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**“A HOSPITAL BASED CROSS  
SECTIONAL STUDY OF CLINICAL,  
WOOD’S LAMP AND DERMOSCOPIC  
FINDINGS IN MELASMA.”**

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**DEPARTMENT OF DERMATOLOGY,  
VENEREOLOGY AND LEPROSY,  
JAWAHARLAL NEHRU MEDICAL COLLEGE,  
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**KLE ACADEMY OF HIGHER EDUCATION AND RESEARCH,  
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### ACCEPTANCE LETTER

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## LIST OF ABBREVIATIONS USED

<b>Sl. No.</b>	<b>Abbreviation</b>	<b>Expansion</b>
1	UV	Ultraviolet
2	MSH	Melanocyte stimulating hormone
3	OCP	Oral contraceptive pill
4	NSAIDs	Nonsteroidal anti-inflammatory drugs
5	KIT	Receptor tyrosine kinase
6	TYR	Tyrosinase
7	SILV	Silver locus protein homologue
8	MITF	Melanocyte inducing transcription factor
9	TYRP1	Tyrosinase related protein 1
10	Wnt	Wingless-related integration site
11	H19	H19 imprinted maternally expressed transcript
12	RNA	Ribonucleic acid
13	MASI	Melasma area and severity index
14	MELASQOL	Melasma quality of life scale
15	DLQI	Dermatology life quality index
16	HRQoL	Health relatd quality of life
17	DNA	Deoxyribonucleic acid
18	HQ	Hydroquinone
19	VEGF	Vascular endothelial growth factor
20	Q switched laser	Quality switched laser
21	Nd:Yag	Neodymium-doped yttrium aluminium garnet

## **ABSTRACT**

**Background:** Melasma is an asymptomatic, acquired, hyperpigmented condition commonly seen on the face. It is characterized by the presence of symmetrical brownish macules to patches over the sun exposed areas. It mainly affects adult females, and is seen in males to a lesser extent. Depending upon the depth of melanin pigment, melasma can be classified into epidermal, dermal and mixed type. By assessing the depth of pigmentation, proper treatment plan can be chalked out.

Wood's lamp is a source of ultraviolet light which filters other visible rays with the help of nickel oxide and barium silicate. It can be helpful in differentiating melasma based on the depth of the pigment.

Dermoscopy is a useful device which can be used to examine and assess the colour of the pigment, depth of the pigment and the vascular component. Therefore it can be used to classify melasma into epidermal, dermal and mixed type.

Due to relative dearth of literature on aspects of correlation between clinical, dermoscopy and Wood's lamp findings, we undertook this study to classify melasma based on depth of pigment and to correlate the dermoscopic features with clinical and Wood's lamp findings.

**Objective:** To study and correlate clinical features, Wood's lamp findings and dermoscopic findings in melasma.

**Materials and method:** This was a hospital based cross-sectional study which was conducted over a duration of one year. A total of 160 patients with clinically diagnosed melasma were included in the study. After obtaining consent, clinical examination, Wood's lamp and dermoscopic examination were conducted. Patients

who had light brown pigmentation on clinical examination were classified into epidermal type of melasma, those with dark brown to brownish gray pigment were classified into dermal type of melasma and patients who had dark brown pigmentation were classified into mixed type of melasma. On Wood's lamp examination, lesions which had accentuation of pigment were classified into epidermal type of melasma, lesions that showed no accentuation were classified into dermal type of melasma and those lesions which had few areas of accentuation were classified into mixed type of melasma. Dermoscopic findings such as regular light brown pigment network, perifollicular sparing, with or without vascular involvement were considered for classifying melasma into epidermal type; for dermal type of melasma brown gray pigmentation, perifollicular hyperpigmentation, perifollicular arciform pattern, vascular features such as erythema and telangiectasias were considered. A combination of both these types were classified into mixed type of melasma. It was then compared with clinical and Wood's lamp findings.

**Results:** Out of 160 patients, 128 (80%) were females and 32 (20%) were males. Majority (50.63%, n=81) of them belonged to an age group of 31-40 years.

On clinical examination, out of 160 patients, 61.3% (n=98) had dark brown color, suggestive of mixed type of melasma; light brown color was seen in 25% (n=40) indicative of epidermal type of melasma; 13.8% (n=22) had dark brown to brown gray color which was suggestive of dermal type of melasma.

