thyroid drugs and leprosy drugs respectively.

Table 15. Details of sun protection by the participants

Usage of sun protection	Percent
No	90.0
Physical methods	5.0
Sunscreens	5.0
Total	100.0

Figure 12. Details of sun protection by the participants

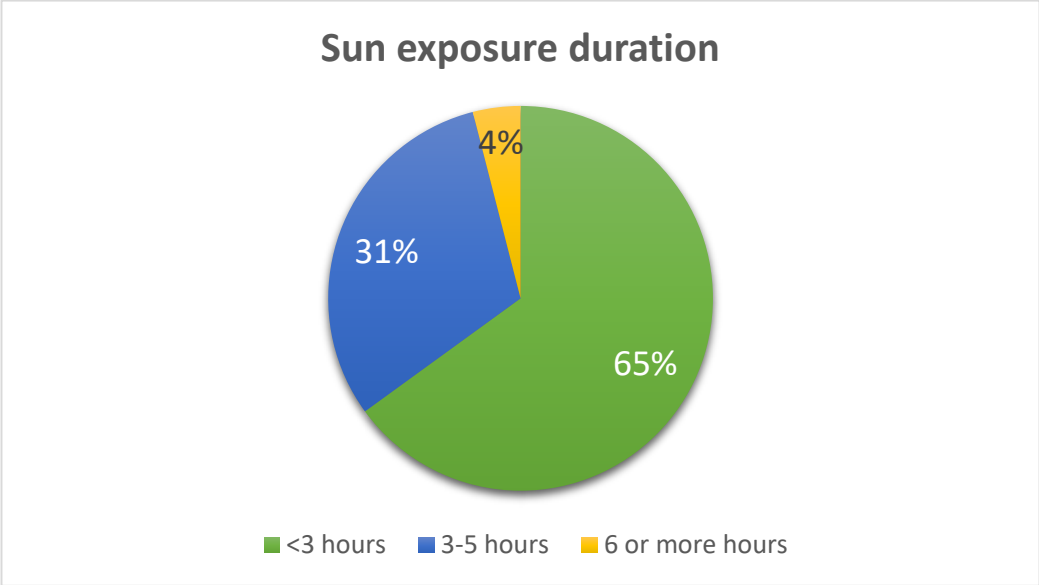


Participants were asked if they had used any methods for preventing sun exposure for which 90% replied since they did not care about sun exposure, did not take any measures to prevent sun exposure whereas 5% told they tried to prevent direct falling of sunlight on face for which they used methods like covering face with scarf or wore caps. Only 5 % of the participants used topical sunscreen preparations.

Table 16. Details of sun exposure

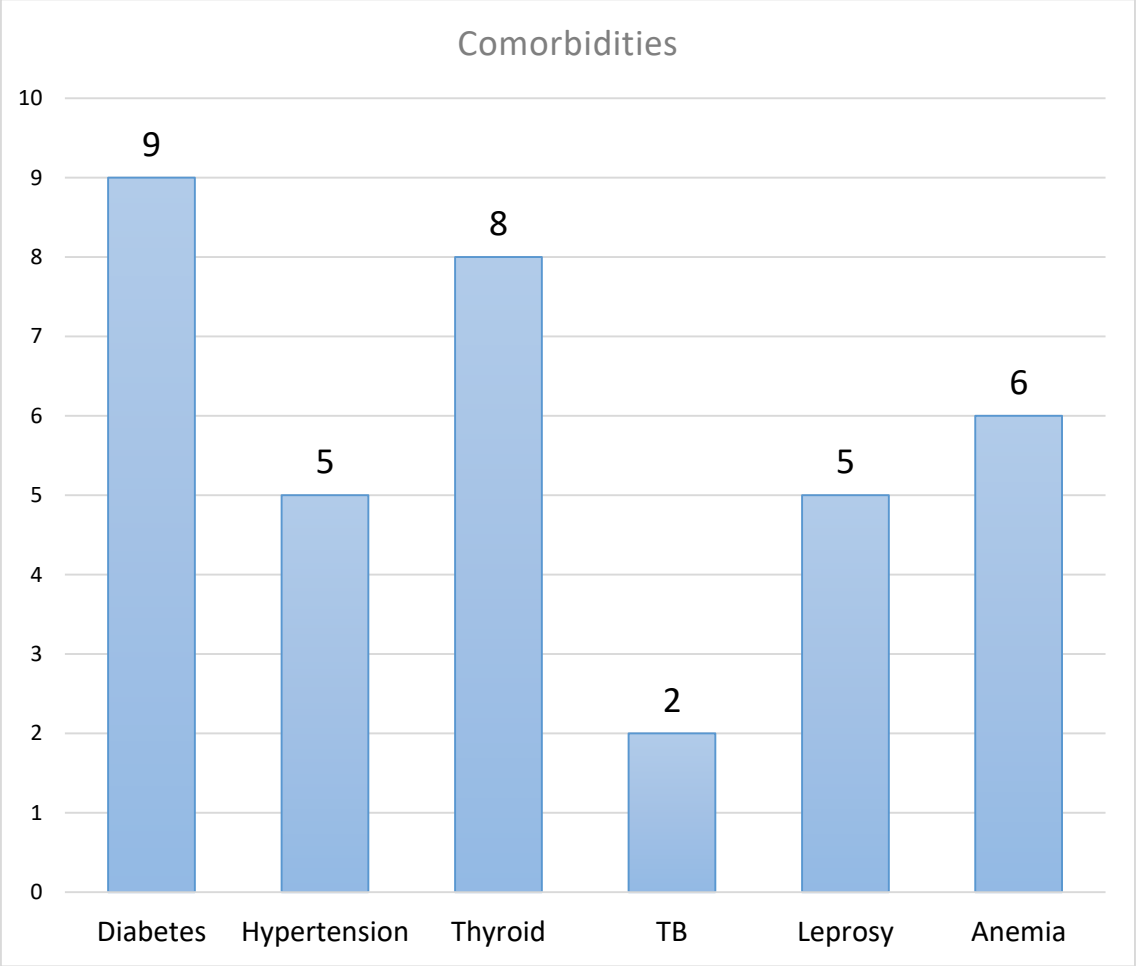
Daily duration of sun exposure	Percent
<3 hours	65.0
3-5 hours	31.0
6 or more hours	4.0
Total	100.0

Figure 13. Details of sun exposure



Sun exposure details were collected which showed that all the cases were exposed to sunlight. Majority (65%) having exposed to sun daily for less than 3 hours per day and 31% of cases getting exposed to sun daily for 3 to 5 hours per day as part of their routine activities including work. 4% of people were exposed to sun for 6 or more hours per day. It was mostly outside workers like agricultural workers, painters who were exposed to sun as a part of their outside jobs.

Figure 14. Details of comorbidities of the participants



While assessing the comorbidities, diabetes peaked the diseases (9%) followed by thyroid disorder (8%). Six patients had anemia, 5 patients had hypertension and another 5 had leprosy.

Table 17. Comorbidities and association with facial hyperpigmentation

Diseases	Diabetes Mellitus	Hyper tension	Thyroid	Tuber culosis	Leprosy	Anemia
POST INFLAMMATORY HYPERPIGMENTATION - ACNE	0	0	1	0	0	1
PERIORBITAL HYPERPIGMENTATION	0	1	1	0	0	0
MELASMA	5	3	6	2	1	2
FACIAL ACANTHOSIS NIGRICANS	2	0	0	0	0	1
NEVUS OF OTA	0	0	0	0	1	0
FRICTIONAL MELANOSIS	1	0	0	0	0	0
ACTINIC KERATOSIS	0	0	0	0	0	1
DRUG INDUCED PIGMENTATION	1	1	0	0	3	1

Five melasma patients, two patients with facial acanthosis nigricans, one patient with frictional melanosis, and one patient with drug induced pigmentation had diabetes mellitus.

One patient with periorbital pigmentation, three melasma patients and one patient with drug induced pigmentation had hypertension. Eight cases had thyroid diseases (1 post inflammatory hyperpigmentation patient, 1 periorbital hyperpigmentation, 6 melasma patients). Past history of pulmonary tuberculosis was present with two melasma patients.

History of leprosy was present in one melasma patient, one patient with Nevus of Ota, and three patients with drug induced pigmentation. Anemia was present with one case each of post inflammatory hyperpigmentation from acne, facial acanthosis nigricans, actinic keratosis, drug induced pigmentation and two patients with melasma.

Table 18. Details of consanguinity and facial hyperpigmentation

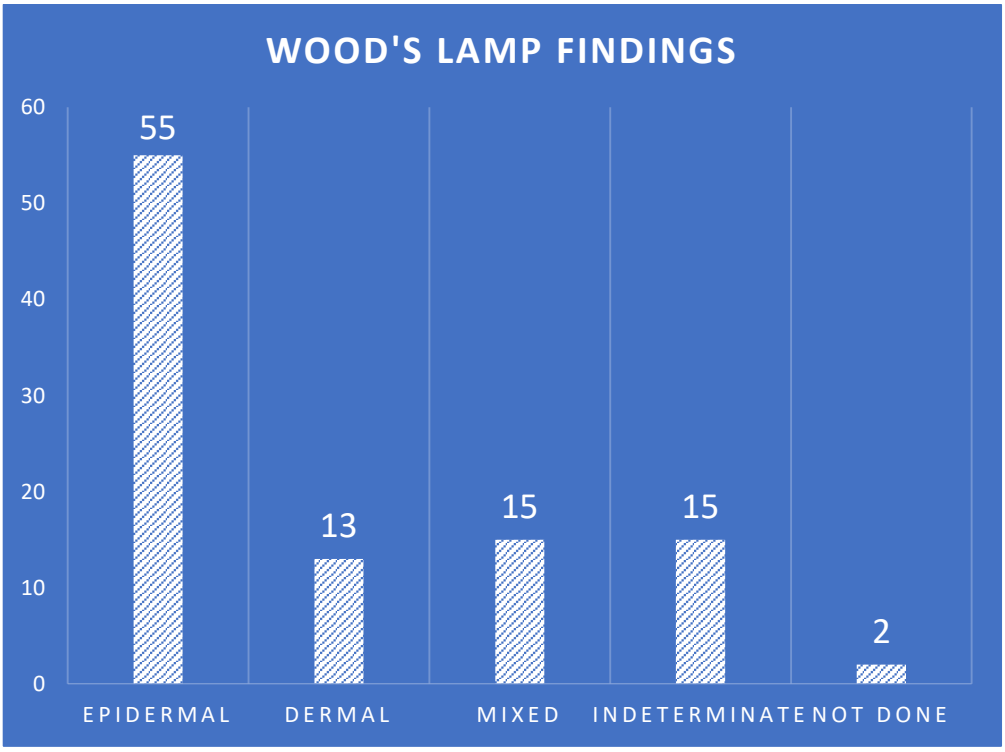
Diseases	Consanguinity			
	Not present	Yes		Total
		No. of cases	%	
PERIORBITAL HYPERPIGMENTATION	9	1	10	10
MELASMA	35	6	14.5	41
FACIAL ACANTHOSIS NIGRICANS	4	1	20	5
MORPHEA	1	1	50	2

While the consanguinity history was elicited it was found that parents of 9% of cases had consanguineous marriage. History of consanguineous marriage was found in the following diseases: Melasma, periorbital hyperpigmentation, facial acanthosis nigricans and morphea. Top in the list was melasma patients in which 14.5% (6 of 41 cases) had consanguineous parents and 10% (1 of 10 cases) of periorbital hyperpigmentation, 20 % (1 of 4 cases) of facial acanthosis nigricans and 50% of facial morphea (1 of 2 cases) had consanguineous parents.

Table 19. Wood's lamp findings of facial hyperpigmentation

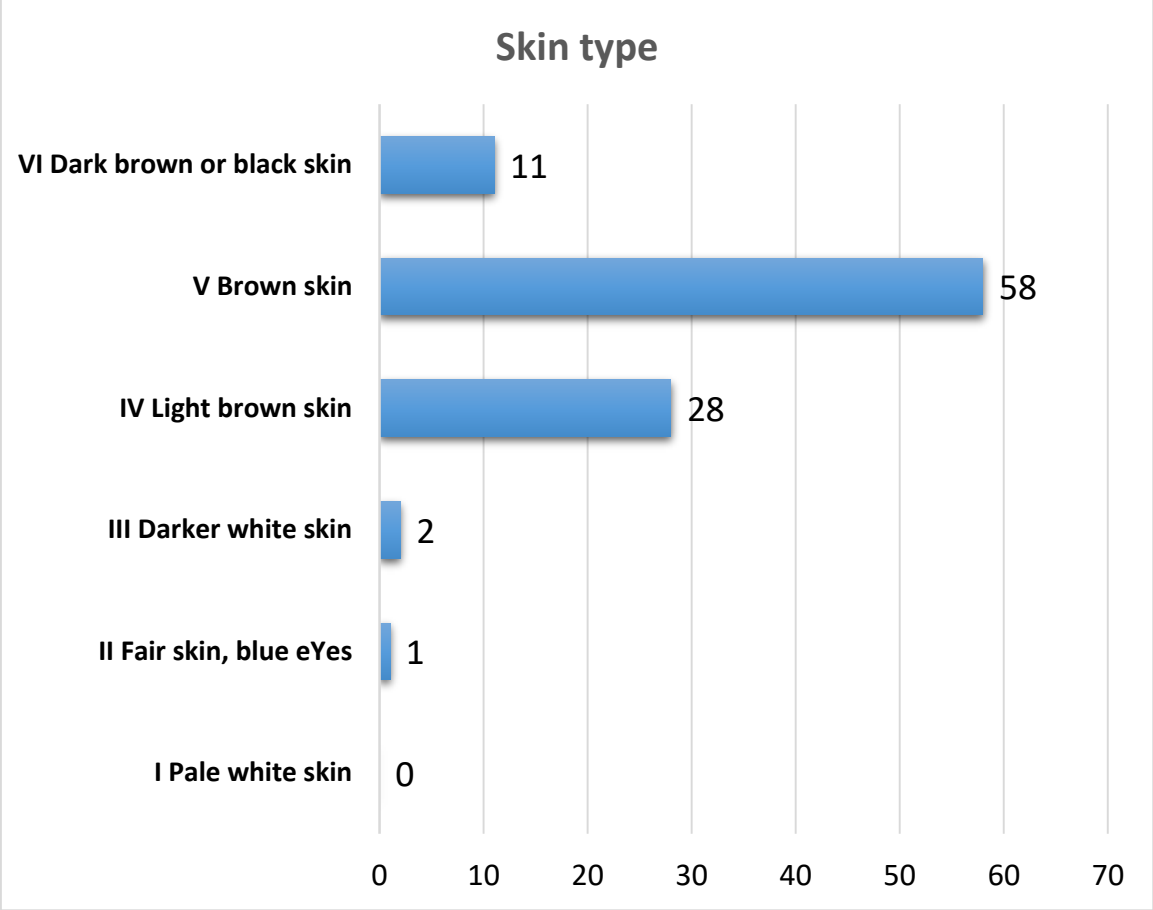
Type	Percent
Epidermal (Accentuation present)	55
Dermal (No accentuation)	13
Mixed	15
Indeterminate	15
Not done	2
Total	100

Figure 15. Wood's lamp findings of facial hyperpigmentation



Ninety eight percentage of the patients were subjected to wood's lamp examination; 2% could not be done due to technical reasons. 55% of patients had epidermal pigmentation, 13% had dermal pigmentation and 15% had mixed dermal and epidermal pigmentation. 15% of patients lacked specific findings since they had other applications on face (turmeric etc.) which produced distinct fluorescence due to which wood's lamp examination was inconclusive.