On Wood's lamp examination, 49.38% (n=79) patients had mixed type of melasma, 26.25% (n=42) patients had epidermal type and 24.38% (n=39) patients had features suggestive of dermal type of melasma.

Dermoscopic examination was suggestive of mixed type of melasma in 56.88% (n= 91) patients, dermal type in 25.63% (n=41) patients and epidermal type of melasma in 17.5% (n=28) patients.

The data was analyzed using statistical software R version 4.0.2 and Microsoft Excel. The sensitivity of dermoscopic examination with respect to Wood's lamp examination in identifying epidermal, dermal and mixed type of melasma were 59.5%, 71.8% and 87.3% respectively, and specificity was 97.4%, 89.5%, 72.8% respectively. By Cohen's Kappa there was substantial agreement present between dermoscopic impression and Wood's lamp examination. (K=0.6112, p<0.00001)

**Conclusion:** Dermoscopy acts as a simple diagnostic tool which helps us to study subtle clinical pattern of skin lesions which cannot be seen by unaided eye. In melasma, it is useful in detecting early melasma changes. It also helps us to differentiate melasma from other causes of facial hyperpigmentation, hence avoiding the need for biopsy in most of the cases. Dermoscopy also has a prognostic importance as it helps in identifying epidermal, dermal and mixed type of melasma, therefore helping in further management of melasma and monitoring the efficacy of treatment. In our study we found that the overall sensitivity and specificity of dermoscopy to be unarguably high. Hence, it should be incorporated as a routine method for examining all the cases of melasma.

**Limitation:** The limitation in our study was that there was no histopathological correlation done. Perhaps the histopathology of the lesion might aid further in standardizing dermoscopic features in each type of melasma.

**Key words:** Melasma, Dermoscopy, Wood's lamp

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## **INTRODUCTION**

Melasma is an asymptomatic, acquired, hyperpigmented condition commonly seen on the face. It is characterized by the presence of symmetrical brownish macules to patches over the sun exposed areas.<sup>1</sup> It mainly affects adult females, and is seen in males to a lesser extent.<sup>2</sup>

Clinically, depending on the distribution of facial lesions, it can be divided into centrofacial type, malar type and mandibular type.<sup>2</sup> Depending upon the depth of melanin pigment, it can be classified into epidermal, dermal and mixed type. By assessing the depth of pigmentation, proper treatment plan can be chalked out.<sup>1</sup>

Wood's lamp is a source of ultraviolet light which filters other visible rays with the help of nickel oxide and barium silicate. The variations in epidermal pigment is more apparent than dermal pigment variations.<sup>3</sup> Hence, it can be helpful in differentiating melasma based on the depth of the pigment.<sup>2</sup>

Dermoscopy is a useful diagnostic device which is non-invasive, and can be used to examine different pigmented lesions.<sup>2</sup> It helps to assess the colour of the pigment, depth of the pigment.<sup>4</sup> and the vascular component. Therefore it can be used to classify melasma into epidermal, dermal and mixed type.<sup>2</sup>

Due to relative dearth of literature on aspects of correlation between clinical, dermoscopy and Wood's lamp findings, we undertook this study to classify melasma based on depth of pigment and to correlate the dermoscopic features with clinical and Wood's lamp findings.

## **AIMS AND OBJECTIVES**

- **PRIMARY OBJECTIVE**

To classify melasma into epidermal type, dermal type and mixed type based on clinical examination, Wood's lamp examination and dermoscopic examination.

- **SECONDARY OBJECTIVE**

To correlate between the clinical, Wood's lamp and dermoscopic examination findings.

## **REVIEW OF LITERATURE**

### **INTRODUCTION**

Melasma is a commonly acquired hyperpigmentation condition.<sup>1</sup> It is identified by the presence of hyperpigmented, bilaterally symmetrical macules and patches more commonly on the face,<sup>5</sup> particularly forehead and malar areas, and less commonly on the lower portion of cheeks, upper lip, chin and sides of neck.<sup>2,6</sup> It mainly involves those areas which are more sun exposed.<sup>7</sup> It is more commonly seen in female population.<sup>1, 6</sup> Numerous aspects are indicated in the etiopathogenesis of melasma, the most common being ultraviolet radiation exposure and genetic influences. Other factors responsible are racial factors, pregnancy, oral contraceptive pill intake, therapies with estrogen and progesterone, thyroid dysfunction, cosmetics, antiepileptics and phototoxic drug.<sup>2,6,8</sup>

### **HISTORICAL BACKGROUND**

Melasma derives its name from the Greek word, “melas” which means black. It also goes by the name chloasma, which is from the word “chloazein” meaning green.<sup>9,10</sup> Other terms like mask of pregnancy is also used to refer to the same condition.<sup>11</sup>

In ancient literature, melasma has been documented by Hippocrates (470-360BC) as hyperpigmented facial lesion which was aggravated by sunlight and heat.<sup>9,10</sup>

The term ‘ephelis’ was used to describe melasma by Joseph Plenck in Doctrine of Morbis Cutaneis.<sup>10</sup>

## **EPIDEMIOLOGY**

Melasma is seen in darker skin types i.e., Fitzpatrick's skin phototype IV-VI.<sup>1</sup> It is commonly seen in people of Hispanic, Asian, African and Middle Eastern descent<sup>5</sup> where there is intense solar ultraviolet radiation exposure.<sup>12</sup> It is frequently seen in women than men.<sup>13,4</sup>

Depending on the population, prevalence of melasma can vary between 1.5 and 33.3%.<sup>4,14,15</sup> Prevalence of melasma during pregnancy worldwide is recorded to be approximately 50-70%.<sup>4,16,17</sup> and its incidence in Indian population in the course of pregnancy is around 10%.<sup>4,13</sup>

## **AGE OF ONSET**

It is usually found to be present more commonly between the 20-40 years age group.<sup>3</sup> In Indian population, the average age of melasma is around 33.45 years.<sup>1,13</sup>

## **SEX RATIO**

It is more commonly seen in females of reproductive age group, with female to male ratio 9:1.<sup>12</sup>

It is found that melasma occurs at a middle age in females and relatively younger age in males.<sup>1</sup>

## **ETIOLOGY**

The exact etiology of melasma is not known. Some of the factors suggestive of etiopathogenesis of melasma are exposure to UV radiation, genetic influences, race-related influences, pregnancy, combined hormonal contraceptive pills, hormonal

therapy with estrogen, progesterone, drugs such as phototoxic drugs, antiepileptic drugs and thyroid dysfunction.<sup>2</sup>

**ULTRAVIOLET (UV) RADIATION:** Both ultraviolet A and B and visible light cause lipid peroxidation in the cell membrane resulting in generation of free radicals. These free radicals stimulate melanogenesis.<sup>12</sup> Its main role in the pathogenesis of melasma is supported by the fact that lesions of melasma are seen in sun-exposed parts of face with sun-protected areas such as philtrum relatively spared; also it is found to fade out during winter.<sup>11</sup>

**VISIBLE LIGHT:** It has been found that visible light causes more profound and stable pigmentation when compared to UV A radiation.<sup>5</sup>

**HORMONES:** Melasma is associated with consumption of combined hormonal contraceptive pills which contains oestrogen and progesterone. This may be because of estrogen influence on the estrogen receptors which are present on the melanocytes and probably stimulate melanogenesis. Progesterone also plays an important role since it is encountered in postmenopausal women who receive progesterone supplementation.<sup>12</sup> Some studies have also shown increase in the luteinizing hormone levels and decreased levels of serum estradiol suggesting a probable subclinical mild ovarian dysfunction.<sup>5</sup> Melanocyte stimulating hormone (MSH) also has been implicated since it is found that melasma begins and also worsens during pregnancy and after profound emotional stress.<sup>12</sup> There has also been a significant relationship between autoimmune thyroid disorders and melasma; especially in women whose onset of melasma developed during the period of gestation or after OCPs intake.<sup>5</sup>

**DRUGS:** Melasma like pigmentation has been found in those consuming drugs such as phenytoin, griseofulvin and NSAIDs.<sup>12</sup> Phenytoin directly acts on melanocytes and causes dispersion of the melanin granules. It also brings about increased pigmentation in the basal epidermis. This pigmentation has been found to disappear few months after stopping the drug.<sup>5</sup>