Figure 16. Analysis of Fitzpatrick skin type in the study

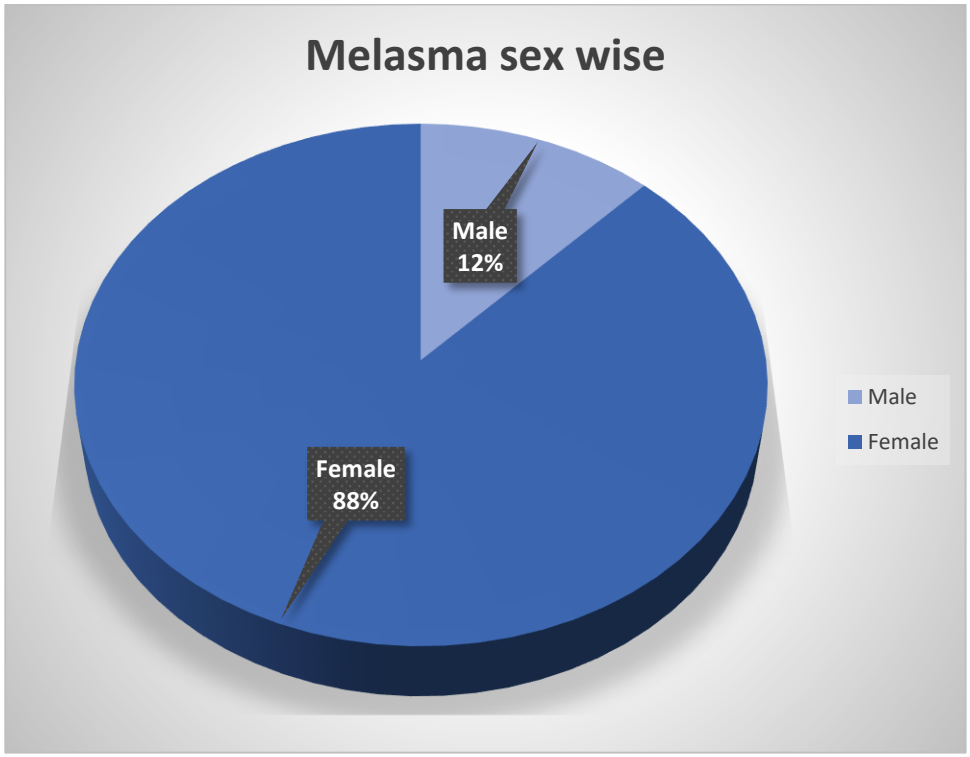


Analyzing the skin type based on Fitzpatrick classification [85], 58% of patients had Type V skin followed by 28% having type IV skin. 11% patients fell to VI skin type. Only one patient in the study had Type II skin. There were no patients with type I Fitzpatrick skin.

MELASMA SUMMARISED

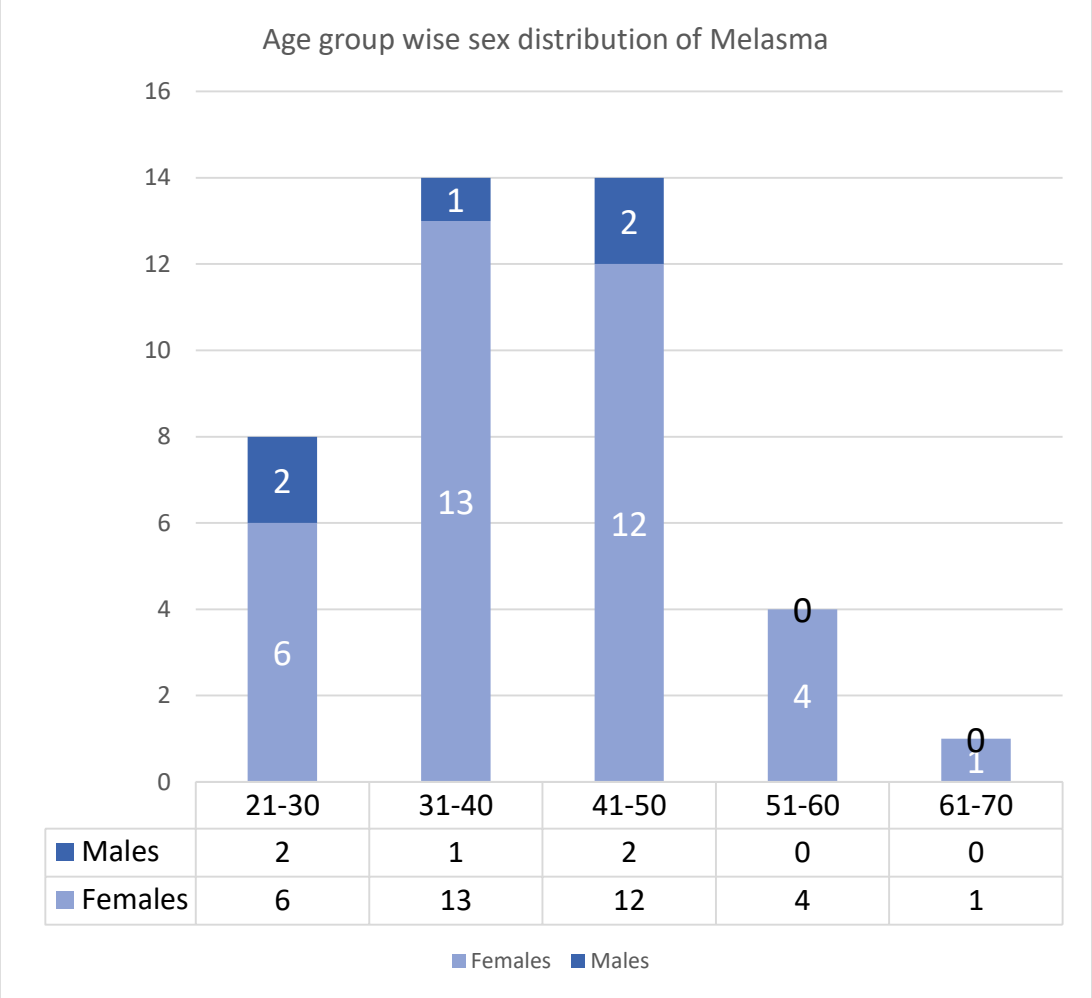
Since melasma formed bulk of the disease further details of melasma patients are summarised.

Figure 17. Sex distribution of melasma patients



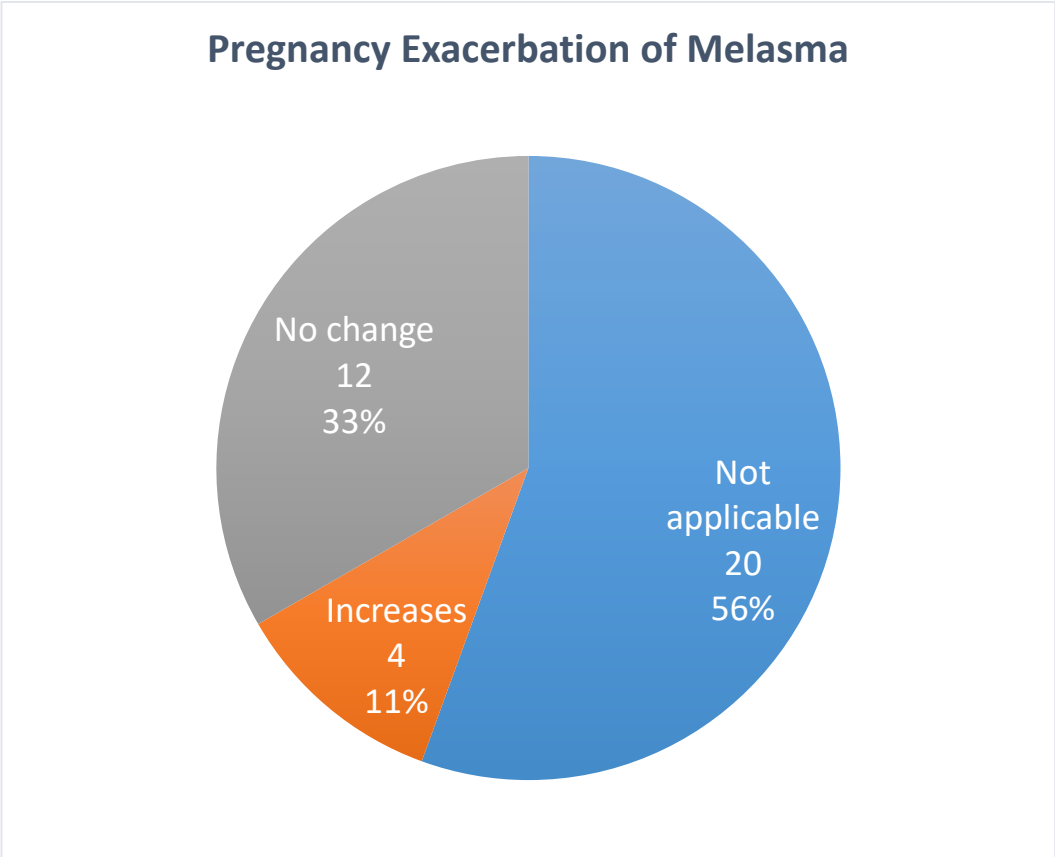
Burden of melasma was more in females than males as evident from the graph. Females formed 88% (36 cases) whereas males were only 12% (5 cases).

Figure 18. Age group wise sex distribution of Melasma patients



In the present study melasma peaked the diseases. Out of the total 41 melasma patients 88 percentage (36 patients) were females and 12 percentage (5 patients) were males. Melasma peaked in two age groups namely 31 to 40 and 41 to 50 in which there were 28 patients totally comprising a total of 25 females and 3 males.

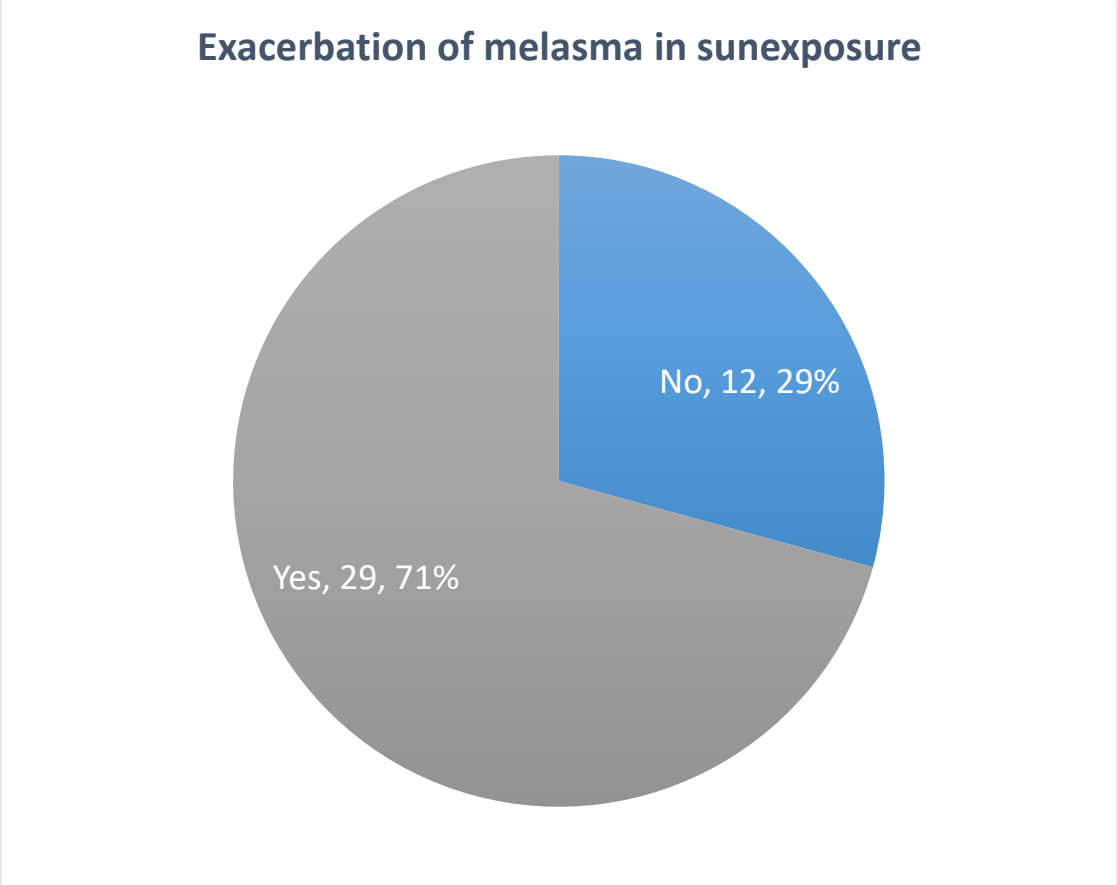
Figure 19. History of pregnancy exacerbation of melasma



Melasma is known to have exacerbation during pregnancy in certain patients. [86] In our study only 11% (4 cases) of females with melasma reported aggravation of the disease during pregnancy.

Thirty three percentage (12 females) did not notice any visible changes when they became pregnant while having the disease. Remaining 56% (20 cases) did not have the disease when they became pregnant.

Figure 20. Relation of aggravation of melasma with exposure to sun light

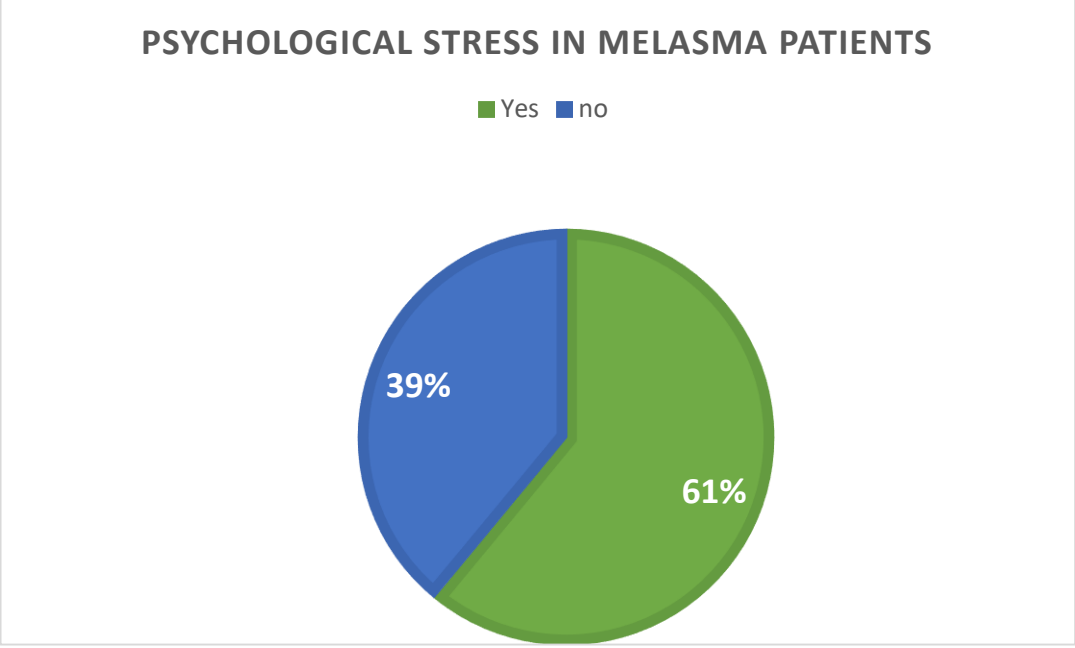


Majority of the patients (71%) said they noted visible darkening of the pigmentation while exposed to sun light whereas only 12% did not notice such visible changes.

Table 20. Relation of melasma and psychological stress

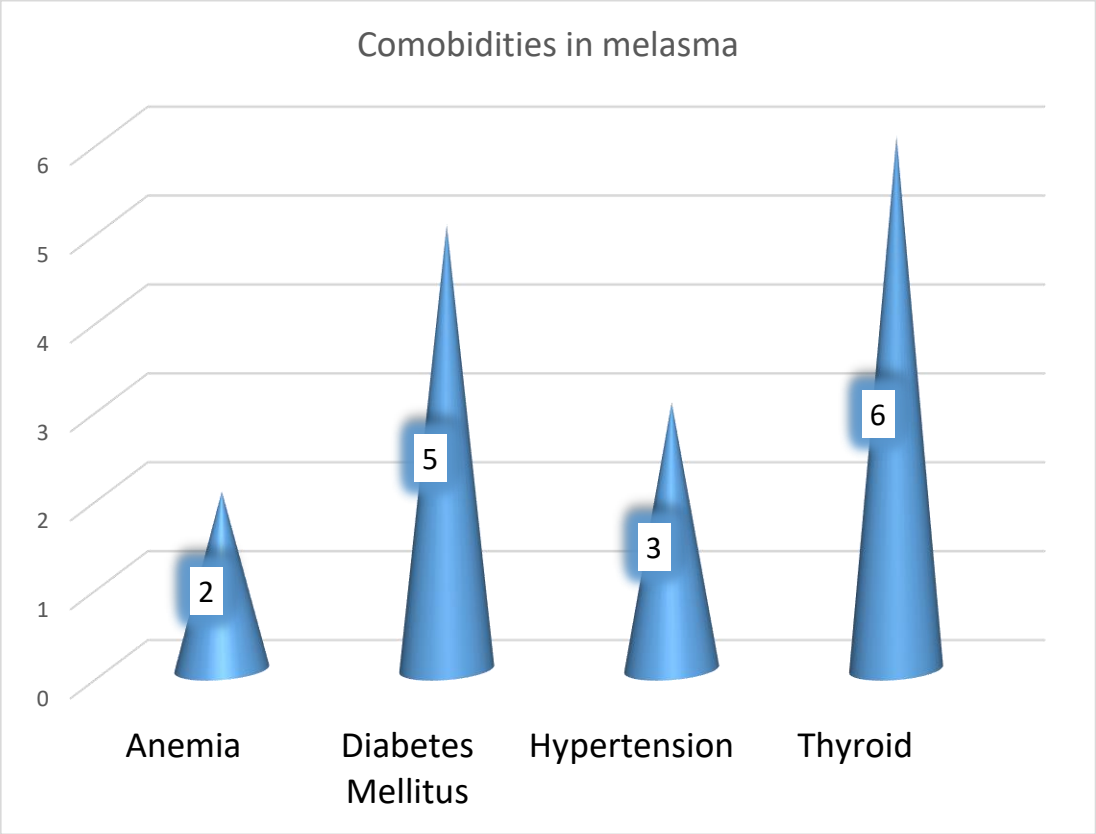
Psychological stress	Cases	%	p Value
Yes	25	61	**0.015**
No	16	39	

Figure 21. Relation of melasma and psychological stress



Sixty one percentage of the people with melasma had psychological stress due to various factors (not related to the disease), prior to the onset of the disease. This is statistically significant as p value is <0.05.

Figure 22. Comorbidities in melasma patients



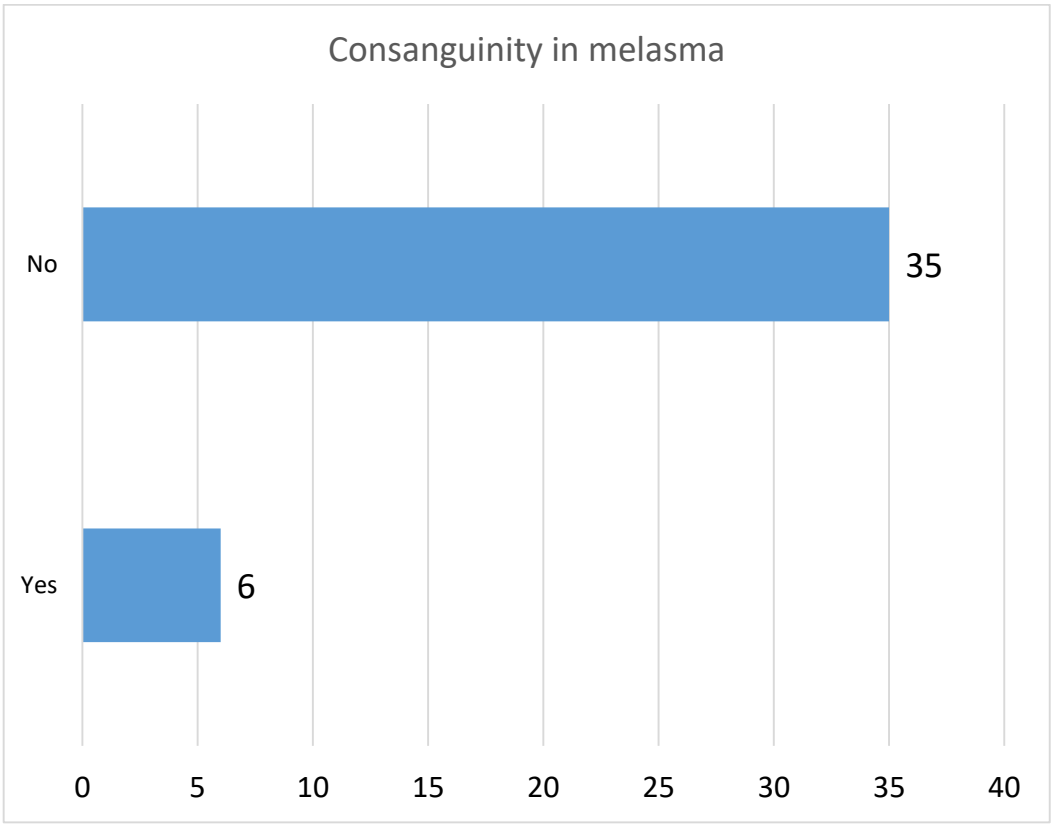
Out of 41 melasma patients 6 patients had hypothyroidism, 5 patients had diabetes mellitus, 3 had hypertension and 2 were anemic.

Table 21. Usage of sun protection in melasma patients

Usage of sun protection in melasma	Percent
Yes	17 %
No	83%
Total	100%

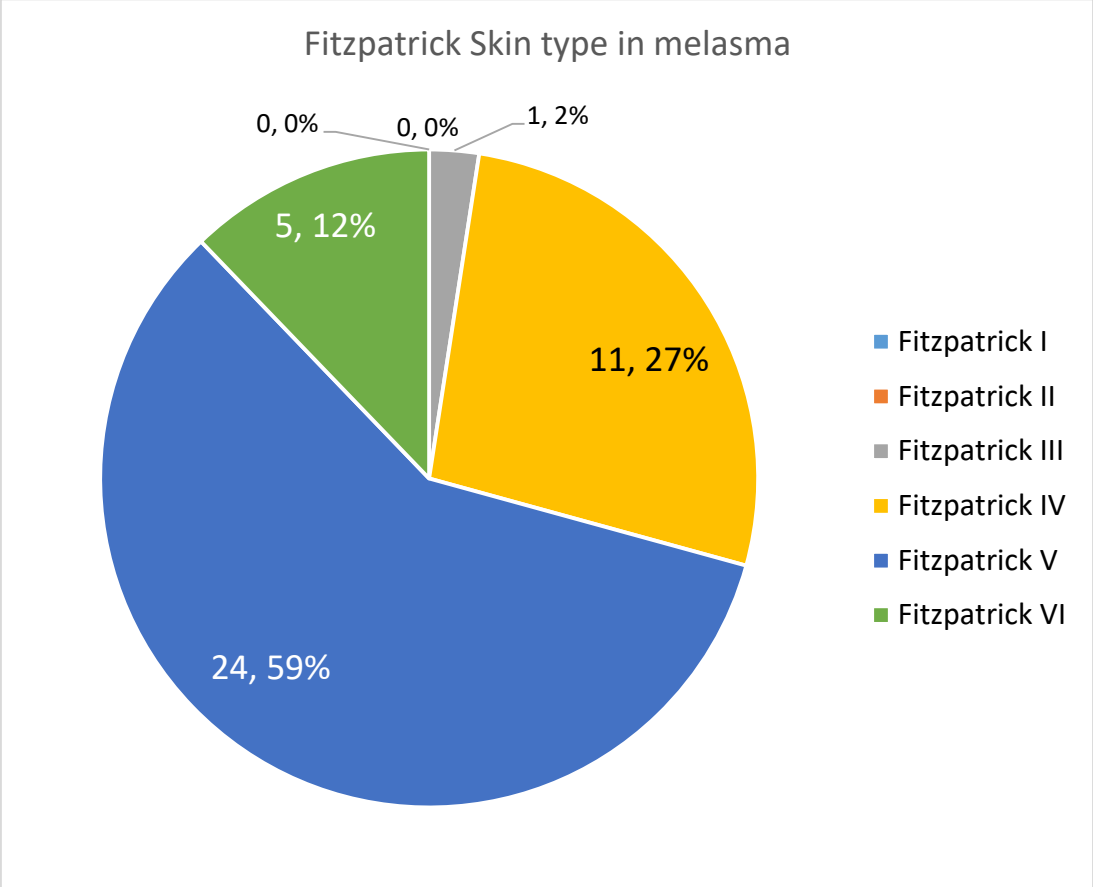
Awareness of importance of sun protection is less in melasma patients which is evident from the data that only 17% (7 patients) were using sun protection whereas majority of melasma patients (83%, 34 patients) did not use any form of sun protection.

Figure 23. Consanguinity in melasma patients



History of consanguineous marriage was present with parents of 6 cases (14.6%) out of the 41 melasma patients.

Figure 24. Fitzpatrick skin type in melasma patients



Majority of melasma patients (59%, 24 cases) had Fitzpatrick skin type V. Next majority had type IV (27%, 11 cases) Fitzpatrick skin. 5 patients (12%) had type VI skin. Only one patient had type III skin (2%). Melasma was not observed in patients with type I & II skin.

Other observations

- No melasma patients in the study had extrafacial disease.
- Majority of the patients had symmetrical involvement of face (37 patients, 90%).

DISCUSSION

Number of cases included in the present study were 100 which correlated with the studies by TN Revathi and Shahana in which both studied 100 patients of facial hyperpigmentation. [3,59]

In the study, females outnumbered males which correlated with all other studies reviewed.[1,3,59] The most common age group in the present study was 21 to 30 whereas this age group was the second most common age group in the studies by Kavya [87] and Revathi [1]. Youngest patient was 13 years old. The youngest patient in the study by Revathi was also 13 years old. [1]

Forty five percentage of the participants were unemployed and 36% were unskilled workers in the study.

Most common cause of facial hyperpigmentation in the present study was melasma which correlated well with five previous studies, all of which concluded that melasma was the most common cause of facial hyperpigmentation.[1,3,59,81,87]

Second most common cause of facial hyperpigmentation in the present study was post inflammatory hyperpigmentation which correlated with previous two studies. [82,87]

Four melasma patients and one female patient with periorbital pigmentation had increased pigmentation during pregnancy. Previous studies by Ana Carolina Handel *et al* also said that melasma increased during pregnancy.[88]

Seventy one percentage of patients with facial hyperpigmentation noted increase in the pigmentation on exposure to sunlight. Various causes said to be responsible for increased pigmentation on sun exposure include ultraviolet (UV) radiation induced immediate pigment-darkening reaction, due to photo-oxidation of preformed melanin, followed by delayed tanning.[89,90]

Thirty four percentage of the participants had already tried some form of treatment for their facial hyperpigmentation including topical and oral treatments. Thirty five percentage had tried some form of home remedies by mixing and making a paste (like vegetables and leaves crushed) and applying on face for the pigmentation. Twenty three percentage of the patients had tried applying numerous raw vegetables on face. History of topical turmeric usage was present in 57% of participants including males and females.

Sixteen percentage of cases had used topical steroids in combination and singly in belief of lightening the facial pigmentation. A study by

Santwana Mahar *et al* showed 11.77% patients misused topical corticosteroids[91] whereas study by Sendrasoa *et al* showed as high as 49.8% had misused topical corticosteroids.[92]

Majority (71%) of the patients had used some form of cosmetics on face. This correlated with the study by Mestawet Getachew *et al* who concluded that 80.1% had used some form of cosmetics on face in their study.[93] Association between cosmetic usage and facial hyperpigmentation was statistically significant in the study as p value was <0.05 (0.034).