**GENETICS:** Genetic factors are implicated, since 30% or more melasma patients have similar complaints in the family. Melasma has also been described in identical twins.<sup>12</sup> It has been hypothesized that KIT and stem cell factor may be involved in the hyperpigmentation of melasma since its expression is increased in the epidermal and dermal lesional skin.<sup>11</sup> Kang et al. found that on transcriptional analysis of skin samples in melasma patients, 279 genes were upregulated and 152 genes were downregulated. Genes related to melanin biosynthesis and markers of melanin such as TYR, SILV, MITF and TYRP1 were upregulated.<sup>5</sup> Other genes implicated in biological pathways such as Wnt pathway, genes involved in the synthesis of prostaglandin, modulation genes, and metabolism of fatty acid were found to be affected.<sup>5</sup> Also, it was found that in the lesional melasma skin, H19 gene, which is responsible for transcription of noncoding ribonucleic acid (RNA) was observed to be downregulated. This resulted in activation of melanogenesis and increase in melanin transfer from melanocytes to keratinocytes.<sup>5</sup>

**COSMETICS:** Since melasma most commonly affects the face, contents of cosmetic products have been implicated as one of the etiological factors.<sup>9</sup>

## **PATHOGENESIS**

In melasma, it has been found that there is increase in both the melanocyte number (melanocytosis) as well as increase in the melanin production (melanogenesis).<sup>5</sup> Also, there is an increase in the size of the melanocyte with increased number of dendrites which is reflected on histopathology by increased melanin deposition in epidermis and dermis.<sup>3</sup>

Prolonged UV exposure causes dermal inflammation and activation of the fibroblasts. This may upregulate the dermal stem cell factors resulting in melanogenesis.<sup>5</sup>

According to a study done by Kim et al. with respect to the vascular characteristics of melasma, there was increase in vascular endothelial growth factor over the affected site. This signifies that there may be increased vascularization in melasma.<sup>5</sup>

In another study by Lee et al., there was an increase in the melanin and erythema indices, stratum corneum hydration in the lesional skin when compared to that of the perilesional skin, suggesting that vascularization accompanied hyperpigmentation.<sup>5</sup>

## **CLINICAL FEATURES**

Melasma is a common hyperpigmentation disorder seen over sun exposed areas, characterized by bilaterally symmetrical hyperpigmented brownish macules.<sup>9</sup> The hyperpigmented macules may be irregular, blotchy, arcuate or have a polycyclic appearance.<sup>7</sup> Very rarely, they may have a linear or even a starburst pattern.<sup>4</sup>

We can classify melasma on the face into 3 types:

- Centrofacial type - characterized by pigmentation over the nose, cheeks, forehead, chin, upper lip
- Malar type - pigmentation over cheeks and nose
- Mandibular type - pigmentation over the mandibular ramus<sup>12</sup>

Worldwide, centrofacial type of melasma is the most common presentation, followed by malar type. However in India, malar type of melasma is noted to be the most common pattern of melasma (73%).<sup>18</sup>

Depending upon the course of natural history of melasma, it is classified as:

- Transient type – where lesions disappear within a year after eliminating the hormonal stimulus
- Persistent type – where lesions are present throughout even after eliminating the hormonal stimulus, and is due to UV and other factors.<sup>12</sup>

Another classification of melasma where we consider depth of melanin pigment is as follows:<sup>19</sup>

- Epidermal type – pigment is situated in the epidermis, hence appears brown with well defined margins.
- Dermal type – pigment is present in the dermis, characterized by gray-brown pigment and poorly defined margins.
- Mixed type (epidermo-dermal type) – presence of melanin in epidermis and dermis, with features of both epidermal and dermal type.
- Indeterminate type – where classification of melasma is difficult, as seen in dark skinned individuals.<sup>20</sup>

This categorization of melasma depending upon pigmentation depth helps in planning different treatment options and also helps with explaining the patients as to what improvement they can expect on treatment.<sup>3</sup>

Lesions of melasma first appear or is aggravated after exposure to UV irradiation or during pregnancy.<sup>11</sup>

In pregnancy, melasma, or “mask of pregnancy” in lightly pigmented individuals usually diminishes after parturition, however in darkly pigmented skin, it tends to persist.<sup>11</sup>