Drug history was present in 17% of the participants. Association between facial hyperpigmentation and drug intake was statistically significant as p value was <0.05 (0.002).

Only 5% had the practice of using topical sunscreen creams on face which was comparable to the findings by Ahamed *et al* showing 8.3% of sun screen usage.[94]

Diabetes (9%) followed by thyroid disorder (8%) were the two most common comorbidities noted in patients with facial hyperpigmentation.

Consanguinity history was present in 9% of patients with facial hyperpigmentation.

Wood's lamp examination of the cases showed majority had epidermal pigmentation (55%), 13% had dermal pigmentation and 15%

had mixed dermal and epidermal pigmentation which correlated with the study by Kavya & Nataraj where 55% had epidermal and15% had dermal pigmentation.[44]

Fitzpatrick skin classification showed 58% of patients had Type V skin followed by 28% having type IV skin.

On summarising the findings in melasma patients, females had higher incidence of melasma. This correlated with all other previous studies reviewed.[2,50,81,87,95] Eleven percentage (4 cases) of females with melasma reported aggravation of the disease during pregnancy. This correlated with the findings by Arun Achar and Sanjay K Rathi where only 13.6% of females (out of 312 cases) had pregnancy exacerbation of melasma. [86] Majority of the patients (71%) said they noted visible darkening of the pigmentation while exposed to sun light. Sixty one percentage of the people with melasma had statistically significant association between psychological stress due to various factors and the disease as p value was <0.05. Six melasma patients had hypothyroidism, 5 were diabetic, 3 had hypertension and 2 were anemic. Only 17% (7 patients) of the melasma patients were using sun protection. History of consanguineous marriage was present with parents of 14.6% (6 cases) of the 41 melasma patients. No studies in literature were found which investigated association between melasma and consanguinity.

SUMMARY

In this one year study, females dominated over males in availing dermatology services for facial hyperpigmentation. Most common age group was 21 to 30 years.

Majority of the patients were unemployed and next majority were unskilled workers working under sunlight like agricultural workers.

Melasma was the most common disease in the study. Second most common disease was post inflammatory hyperpigmentation from acne.

Majority of the patients had aggravation of the pigmentation on exposure to sunlight.

Thirty four percentage of the participants had tried some form of treatment for their facial hyperpigmentation. Some patients (35%) had tried some form of home remedies for their pigmentation, in which 23% had tried applying raw vegetables on face. More than half of the participants (57%) including males and females were applying turmeric on face. Majority of the patients had used some form of cosmetics on face.

Topical steroid abuse on face was present in sixteen percentage of cases. Sunscreen usage was very low in patients as only 5% had the practice of using topical sunscreen creams on face.

Diabetes mellitus and thyroid disorder was the two most common comorbid illness noted in the study.

Wood's lamp examination of the cases showed majority had epidermal pigmentation and 13% had dermal pigmentation.

Majority of the participants had Fitzpatrik skin type V followed by type IV skin.

In the melasma group of patients, females formed majority (36 cases) whereas males were only 5 cases.

Some female melasma patients (11.11%) noted aggravation of the pigmentation during pregnancy. Majority of the melasma patients noted visible darkening of the pigmentation while exposed to sun light. Only few (17%) of the melasma patients were using sun protection. Consanguinity history of 14.6% was present in melasma patients.

CONCLUSION

1. Females dominated over males in availing dermatology services for facial hyperpigmentation.
2. Melasma was the most common disease and second most common was Post Inflammatory Hyperpigmentation from acne.
3. Topical steroid abuse on face was present in 16% of cases.
4. More than half of the participants (57%) including males and females had the habit of applying turmeric on face.
5. Sunscreen usage was very low in general as overall only 5% had the practice of using topical sunscreens. Whereas 17% of melasma patients used topical sunscreen agents.
6. Association between cosmetic usage and facial hyperpigmentation was statistically significant as p value was <0.05.
7. Association between facial hyperpigmentation and drug intake was statistically significant as p value was <0.05.
8. More than half of the total participants (61%) and nearly three fourths of the melasma patients (71%) noted visible aggravation of pigmentation on exposure to sunlight.

9. There was statistically significant association between psychological stress due to various factors and melasma (p value = <0.05)
10. Consanguinity history of 14.6% was present in melasma patients.
11. Majority of the participants had Fitzpatrik skin type V.
12. Wood's lamp examination showed that majority of the participants (55%) had epidermal pigmentation.

RECOMMENDATIONS

- The higher incidence of consanguinity in melasma patients (14.5%) is to be investigated further. Structured large scale studies are required in this regard to find association between consanguinity and melasma.
- Decreased usage of sun protection in melasma patients point out the lack of awareness on sun protection in melasma. Therefore actions are required to increase public awareness regarding importance of sun protection in melasma.
- Topical steroid abuse on face was noted in the study. Actions are required to condemn topical steroid abuse in the public.

LIMITATIONS OF THE STUDY

- Since the study focussed on overall causes of facial hyperpigmentation, detailed evaluation on individual diseases were not possible. Therefore only most relevant details of various diseases were included in the study.
- Only few studies in literature dealt with all causes of facial hyperpigmentation as a whole due to which comparing results were difficult.
- In some observations, only generalized results could be included as discussing the results individually with reference to each disease was difficult.
- Being a hospital based study, results cannot be extrapolated to the general population.
- Sample size was less which could give varying results when generalized.
- Diagnosis was based on history and clinical examination. Utility of investigations was limited to Wood's lamp.

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ABBREVIATIONS

AK	-	Actinic Keratosis
AN	-	Acanthosis Nigricans
BFGF	-	Basic Fibroblast Growth Factor
BMI	-	Body Mass Index
CAMP	-	Cyclic AMP
DLE	-	Discoid Lupus Erythematosus
DM	-	Diabetes Mellitus
DOPA	-	Dihydroxyphenylalanine
EDP	-	Erythema Dyschromicum Perstans
EGF	-	Epidermal Growth Factor
EPPB	-	Erythromelanosis Peribuccale Pigmentaire of Brocq
FAN	-	Facial Acanthosis Nigricans
FM	-	Frictional Melanosis
GCR	-	Glucocorticoid Receptor
HN	-	Hori Nevus

HTN	-	Hypertension
IFN α	-	Interferon α
IPL	-	Intense Pulsed Light
LP	-	Lichen Planus
LPP	-	Lichen Planus Pigmentosus
MSH	-	Melanocyte Stimulating Hormone
NB UVB	-	Narrow Band Ultraviolet B
NOO	-	Nevus Of Ota
OCP	-	Oral Contraceptive Pills
OGTT	-	Oral Glucose Tolerance Test
PC	-	Poikiloderma Of Civatte
PCOS	-	Polycystic Ovarian Syndrome
PG	-	Prostaglandin
PIH	-	Post Inflammatory Hyperpigmentation
PMLE	-	Polymorphous Light Eruption
POH	-	Periorbital Hyperpigmentation

Qs Nd:YAG	-	Q Switched Neodymium-Doped Yttrium Aluminum Garnet
RAR	-	Retinoic Acid Receptors
RM	-	Riehl's Menalosis
SLE	-	Systemic Lupus Erythematosus
SM	-	Seborrheic Melanosis
TCS	-	Topical Corticosteroid
TGF α	-	Transforming Growth Factor α
TNF α	-	Tumor Necrosis Factor α
TRP	-	Tyronsinase Related Protein
UV	-	Ultra Violet
UVA	-	Ultra Violet A
WHR	-	Waist To Hip Ratio

CLINICAL IMAGES

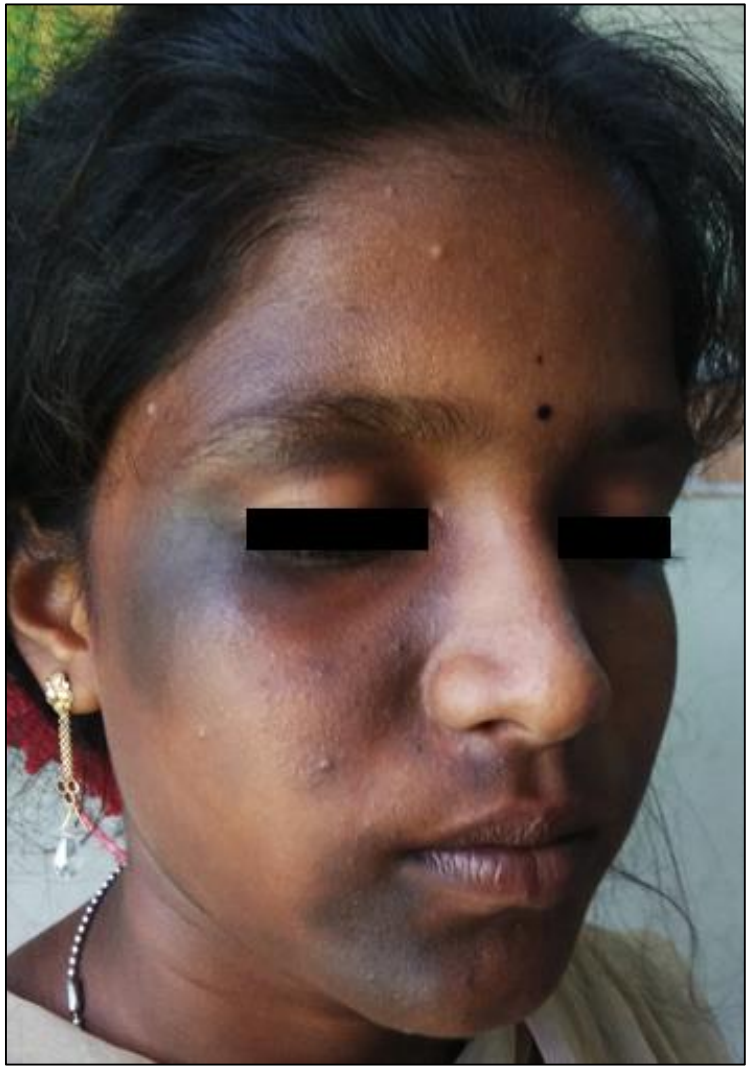

Image 1. *Nevus of Ota*

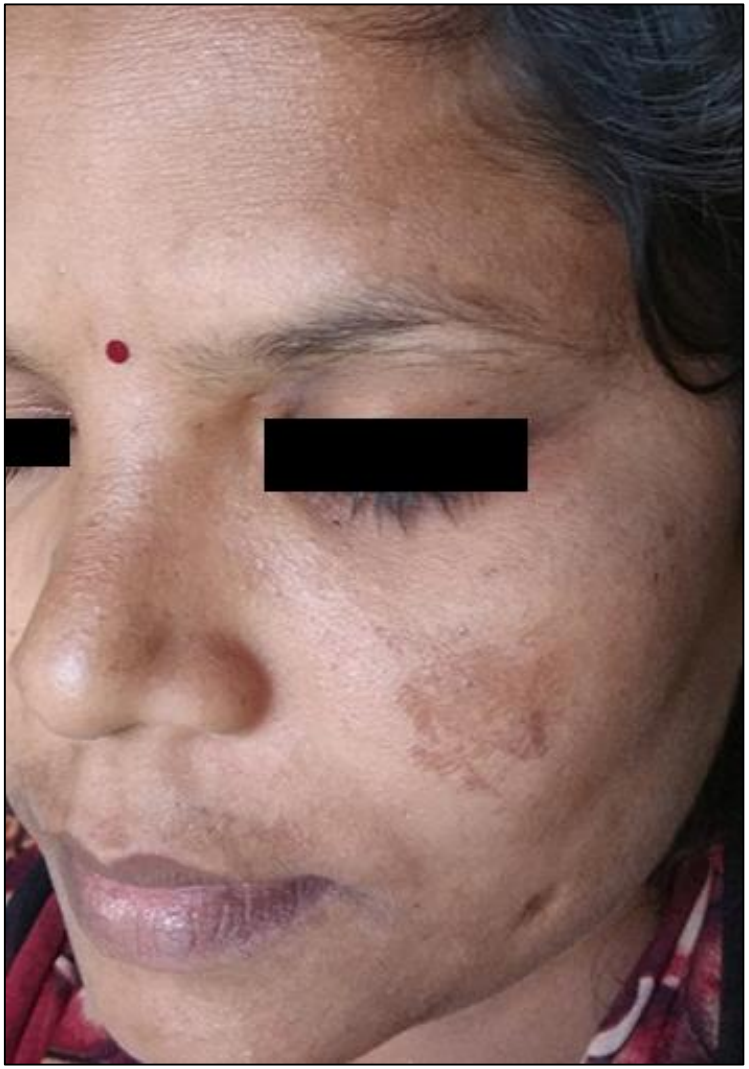

Image 2. *Female patient with centrofacial melasma*

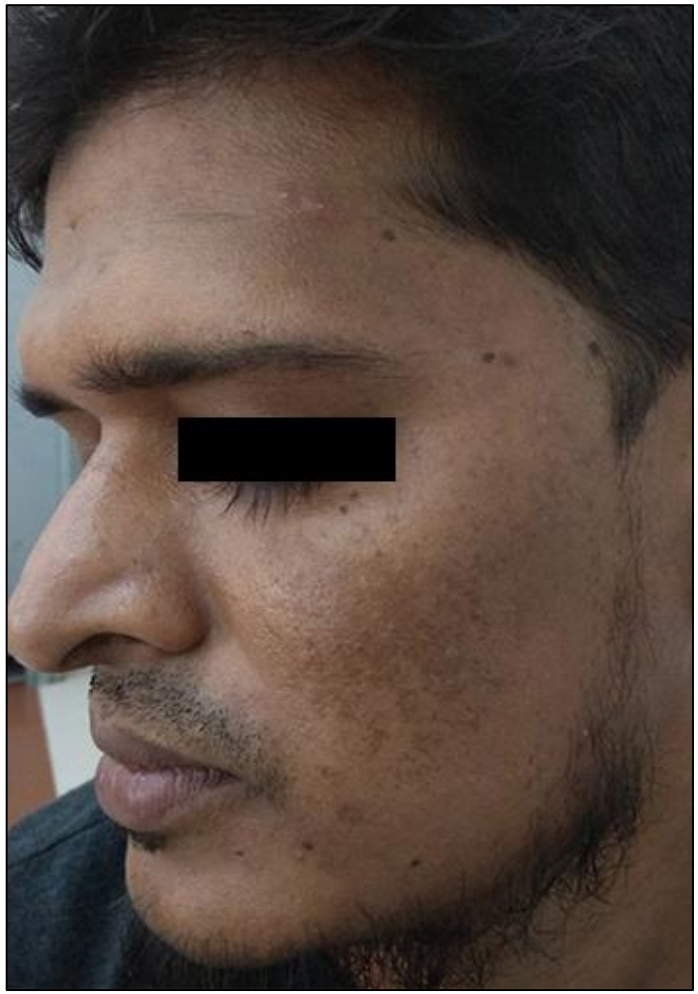

Image 3. *Young male patient with melasma*

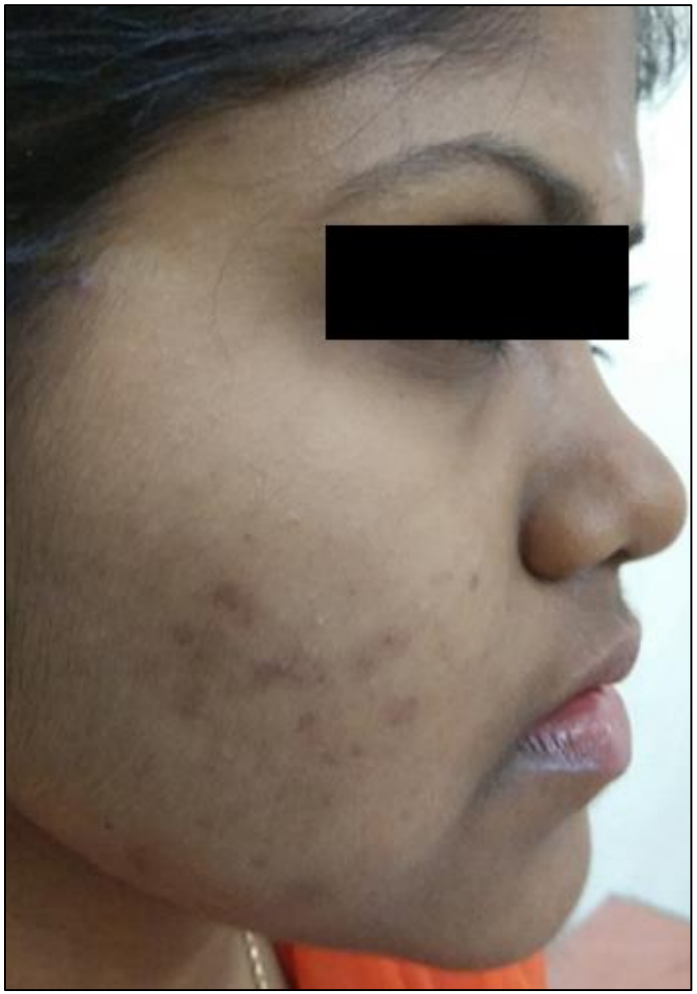

Image 4. *Post inflammatory hyperpigmentation from acne*

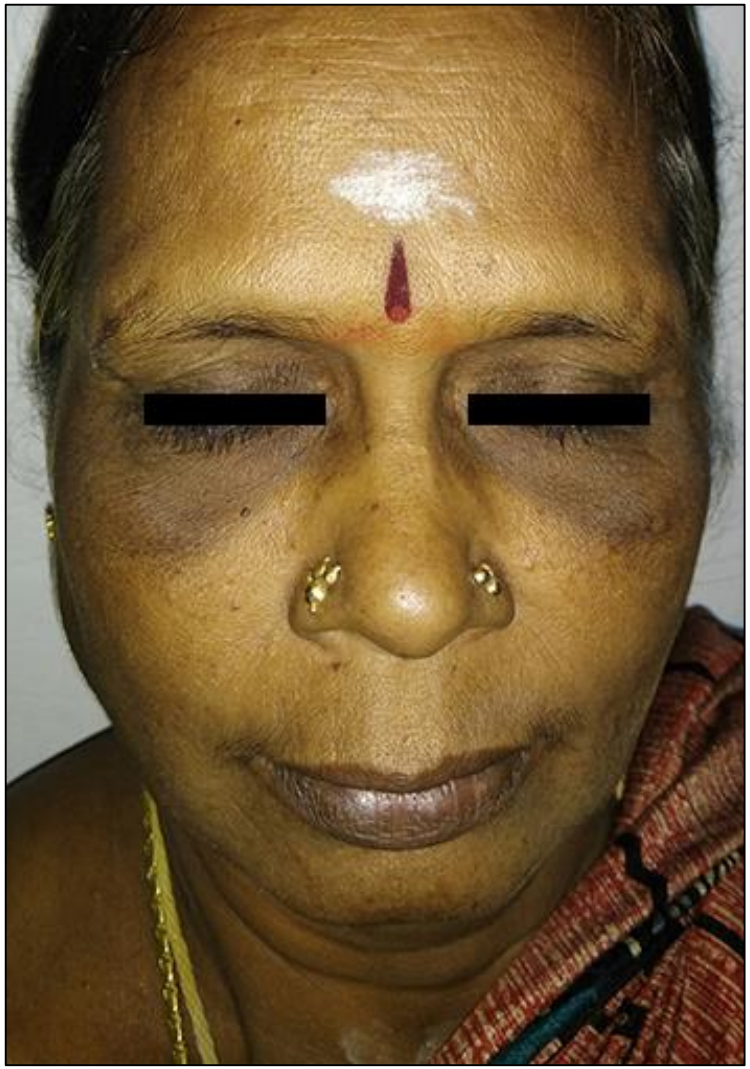

Image 5. *Periorbital hyperpigmentation*

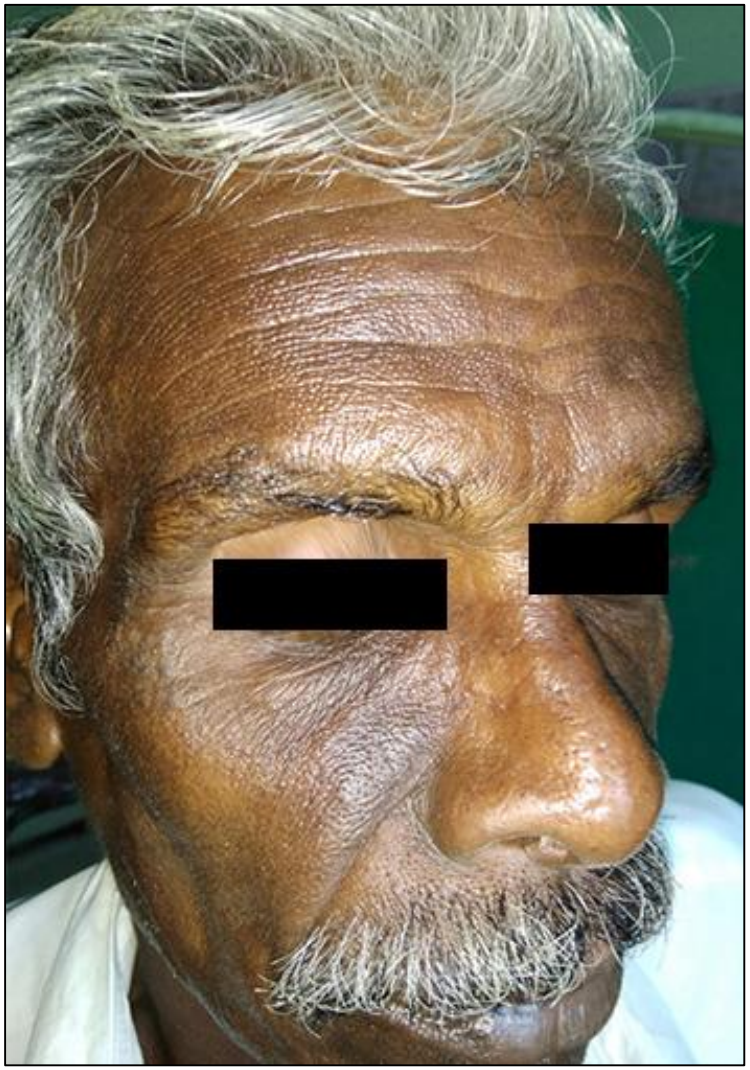

Image 6. *Facial Acanthosis Nigricans*

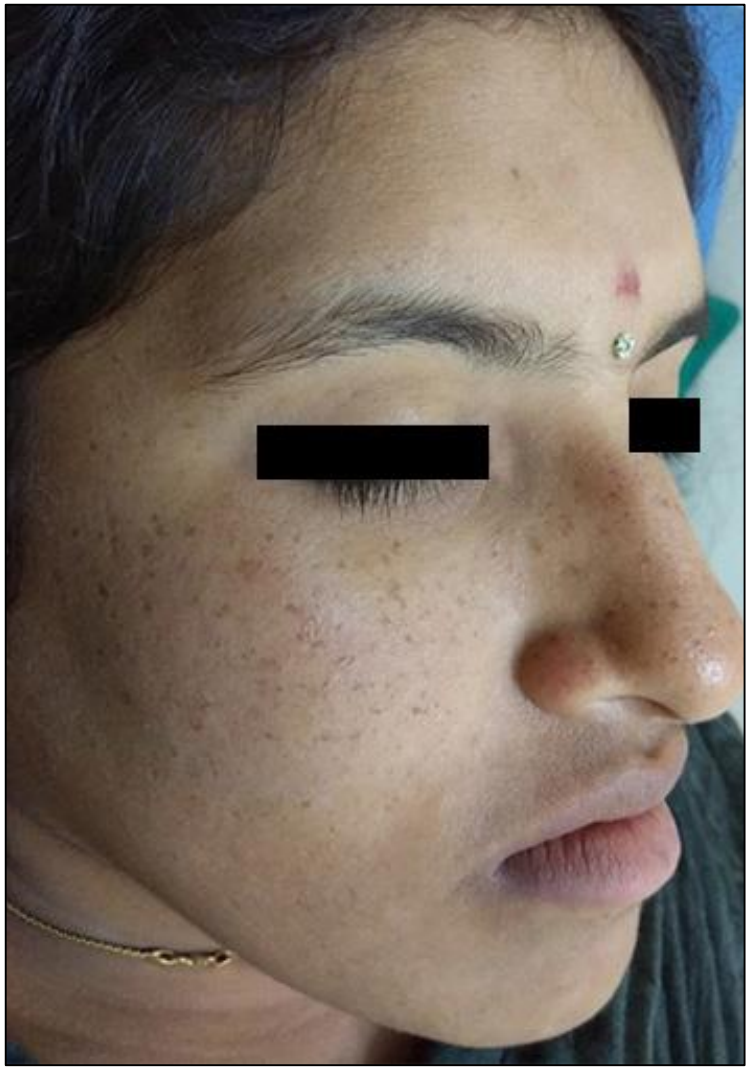

Image 7. *Freckles*

Image 8. *Drug (Clofazimine) induced pigmentation*

Image 9. *Riehl's melanosis*

Image 10. *Facial morphea. (Note: Biopsy site visible)*

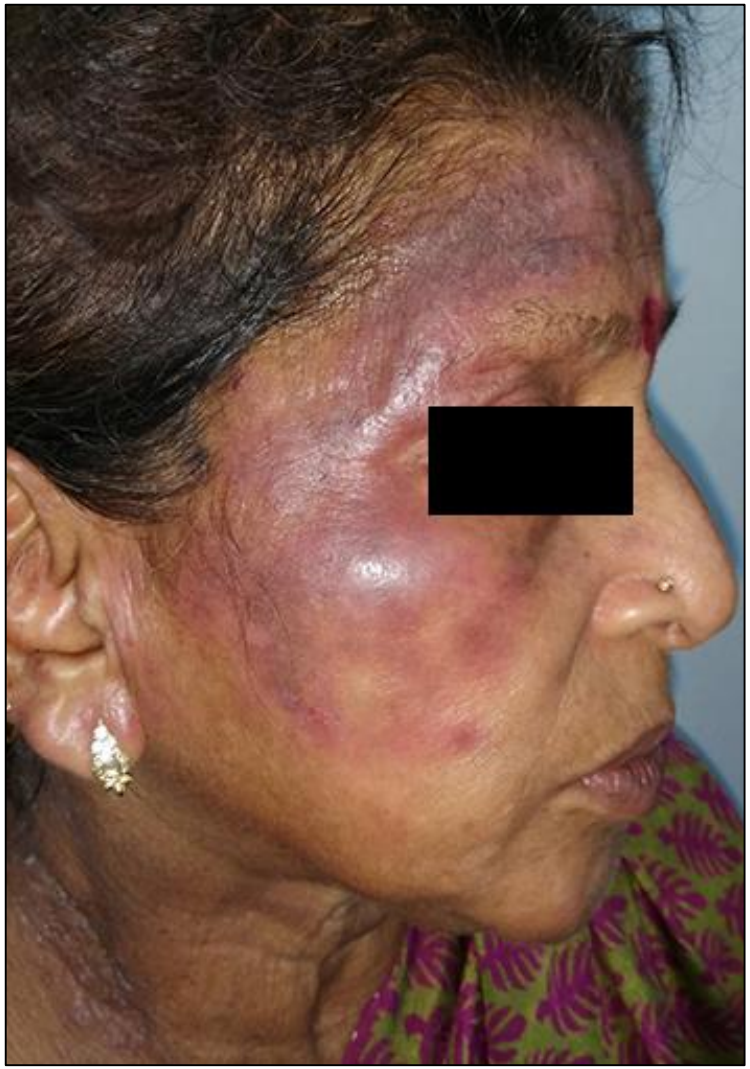

Image 11. *Topical steroid abuse*

Image 12. *Frictional melanosis*

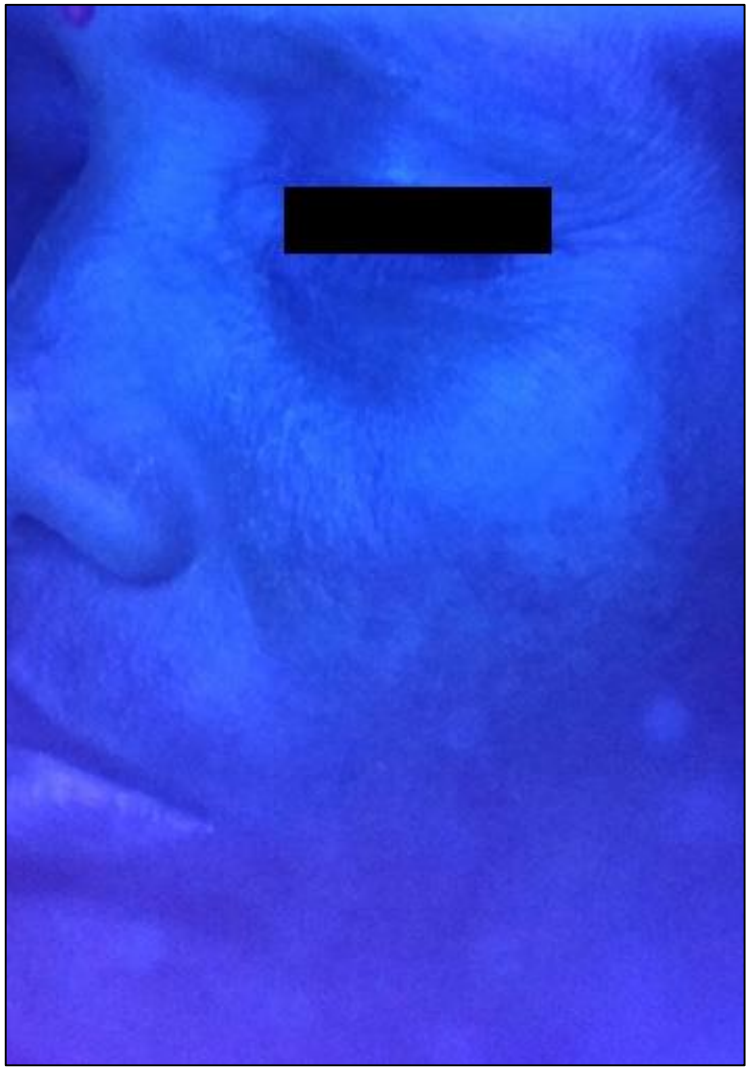

Image 13. *Wood's lamp examination of melasma*

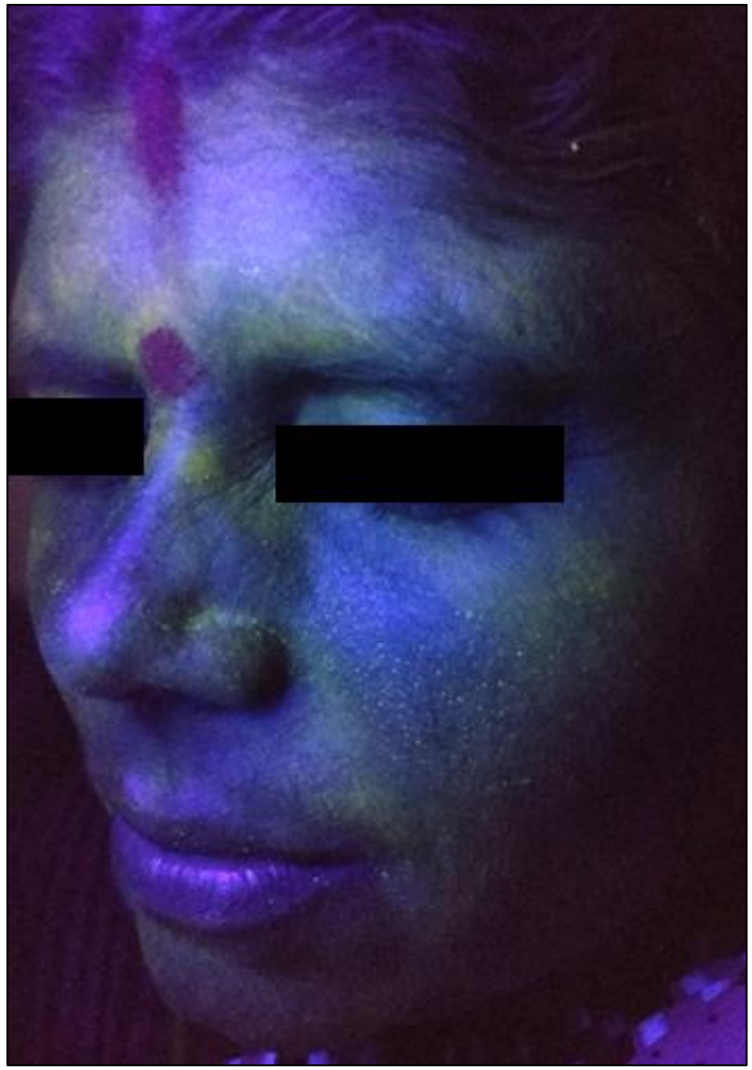

Image 14. *Turmeric application masking Wood's lamp features*

ANNEXURE 1 - PROFORMA

A CLINICO EPIDEMIOLOGICAL STUDY ON FACIAL HYPERPIGMENTATION IN A TERTIARY CARE HOSPITAL IN KANCHIPURAM DISTRICT, TAMILNADU

QUESTIONNAIRE [Ver 2.1.1]

S. No.:	Date:

VITAL STATISTICS

1. OP/ IP No.:_____
2. Name:_____
3. Age:_____
4. Sex: 1. [ ] Male 2. [ ] Female
5. Year of birth:

   _____
6. Contact no.:

   _____
7. Address:_____

   _____

   _____

   _____
8. Education:
   1. [ ] Professional or honours
   2. [ ] Graduate or postgraduate
   3. [ ] Intermediate or post-high school diploma
   4. [ ] High School Certificate
   5. [ ] Middle School certificate
   6. [ ] Primary School certificate
   7. [ ] Illiterate
9. Occupation
   1. [ ] Professional
   2. [ ] Semi-Professional
   3. [ ] Clerical, Shop Owner, Farmer
   4. [ ] Skilled Worker
   5. [ ] Semi-Skilled Worker
   6. [ ] Unskilled Worker
   7. [ ] Unemployed
10. Monthly income [ ]
    1. [ ] Not working
    2. [ ] ≥ 42,876
    3. [ ] 21,438-42,875
    4. [ ] 16,078-21,437
    5. [ ] 10719-16,077
    6. [ ] 6,431-10,718
    7. [ ] 2,165-6,430
    8. [ ] ≤2164
11. Marital status:
    1. [ ] Single
    2. [ ] Married
    3. [ ] Other

HISTORY

12. Facial pigmentation during pregnancy
    1. [ ] Not applicable
    2. [ ] Increases
    3. [ ] Decreases
    4. [ ] No change
13. Facial pigmentation during menstruation
    1. [ ] Increases
    2. [ ] Decreases
    3. [ ] No change
    4. [ ] Not applicable
14. exacerbation in sun exposure
    1. [ ] No
    2. [ ] Yes
15. Treatment taken for this hyperpigmentation so far?
    1. [ ] No
    2. [ ] Topical only
    3. [ ] Oral only
    4. [ ] Topical + oral
16. Tried any home remedies for this condition (native preparations other than turmeric)?
    1. [ ] No
    2. [ ] Yes
17. Took any alternative medical treatments for this condition?
    1. [ ] No
    2. [ ] Ayurveda
    3. [ ] Homeo
    4. [ ] Unani
    5. [ ] Siddha
    6. [ ] Naturals
18. H/o application of topical steroid
    1. [ ] No
    2. [ ] Do not know
    3. [ ] Yes, plain steroid
    4. [ ] Combination steroids (with antifungal or antibiotics etc. Eg: 'Dermi5', 'Candid B')
19. If steroid applied
    1. [ ] Not applicable
    2. [ ] Self-medication (Friends said)
    3. [ ] Doctor prescribed
    4. [ ] Pharmacist adviced
20. Application of turmeric
    1. [ ] No
    2. [ ] Yes
    3. [ ] Yes, but not for this condition
21. Local application of oils
    1. [ ] No
    2. [ ] Coconut oil
    3. [ ] Mustard oil
    4. [ ] Amala oils
    5. [ ] Others [ ]
22. Local application of Neem
    1. [ ] No
    2. [ ] Yes
23. Local application of other vegetables
    1. [ ] No
    2. [ ] Yes
24. Cosmetic usage
    1. [ ] No
    2. [ ] Talcum powder
    3. [ ] Steroid combination
    4. [ ] Fairness cream
    5. [ ] Compact lotion
    6. [ ] Foundation
    7. [ ] Eye liner
    8. [ ] Lip liner
    9. [ ] Kumkum
    10. [ ] Bleaching
    11. [ ] Facial
    12. [ ] Hair dye
25. If hair dye usage usage +
    1. [ ] Not applicable
    2. [ ] Self
    3. [ ] Doctor prescribed
26. History of frequent rubbing
    1. [ ] No
    2. [ ] occasional
    3. [ ] most often
27. history of dermographism
    1. [ ] No
    2. [ ] Yes
28. H/o psychological stress?
    1. [ ] No
    2. [ ] Yes
29. Drug history - medications
    1. [ ] Nil
    2. [ ] Oral contraceptive pills
    3. [ ] Phenytoin
    4. [ ] Amiodarone
    5. [ ] Thyroid drugs
    6. [ ] ATT
    7. [ ] Leprosy treatment