#### **MELASMA AREA AND SEVERITY INDEX (MASI)**

- The MASI was formulated by Kimbrough-Green et al. It gives an accurate quantification of melasma severity and changes during the course of treatment. To compute MASI score, there are three factors that are assessed subjectively : area of involvement (A), darkness of the lesion (D), and homogeneity of the lesion (H).<sup>21</sup>
- To calculate MASI, the face is split into four parts: forehead, chin, right and left malar region. The forehead, right and left malar regions are given 30% each and chin is given 10%.<sup>22</sup> The area of involvement in these 4 regions are graded from 0 to 6, where, 0 = no involvement; 1 = <10% involved; 2 = 10%-29% involved; 3 = 30%-49% involved; 4 = 50%-69% involved; 5 = 70%-89% involved; and 6 = 90%- 100% involved.
- There are two parameters used: darkness (D) and homogeneity (H). They are graded from 0 to 4 where 0 = absent; 1 = slight; 2 = mild; 3 = marked; 4 = maximum.<sup>23</sup>

- Final formula to calculate MASI is:

$$\text{MASI} = 0.3 \text{ A(D+H)}_{\{\text{FOREHEAD}\}} + 0.3 \text{ A(D+H)}_{\{\text{R.MALAR}\}} + 0.3 \text{ A(D+H)}_{\{\text{L.MALAR}\}} + 0.1 \text{ A(D+H)}_{\{\text{CHIN}\}}^{24}$$

- The maximum MASI score is 48 and minimum is 0.
- It helps to provide a good reliability and a good validity.<sup>23</sup>
- Other scoring systems used in melasma are modified MASI scoring<sup>23</sup>, Melasma Severity Index (MSI)<sup>21</sup>

There are different indices that may be used for measuring quality of life in melasma, some of them are MELASQOL, DLQI, HRQoL.<sup>22</sup>

## **DIFFERENTIAL DIAGNOSIS**

- Exogenous ochronosis : It is an acquired condition which occurs due to prolonged topical usage of hydroquinone and is characterized by deposition of polymerized homogentisic acid in collagen. Clinically it presents with blue-black or slate gray asymptomatic pigmented papules mainly over the malar eminence, lower cheeks, temples, neck, back and extensor surfaces of extremities.<sup>24</sup> On histopathology, yellow brown banana shaped pigment fibres are seen in the dermis<sup>25</sup> On dermoscopy, amorphous blue gray areas are seen which obliterate follicular openings.<sup>26</sup> There are irregular dermoscopic features with brown gray annular, globular, arciform structures are seen<sup>27</sup> also a characteristic “worm-like” pattern is also seen.<sup>28</sup>
- Lichen planus pigmentosus: Here, there are violaceous lesions over the face, temples, preauricular region with neck involvement. Histopathologically, there

is vacuolar degeneration of basal layer with variable lichenoid infiltrate and epidermal atrophy.<sup>11</sup> On dermoscopy, multiple bluish grey with brownish globules and granules are arranged in reticular pattern with whitish follicular plugging.<sup>29</sup>

- Acquired bilateral nevus of Ota - like macules or Hori's nevus: It is reportedly seen in 4<sup>th</sup> to 5<sup>th</sup> decade in Asian women and is characterized by multiple brown-gray to brown-blue macules mainly in the malar area. They lack mucosal or oral involvement. Histologically, there are pigment producing dermal melanocytes.<sup>11</sup> On dermoscopy, there is bluish grey pigmentation with reticular and globular pattern is seen along with few whitish and dark brown areas.<sup>29</sup>
- Post inflammatory hyperpigmentation: It can be seen following photosensitivity reactions, cutaneous lupus erythematosus. There is a history of inflammatory phase and associated pruritus or burning sensation, other areas of the body may be involved.<sup>11</sup> On dermoscopy, there is accentuation of pseudoreticular honeycomb pattern, with or without whitish irregular blotches.<sup>29</sup>
- Pigmented contact dermatitis or Riehl's melanosis: It is mostly seen in middle aged women. It is characterized by sudden onset of gray-brown to black hyperpigmentation and is seen in areas where contactants are applied such as forehead, zygomatic area, temples, neck and rarely the hands, forearms, and trunk. On histopathology, basal layer shows liquefactive degeneration.<sup>30</sup> On dermoscopy, we see brown-grey reticulate pattern due to dermal melanin deposition.<sup>11</sup>