    8. [ ] Minocycline
    9. [ ] Psoralens
    10. [ ] Psychotic medications
    11. [ ] Others:
30. If leprosy treatment taken
    1. [ ] Not applicable
    2. [ ] Monotherapy
    3. [ ] MDT
    4. [ ] Details Not kNown
31. Usage of sun protection
    1. [ ] No
    2. [ ] physical
    3. [ ] chemical- sunscreen
    4. [ ] systemic
32. Sun exposure
    1. [ ] Daily
    2. [ ] occasionally
    3. [ ] 2 to 3 days a week
33. If daily, duration per day
    1. [ ] <3 hours
    2. [ ] 3-5 hours
    3. [ ] 6 or more hours
34. H/o recent insect bite on face
    1. [ ] Not applicable
    2. [ ] ≤ 6 months back
    3. [ ] 2-5 months back
    4. [ ] ≤1 month

PAST HISTORY

35. Diabetes mellitus
    1. [ ] No
    2. [ ] <1 year
    3. [ ] 1-5 yrs
    4. [ ] 5-10 years
    5. [ ] >10 years
36. Hypertension
    1. [ ] No
    2. [ ] <1 year
    3. [ ] 1-5 yrs
    4. [ ] 5-10 years
    5. [ ] >10 years
37. Thyroid disorder
    1. [ ] No
    2. [ ] Hyper
    3. [ ] Hypo
    4. [ ] Autoimmune
38. Tuberculosis
    1. [ ] NO
    2. [ ] Pulmonary
    3. [ ] Extrapulmonary
39. Leprosy
    1. [ ] No
    2. [ ] Yes
40. Anemia
    1. [ ] No
    2. [ ] Yes
41. Marital history- consanguinity?
    1. [ ] No
    2. [ ] Yes

PERSONAL HISTORY

42. Smoking
    1. [ ] No
    2. [ ] <1yr
    3. [ ] 1-5 years
    4. [ ] 5-10 years
    5. [ ] >10 years
    6. [ ] Exsmoker (1 year)
43. Alcoholism
    1. [ ] No
    2. [ ] <1yr
    3. [ ] 1-5 years
    4. [ ] 5-10 years
    5. [ ] >10 years
    6. [ ] Ex alcoholic (1year)

A CLINICO EPIDEMIOLOGICAL STUDY ON FACIAL HYPERPIGMENTATION IN A TERTIARY CARE HOSPITAL IN KANCHIPURAM DISTRICT, TAMILNADU

QUESTIONNAIRE [Ver 2.1.1]

44. Diet
    1. [ ] Veg
    2. [ ] Mixed
45. Beverages (Tea, coffe)
    1. [ ] No, only water
    2. [ ] Tea
    3. [ ] Coffee
    4. [ ] Both tea & coffee
    5. [ ] Milk only

EXAMINATION

46. PICCLE
    1. [ ] Pallor
    2. [ ] Icterus
    3. [ ] Cyanosis
    4. [ ] Clubbing
    5. [ ] LNE
    6. [ ] Edema
    7. [ ] Nil
47. Skin type:
    1. [ ] I Pale white skin, blue/green eyes, blond/red hair
    2. [ ] II Fair skin, blue eYes
    3. [ ] III Darker white skin
    4. [ ] IV Light brown skin
    5. [ ] V Brown skin
    6. [ ] VI Dark brown or black skin
48. Skin atrophy?
    1. [ ] No
    2. [ ] Yes
49. Pattern of pigmentation
    1. [ ] Diffuse
    2. [ ] Reticular
    3. [ ] Mottled
50. Borders
    1. [ ] Ill defined
    2. [ ] Well defined
51. Site/(s) of pigmentation
    1. [ ] Forehead right
    2. [ ] Forehead left
    3. [ ] Glabellar
    4. [ ] Periorbital right
    5. [ ] Periorbital left
    6. [ ] Cheek right
    7. [ ] Cheek left
    8. [ ] Nose
    9. [ ] Philtrum
    10. [ ] Upperlip
    11. [ ] Lowerlip
    12. [ ] Chin
    13. [ ] Ear right
    14. [ ] Ear left
    15. [ ] Perioral
52. Other sites
    1. [ ] Nil
    2. [ ] neck
    3. [ ] upper limb
    4. [ ] body
    5. [ ] groin
    6. [ ] genitalia
    7. [ ] lower limb
53. Signs of inflammation
    1. [ ] No
    2. [ ] Yes
54. Symmetrical
    1. [ ] No
    2. [ ] Yes
55. lesions present on sun-exposed regions
    1. [ ] No
    2. [ ] Yes
56. sparing of sun-protected sites such as philtrum
    1. [ ] No
    2. [ ] Yes

INVESTIGATIONS

57. Wood's lamp examination
    1. [ ] Epidermal (Accentuation +)
    2. [ ] Dermal (No accentuation)
    3. [ ] Mixed
    4. [ ] Indeterminate
    5. [ ] Not done
    6. [ ] Done but No relevant findings

DIAGNOSIS:

58. DIAGNOSIS

1. POST INFLAMMATORY HYPERPIGMENTATION
    a. ACNE SCAR
2. PERIORBITAL HYPERPIGMENTATION
3. MELASMA
4. FACIAL ACANTHOSIS NIGRICANS
5. DERMATOSIS PAPULOSA NIGRA
6. SEBORRHOEIC KERATOSIS
7. EPHELIDES
8. LENTIGINES
9. FRECKLES
10. ERYTHEMA DYSCHROMICUM PERSTANS (EDP)
11. LICHEN PLANUS PIGMENTOSUS (LPP)
12. RIEHL'S MELANOSIS (RM)
13. ERYTHROMELANOSIS PERIBUCCALE PIGMENTAIRE OF BROCQ (EPP)
14. POIKILODERMA OF CIVATTE
15. ERYTHROMELANOSIS FOLLICULARIS OF FACE AND NECK
16. NEVUS OF OTA
17. NEVUS OF ITO
18. SEBORRHEIC MELANOSIS
19. FRICTIONAL MELANOSIS
20. ACTINIC KERATOSIS
21. MORPHEA
22. SLE RASH
23. TOPICAL STEROID ABUSE
24. DRUG INDUCED PIGMENTATION

Treatment given:

ANNEXURE 2 - CONSENT

Informed Consent:

Title: ***A Clinico epidemiological study on facial hyperpigmentation in a tertiary care hospital in Kanchipuram district, Tamilnadu***

Principal Investigator:

Dr. Mahroof Thamarassery
Department of Dermatology, Venerology & Leprology
Karpaga Vinayaga Institute of Medical Sciences & RC, Madhuranthakam.

A structured questionnaire will be administered to get necessary information for the study. The participation in the study will require approximately 25 minutes of your valuable time and it does not include any invasive procedure. There are no risks involved in the study. Participation in the study is completely voluntary and confidentiality will be maintained. Your consent is required before you can participate in this study and you have the right to refuse / withdraw from this study.

I have read this consent form and I fully understand the content of this document and voluntarily consent to participate in the study. All of my questions concerning this study have to be answered. If I have any questions in the future about this study the investigator listed above will answer them. I understand that this consent ends at the conclusion of this study. By signing this form, I agree to participate in this study.

Date: **Participants Name & Signature**

CERTIFICATION OF INFORMED CONSENT

I certify that I have explained the nature and purpose of this study to the above named individual and I have discussed the potential benefits of this study participation. The questions, the individual had about this study have been answered and we will always be available to address future questions.

Date: **Signature of person obtaining consent**

CONSENT (TAMIL)

சுய ஒப்புதல் படிவம்

ஆராய்ச்சியின் தலைப்பு :

A CLINICO EPIDEMIOLOGICAL STUDY ON FACIAL HYPERPIGMENTATION IN A TERTIARY CARE HOSPITAL IN KANCHIPURAM DISTRICT, TAMILNADU

பெயர் : வயது : தேதி : உள்நோயாளி எண் :

..... என்பவராகிய நான் இந்த ஆய்வின் விவரங்களும் அதன் நோக்கங்களும் முழுமையாக அறிந்து கொண்டேன். எனது சந்தேகங்கள் அனைத்திற்கும் தகுந்த விளக்கம் அளிக்கப்பட்டது. இந்த ஆய்வில் முழு சுதந்திரத்துடன் மற்றும் சுயநினைவுடன் பங்கு கொள்ள சம்மதிக்கிறேன்.

எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்து கொண்டு நான் எனது சம்மதத்தைத் தெரிவிக்கிறேன். இச்சுய ஒப்புதல் படிவத்தை பற்றி எனக்கு விளக்கப்பட்டது.

இந்த ஆய்வினை பற்றிய அனைத்து தகவல்களும் எனக்கு தெரிவிக்கப்பட்டது. இந்த ஆய்வில் எனது உரிமை மற்றும் பங்கினை பற்றி அறிந்து கொண்டேன்.

இந்த ஆய்வில் பிறரின் நிர்பந்தமின்றி என் சொந்த விருப்பத்தின் பேரில்தான் பங்கு பெறுகிறேன் மற்றும் நான் இந்த ஆராய்ச்சியிலிருந்து எந்நேரமும் பின் வாங்கலாம் என்பதையும் அதனால் எந்த பாதிப்பும் ஏற்படாது என்பதையும் நான் புரிந்து கொண்டேன்.

இந்த ஆய்வில் கலந்து கொள்வதன் மூலம் என்னிடம் பெறப்படும் தகவலை ஆய்வாளர் இன்ஸ்டிட்யூசனல் எத்திக்ஸ் கமிட்டியினரிடமோ, அரசு நிறுவனத்திடமோ தேவைப்பட்டால் பகிர்ந்து கொள்ளலாம் என சம்மதிக்கிறேன்.

இந்த ஆய்வின் முடிவுகளை வெளியிடும்போது எனது பெயரோ, அடையாளமோ வெளியிடப்பட்டாது என அறிந்து கொண்டேன். இந்த ஆய்வின் விவரங்களைக் கொண்ட தகவல் தாளைப் பெற்று கொண்டேன்.

இந்த ஆய்வில் பங்கேற்கும் பொழுது ஏதேனும் சந்தேகம் ஏற்பட்டால், உடனே ஆய்வாளரை தொடர்பு கொள்ள வேண்டும் என அறிந்து கொண்டேன்.

இச்சுய ஒப்புதல் படிவத்தில் கையெழுத்திடுவதன் மூலம் இதிலுள்ள அனைத்து விஷயங்களும் எனக்கு தெளிவாக விளக்கப்பட்டது என்றும் தெரிவிக்கிறேன் என்று புரிந்து கொண்டேன். இச்சுய ஒப்புதல் படிவத்தின் ஒரு நகல் எனக்கு கொடுக்கப்படும் என்றும் தெரிந்து கொண்டேன்.

பங்கேற்பாளர் / பாதுகாவலர் கையொப்பம் தேதி :

ஆய்வாளர் கையொப்பம் தேதி :

ANNEXURE 3 - ETHICAL COMMITTEE CERTIFICATE

INSTITUTIONAL ETHICAL COMMITTEE

KARPAGA VINAYAGA INSTITUTE OF MEDICAL SCIENCES & RESEARCH CENTRE

MADURANTHAGAM - 603 308

EC Ref. No: 102/2017

CERTIFICATE FOR APPROVAL

The Institutional Ethical Committee of Karpaga Vinayaga Institute of Medical Sciences & Research Centre, Maduranthagam reviewed and discussed the application for approval **"A clinico-epidemiological study on facial hyperpigmentation in a tertiary care hospital in Kanchipuram district, Tamilnadu"** by **Dr. Mahroof Thamarassery, I PG**, Guided by **Dr. R. Baskaran**, Professor and Head, Department of Dermatology, Karpaga Vinayaga Institute of Medical Sciences & Research Centre, Maduranthagam.

The proposal is **APPROVED**

The Institutional Ethics Committee expects to be informed about the progress of the study and any changes in the protocol / information / informed consent and asks to be provided a copy of the final report.

04/12/17

for **Chairperson, Ethics Committee**

Date:04 /12/17

ANNEXURE 4 - MASTER CHART

S No.	age	sex	edu	occu	inco	marital	during_preg	exac_in_sun	Rx_so_far	*home_remedi*	alt_rx	TCS	if_TCS	turmeic	oils	neem	other_veg	cosmetics	hair_dye	freq_rubbng	psych_stress	drug_hx	if_leprosy	sun_protec	sun_expo	daly_dura	insectbite	t2dm	htn	thyr	tb	lep	anemia	consangunity	smok	alcho	diet	beverage	pallor	skintype	atrophy	sites	othersites	symmetrical	woods	**Diag**	**2nd diag**
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
1	13	2	4	7	1	1	1	1	4	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	5	1	,4,5,6,7,10	1	2	3	**16**	**0**
2	65	2	5	7	7	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	1	3	2	1	1	1	1	1	1	1	1	2	0	5	1	1,6,7,8,13	1	2	1	**3**	**0**
3	33	2	4	7	1	2	1	2	4	2	1	1	1	2	1	1	2	2	1	1	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	2	4	1	4	1	6,7,8	1	2	3	**3**	**0**
4	47	1	2	1	2	2	1	2	1	2	1	1	1	1	1	1	2	1	3	3	1	1	1	3	1	1	1	4	1	1	1	1	1	1	5	5	2	4	0	4	1	3,6,7,8,12	1	2	2	**19**	**0**
5	53	2	5	7	1	2	1	2	1	1	1	1	1	1	5	2	2	2	2	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	1,2,6,7	1	1	1	**3**	**0**
6	41	2	5	7	1	2	4	2	1	2	2	1	1	2	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	4	0	4	1	2,3,4,5,6,7	1	2	1	**3**	**0**
7	39	2	5	6	6	2	1	2	1	1	1	1	1	3	1	1	1	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	0	4	1	6,7	1	2	1	**3**	**0**
8	44	2	6	6	1	2	1	1	2	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	5	0	4	1	1,2,6,7,8	1	2	1	**3**	**0**
9	80	1	7	7	8	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	6	2	1	1	5	2	7	1	2	1	**20**	**0**
10	55	2	5	7	1	2	1	2	1	1	1	1	1	1	2,5	2	2	2	2	1	2	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	2	4	0	6	1	,2,4,5,6,7,8	1	1	1	**3**	**0**
11	51	1	7	6	6	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	7	3	1	1	1	1	1	1	1	1	2	1	1	1	1	2	4	1	5	1	1,2,8,10	1	2	6	**24**	**0**
12	18	1	2	7	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0	5	1	10	1	2	1	**1**	**0**
13	50	2	5	7	1	2	1	2	1	1	1	1	1	3	2	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	4	1	5	1	2,4,5,6,7,8	1	2	1	**2**	**0**
14	27	1	4	7	4	1	4	2	1	2	2	1	1	2	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	0	5	1	1,2,6,7	1	2	1	**9**	**0**
15	48	2	4	7	1	2	1	2	2	2	1	1	1	2	2	2	2	2	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	4	0	4	1	,3,4,5,6,7,8	1	2	1	**12**	**0**
16	23	1	3	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0	5	1	1,2,6,7	1	2	1	**1**	**0**
17	42	1	2	1	3	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	4	2	4	0	4	1	6,7	1	2	1	**3**	**0**
18	30	2	4	7	1	2	2	2	2	1	1	1	1	1	1	1	1	2	1	1	1	5	1	1	2	1	1	1	1	3	1	1	1	2	1	1	2	4	1	5	1	,3,5,6,7,8,1	1	2	1	**3**	**0**
19	43	2	6	7	1	2	1	2	1	2	1	1	1	2	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	6,7	1	2	1	**3**	**0**
20	29	1	4	7	4	1	4	2	1	2	2	1	1	2	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	0	5	1	1,2,6,7	1	2	1	**9**	**0**
21	60	2	7	6	1	2	4	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	3	1	1	1	1	1	1	1	1	2	4	0	6	1	6,7,8,10,11	1	2	6	**4**	**0**
22	35	2	6	7	1	2	4	2	1	1	1	3	2	2	1	1	1	2	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	3	0	5	1	6,7	1	2	1	**3**	**0**
23	28	2	2	1	1	1	1	2	2	2	2	1	1	2	1	2	2	2	1	1	2	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	2	5	0	5	1	6,7,8	1	2	1	**3**	**0**
24	40	2	5	5	6	2	4	1	3	2	1	1	1	1	1	1	1	2	2	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	1,2,6,7	1	2	3	**3**	**0**
25	37	2	7	6	6	2	1	1	1	1	1	1	1	2	1	1	1	1	1	3	2	1	1	1	1	2	1	1	1	3	1	1	1	1	1	1	2	1	0	5	1	6,7,8	1	2	1	**3**	**0**

26	42	2	6	7	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	5	1	1	2	1	1	1	3	3	1	1	1	1	1	1	2	3	0	5	1	1,2,8	1	2	3	**3**	**0**
27	36	2	5	6	7	2	4	2	2	1	1	1	1	2	1	1	1	2	2	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	6,7,8	1	2	3	**3**	**0**
28	37	2	7	6	6	2	1	1	1	1	1	1	1	2	1	1	1	1	1	3	2	1	1	1	1	2	1	1	1	3	1	1	1	2	1	1	2	1	0	5	1	6,7,8	1	2	1	**3**	**0**
29	50	2	6	6	6	2	4	1	4	2	2	1	1	2	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	4	0	6	1	,2,4,5,6,7,1	1	2	1	**16**	**0**
30	43	2	6	6	6	2	4	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	10,12	1	2	1	**18**	**0**
31	23	1	2	7	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0	5	1	1,2,6,7	1	2	1	**1**	**0**
32	47	2	7	5	6	2	4	2	1	1	1	1	1	1	1	1	1	2	2	1	2	6	1	1	2	1	1	1	1	1	3	1	1	1	1	1	2	4	0	4	1	3,4,5,6,7,8,1	1	2	3	**3**	**0**
33	29	2	4	7	1	2	2	2	1	1	1	3	4	2	1	1	1	2	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	2	4	1	6	1	4,5	1	2	5	**2**	**0**
34	50	2	6	7	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	5	1	1	2	1	1	1	3	3	1	1	1	1	1	1	2	3	0	4	1	1,2,8	1	2	3	**3**	**0**
35	26	2	1	1	5	2	2	2	2	2	1	2	1	1	1	1	2	2	1	1	2	2	1	1	1	3	1	1	1	1	1	1	2	2	1	1	2	4	1	4	1	6,7,8	1	2	1	**3**	**0**
36	42	2	5	6	6	2	1	2	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	0	5	1	4,6,7	1	2	3	**3**	**0**
37	15	2	2	7	1	1	1	1	1	2	1	1	1	2	1	1	1	2	1	3	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	3	0	5	1	4,5	1	2	1	**2**	**0**
38	27	2	2	7	1	2	1	2	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	3	1	1	1	1	1	1	2	3	0	4	1	6,7,8	1	2	4	**1**	**0**
39	35	2	6	6	6	2	1	2	1	1	1	1	1	2	1	1	1	2	1	1	2	1	1	1	1	3	1	1	1	1	1	1	2	2	1	1	2	3	1	5	1	2,6,7,8,10,1	1	2	2	**4**	**0**
40	30	2	4	7	1	2	1	2	1	1	1	1	1	2	1	2	2	2	2	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	5	1	2,6,7,8,10,1	1	2	1	**4**	**0**
41	29	2	5	7	1	2	4	2	1	2	2	1	1	2	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	0	5	1	1,2,6,7	1	2	1	**9**	**0**
42	22	1	2	7	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	0	5	1	1,2,6,7,8	1	2	1	**1**	**0**
43	32	1	5	6	6	2	1	2	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	0	3	1	4,6,7	1	2	3	**3**	**0**
44	14	2	5	7	1	1	1	1	1	2	1	1	1	1	1	1	2	2	1	3	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	4	1	4	1	4,5	2	2	6	**2**	**0**
45	36	2	5	7	1	2	1	1	1	2	1	1	1	2	1	1	2	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	4	1	5	1	4,5	2	2	4	**2**	**4**
46	41	2	5	7	1	2	4	2	1	2	2	1	1	2	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	0	5	1	1,2,6,7	1	2	1	**9**	**0**
47	25	1	2	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	0	4	1	1,2,6,7	1	1	1	**1**	**0**
48	55	2	5	6	6	2	1	2	2	1	1	1	1	2	1	1	2	2	2	1	2	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	4	0	4	1	4,5	1	2	1	**2**	**0**
49	15	2	2	7	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	3	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	3	0	3	1	4,5	1	2	1	**2**	**0**
50	43	2	4	2	5	2	1	2	4	1	1	1	1	2	1	1	1	2	2	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	2	2	1	1	4	0	4	2	1	3	1	4	**21**	**0**

51	33	2	5	6	6	2	1	2	4	1	1	3	3	2	1	1	1	2	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	3	0	5	1	6,7,8	1	2	5	**22**	**0**
52	46	2	6	6	6	2	4	1	4	2	2	1	1	2	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	1,4	1	2	1	**16**	**0**
53	43	2	6	6	6	2	4	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	10,12	1	2	1	**18**	**0**
54	28	1	5	6	6	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	2	4	0	5	1	6,7,8	1	2	3	**3**	**0**
55	23	1	2	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	1,2,6,7	1	1	1	**1**	**0**
56	53	1	5	6	5	2	1	1	1	1	1	1	1	1	2	1	1	2	2	3	2	1	1	1	3	2	3	1	1	1	1	1	1	1	1	1	2	4	1	5	1	,3,4,5,6,7,8	1	2	2	**4**	**0**
57	19	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	4	0	4	1	4,5,6,7	1	2	6	**1**	**2**
58	27	2	5	7	1	2	4	2	1	2	2	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	0	5	1	2,6,7	1	2	1	**9**	**0**
59	40	2	4	7	1	2	1	2	2	2	1	1	1	2	2	2	2	2	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	1,2,6,7	1	2	1	**12**	**0**
60	34	2	5	6	1	2	1	1	1	1	1	3	3	2	1	1	1	2	2	1	2	1	1	3	2	2	1	1	1	1	1	1	2	2	1	1	2	4	1	4	1	6,7,8,9	1	2	3	**3**	**0**
61	55	2	3	7	1	2	4	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0	5	1	8	1	1	3	**3**	**0**
62	50	2	5	7	1	2	1	2	1	1	1	1	1	3	2	1	1	2	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	4	1	4	1	4,5	1	2	1	**2**	**0**
63	58	1	7	6	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	3	1	1	1	1	1	1	1	1	2	4	0	6	1	1,2,6,7	1	2	6	**4**	**0**
64	31	2	5	6	1	2	1	1	1	1	1	3	3	2	1	1	1	2	2	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	2	4	1	5	1	6,7,8,9	1	2	3	**3**	**0**
65	43	2	5	6	6	2	2	2	2	1	1	4	2	2	1	1	1	2	2	1	2	1	1	1	2	2	1	2	1	1	1	1	1	1	1	1	2	4	0	5	1	6,7	1	2	2	**3**	**0**
66	24	2	4	2	6	2	1	2	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	3	0	6	1	1,2,6,7	1	2	4	**1**	**0**
67	40	2	5	6	6	2	4	2	2	1	1	4	2	2	1	1	1	2	2	1	2	2	1	1	2	2	1	2	1	1	1	1	1	1	1	1	2	4	0	5	1	6,7	1	2	2	**3**	**0**
68	45	1	5	6	6	2	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	4	0	4	1	4,5	1	2	6	**2**	**0**
69	47	2	6	6	7	2	4	2	1	1	1	1	1	2	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	0	6	1	3,6,7,8	1	2	3	**3**	**0**
70	24	1	2	7	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	0	5	1	6,7,8	1	2	1	**1**	**0**
71	38	2	5	6	6	2	4	2	2	1	1	4	2	2	1	1	1	2	2	1	2	2	1	1	2	2	1	2	1	1	1	1	1	1	1	1	2	4	1	5	1	1,2,6,7,8	1	2	2	**3**	**0**
72	26	2	5	6	7	2	1	2	2	2	2	1	1	2	1	2	2	2	1	1	2	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	6,7,8	1	2	1	**3**	**0**
73	46	2	5	6	6	2	4	2	2	1	1	4	2	2	1	1	1	2	2	1	2	6	1	1	2	2	1	2	1	1	2	1	1	1	1	1	2	4	1	5	1	6,7,8	1	2	3	**3**	**0**
74	43	2	6	7	1	2	1	1	2	2	1	2	1	1	1	1	1	2	2	1	1	5	1	1	2	1	1	1	3	3	1	1	1	1	1	1	2	3	0	4	1	4,5,6,7,8	1	2	1	**2**	**3**
75	31	2	5	7	1	2	4	2	1	2	2	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	0	5	1	1,6,7	1	2	1	**9**	**0**

76	49	2	5	6	6	2	4	2	2	1	1	4	2	2	1	1	1	2	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	6,7,8	1	2	2	**3**	**0**
77	28	1	2	2	4	2	1	2	2	1	1	4	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	6,7	1	2	2	**3**	**0**
78	46	2	5	6	7	2	1	2	2	2	2	1	1	2	1	2	2	2	1	1	2	7	3	2	2	2	1	1	1	1	1	2	1	1	1	1	2	5	0	5	1	6,7,8	1	2	1	**3**	**0**
79	39	2	2	7	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0	4	1	1,2,6,7	1	2	1	**3**	**0**
80	35	2	4	2	6	2	1	2	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	3	0	4	1	1,2,6,7	1	2	4	**1**	**0**
81	31	1	4	5	5	2	1	1	2	2	1	3	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	5	0	5	1	6,7	1	2	6	**23**	**0**
82	30	2	2	1	4	2	1	1	4	1	1	3	3	1	1	1	1	2	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	2	4	0	4	2	2	1	1	2	**21**	**0**
83	70	2	2	5	5	2	1	1	2	2	1	4	2	2	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	1,2,6,7	1	2	6	**23**	**0**
84	27	2	5	7	1	2	1	1	1	1	1	1	1	2	1	1	1	2	1	1	2	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	2	1	1	4	1	4,5	1	2	6	**1**	**2**
85	65	1	7	6	6	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	7	3	1	1	1	1	1	1	1	1	2	2	1	1	1	2	4	1	5	1	1,2,8,10	1	2	6	**24**	**0**
86	45	2	6	7	1	2	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	2	1	0	5	1	4	1	1	2	**16**	**0**
87	41	2	5	6	5	2	1	2	2	2	2	1	1	2	1	2	2	2	1	1	2	1	3	2	2	2	1	1	1	1	1	1	1	1	1	1	2	5	0	4	1	6,7,8	1	2	1	**3**	**0**
88	38	2	6	6	6	2	4	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	0	6	1	1,2,6,7	1	2	1	**3**	**0**
89	18	2	7	7	1	1	1	2	2	2	1	3	2	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	5	0	4	1	1,2,6,7	2,4	2	1	**1**	**0**
90	52	2	5	7	1	2	1	2	1	1	1	1	1	1	2,5	2	2	2	2	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	4	0	6	1	1,2,6,7,8	1	1	1	**3**	**0**
91	37	2	4	5	6	1	1	2	4	2	1	1	1	2	1	1	1	2	1	3	2	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	2	4	0	5	1	1,2,7,8,12	1	1	1	**1**	**0**
92	18	2	2	7	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	3	1	1	1	3	2	1	1	1	1	1	1	1	1	1	1	1	2	3	0	4	1	6	1	1	1	**1**	**0**
93	15	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	3	1	2	1	1	1	1	1	1	1	1	1	1	2	3	0	5	1	2,7	1	1	1	**1**	**16**
94	24	1	5	6	6	1	1	2	2	2	1	4	3	3	1	1	2	2	1	3	2	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	2	2	0	5	1	1,2,6,7	1	1	2	**1**	**0**
95	22	2	1	1	1	1	1	1	4	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	0	2	1	1,2,6,7	1	1	2	**1**	**0**
96	42	1	6	6	6	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	3	1	3	1	1	1	1	1	1	1	1	1	6	2	4	0	6	1	2,3,4,5,6,7,8	1	2	1	**3**	**0**
97	23	1	2	1	1	1	1	1	1	2	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	0	4	1	6,8	1	1	2	**1**	**0**
98	81	1	6	6	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	7	3	1	1	2	1	3	3	1	1	2	1	1	3	1	2	2	0	6	1	1,2,5,8	1	1	1	**24**	**0**
99	22	1	2	1	7	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0	5	1	1,2	1	2	1	**25**	**0**
100	30	2	4	7	1	2	2	2	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	4	1	5	1	2,5,6,7,8,10	1	2	1	**3**	**0**

ANNEXURE 5 - KEY TO MASTER CHART

VITAL STATISTICS

4. 1. Male 2. Female

8. Education:
1. Professional or honours
2. Graduate or postgraduate
3. post-high school diploma
4. High School Certificate
5. Middle School certificate
6. Primary School certificate
7. Illiterate

9. Occupation
1. Professional
2. Semi-Professional
3. Clerical, Shop Owner, Farmer
4. Skilled Worker
5. Semi-Skilled Worker
6. Unskilled Worker
7. Unemployed

10. Monthly income
1. Not working
2. ≥ 42,876
3. 21,438-42,875
4. 16,078-21,437
5. 10719-16,077
6. 6,431-10,718
7. 2,165-6,430
8. ≤2164

11. Marital status:
1. Single
2. Married
3. Other

12. FHP during pregnancy
1. Not applicable
2. Increases
3. Decreases
4. No change

13. FHP during menstruation
1. Increases
2. Decreases
3. No change
4. Not applicable

14. Exacerbation in sun exposure
1. No
2. Yes

15. Treatment?
1. No
2. Topical only
3. Oral only
4. Topical + oral

16. Home remedies
1. No
2. Yes

17. alternative treatments
1. No
2. Ayurveda
3. Homeo
4. Unani
5. Siddha
6. Naturals

18. H/o application of topical steroid
1. No
2. Do not know
3. Yes, plain steroid
4. Combination steroids

19. If steroid applied
1. Not applicable
2. Self-medication (Friends said)
3. Doctor prescribed
4. Pharmacist adviced

20. Application of turmeric
1. No
2. Yes
3. Yes, but not for this condition

21. Local application of oils
1. No
2. Coconut oil
3. Mustard oil
4. Amala oils
5. Others [ ]

22. Local application of Neem
1. No
2. Yes

23. Local appln of vegetables
1. No
2. Yes

24. Cosmetic usage
1. No
2. Talcum powder
3. Steroid combination
4. Fairness cream
5. Compact lotion
6. Foundation
7. Eye liner
8. Lip liner
9. Kumkum
10. Bleaching
11. Facial
12. Hair dye

25. hair dye?
1. Not applicable
2. Self
3. Doctor prescribed

26. frequent rubbing
1. No
2. occasional
3. most often

27. dermographism
1. No
2. Yes

28. H/o psychological stress?
1. No
2. Yes

29. Drug history -
1. Nil
2. OCPs
3. Phenytoin
4. Amiodarone
5. Thyroid drugs
6. ATT
7. Leprosy treatment
8. Minocycline
9. Psoralens
10. Psychotic medications
11. Others:

30. If leprosy treatment taken
1. Not applicable
2. Monotherapy
3. MDT
4. Details Not kNown

31. Usage of sun protection
1. No
2. physical methods
3. sunscreen
4. systemic

32. Sun exposure
1. Daily
2. occasionally
3. 2 to 3 days a week

33. If daily, duration per day
1. <3 hours
2. 3-5 hours
3. 6 or more hours

34. H/o recent insect bite on face
1. Not applicable

2. > 6 months back
3. 2-5 months back
4. <1 month

35. Diabetes mellitus
1. No
2. <1 year
3. 1-5 yrs
4. 5-10 years
5. >10 years

36. Hypertension
1. No
2. <1 year
3. 1-5 yrs
4. 5-10 years
5. >10 years

37. Thyroid disorder
1. No
2. Hyper
3. Hypo
4. Autoimmune

38. Tuberculosis
1. NO
2. Pulmonary
3. Extrapulmonary

39. Leprosy
1. No
2. Yes

40. Anemia
1. No
2. Yes

41. consanguinity?
1. No
2. Yes

42. Smoking
1. No
2. <1yr
3. 1-5 years
4. 5-10 years
5. >10 years
6. Ex-smoker (1 year)

43. Alcoholism
1. No
2. <1yr
3. 1-5 years
4. 5-10 years
5. >10 years
6. Ex alcoholic (1year)

44. Diet
1. Veg
2. Mixed

45. Beverages (Tea, coffe)
1. No, only water
2. Tea
3. Coffee
4. Both tea & coffee
5. Milk only

46. PICCLE
1. Pallor
2. Icterus
3. Cyanosis
4. Clubbing
5. LNE
6. Edema
7. Nil

48. Skin atrophy?
1. No
2. Yes

49. Pattern of pigmentation
1. Diffuse
2. Reticular
3. Mottled

50. Borders
1. Ill defined
2. Well defined

51. Site/(s) of pigmentation
1. Forehead right
2. Forehead left
3. Glabellar
4. Periorbital right
5. Periorbital left
6. Cheek right
7. Cheek left
8. Nose
9. Philtrum
10. Upperlip
11. Lowerlip
12. Chin
13. Ear right
14. Ear left
15. Perioral

52. Other sites
1. Nil
2. neck
3. upper limb
4. body
5. groin
6. genitalia
7. lower limb

53. Signs of inflammation
1. No
2. Yes

54. Symmetrical
1. No
2. Yes

55. lesions present on sun-exposed regions
1. No
2. Yes

56. sparing of sun-protected sites
1. No
2. Yes

57. Wood's lamp
1. Epidermal
2. Dermal
3. Mixed
4. Indeterminate
5. Not done
6. No relevant findings

58. DIAGNOSIS
1. POST INFLAMMATORY HYPERPIGMENTATION
a. ACNE SCAR
2. PERIORBITAL HYPERPIGMENTATION
3. MELASMA
4. FACIAL ACANTHOSIS NIGRICANS
5. DPN
6. SEBORRHOEIC KERATOSIS
7. EPHELIDES
8. LENTIGINES
9. FRECKLES
10. ERYTHEMA DYSCHROMICUM PERSTANS (EDP)
11. LPP
12. RIEHL'S MELANOSIS
13. ERYTHROMELANOSIS PERIBUCCALE PIGMENTAIRE OF BROCQ (EPP)
14. POIKILODERMA OF CIVATTE
15. ERYTHROMELANOSIS FOLLICULARIS OF FACE AND NECK
16. NEVUS OF OTA
17. NEVUS OF ITO
18. SEBORRHEIC MELAN
19. FRICTIONAL MELANOSIS
20. ACTINIC KERATOSIS
21. MORPHEA
22. SLE RASH
23. TOPICAL STEROID ABUSE

24. DRUG INDUCED PIGMENTATION