- Solar lentigines: They occur due to long-standing exposure to UV rays and is characterized by well-defined, round or oval dark brown to black macules. It is seen on sun-exposed areas, mainly on the dorsum of forearms and hands, face, upper chest and back.<sup>31</sup> On histopathology, there is epidermal hyperplasia, melanocyte proliferation and melanin accumulation within keratinocytes. The rete ridges have club-shaped extensions resulting in reticulated pattern formation. Upper dermis has a mild perivascular lymphocytic infiltrate.<sup>32</sup> On dermoscopy, there is pigment network accentuation with moth eaten border.<sup>29,33</sup>
- Erythema dyschromicum perstans / ashy dermatosis: The exact cause is not known, however it may be associated with ingestion of ammonium nitrate, whipworm infestation, and HIV seroconversions. It presents as gray to gray-blue macules and patches distributed symmetrically over neck, trunk, proximal arms, face. On histopathology there is minimal epidermal hyperplasia with perivascular infiltrates consisting of lymphocytes and melanophages.<sup>34</sup> On dermoscopy, there is accentuation of uniform reticular pigment network. Granules are also seen which correlate with clusters of melanophages. The reticular pattern can either be complete or may be disintegrated at some places into discrete granular, speckled, linear, angulated blue-gray deposits.<sup>35</sup>
- Poikiloderma of Civatte: It is a chronic dermatosis which is seen in fair skinned people over sun-exposed areas. It presents as erythematous patches and is seen mainly over the face, sides of neck and central chest.<sup>36</sup> Histologically, there is irregular basal layer hyperpigmentation, telangiectasia and dermal atrophy.<sup>37</sup> On dermoscopy, perifollicular areas are uninvolved with “spaghetti and meatballs” vascular pattern.<sup>36</sup>

- Erythromelanosis follicularis faciei et colli: It is frequently seen in young adults and adolescents, more in males. It is characterized by symmetrical well defined hyperpigmentation, erythema and follicular oriented papules over preauricular and maxillary area, and may involve temples and sides of neck. On biopsy, we see follicular hyperkeratosis, hyperpigmentation of basal layer, dilated capillaries in the superficial dermis and perivascular inflammatory infiltrate.<sup>38</sup> On dermoscopy, usually we see whitish scales, perifollicular or interfollicular gray-blue granules (peppering), and plugging of follicular ostia with whitish keratotic material over reddish brown background.<sup>36</sup>

## **DIAGNOSIS**

There are various modalities which assist in diagnosing melasma when in doubt.

**WOODS LAMP:** Wood's lamp was invented by Robert W Wood in 1903. It works by emitting long-wave ultraviolet radiation, also known as black light, which is produced by mercury arc under high pressure fitted with barium silicate and 9% nickel oxide filter, otherwise known as the "Wood's filter." It filters out all light rays except light belonging to wavelength between 320-400 nm.<sup>39</sup> Examination of melasma lesions with the help of Wood's lamp helps in recognizing the situation of melanin pigment. Under Wood's lamp, epidermal type of melasma becomes more pronounced and dermal type becomes less apparent. Based on these features, Sanchez et al categorized melasma into four types: epidermal melasma, dermal melasma, mixed type of melasma and Wood's lamp inapparent type.<sup>4</sup> Epidermal type of melasma, which is normally seen as light brown colour, under Wood's lamp shows enhanced color contrast.<sup>3</sup> Dermal type of melasma is seen as greyish or bluish pigment on clinical

examination and on Wood's lamp examination, it shows less colour contrast.<sup>3</sup> Mixed type of melasma shows enhancement in few areas on Wood's lamp examination.<sup>2</sup>

**DERMOSCOPY:** A dermoscope or a dermatoscope is a diagnostic non-invasive tool which is used to visualize fine clinical patterns of skin lesions and the skin structures in its subsurface which are usually not seen to the unassisted eye. It is also known by other names such as episcopes, epiluminescence microscope, skin surface microscope. The patterns observed on dermoscope is often consistent with certain diseases, hence can be employed in diagnosing and thereby minimizing the need for skin biopsy. It also has an added advantage of storing the images, further helping in follow-up of the patients. Basically, a dermoscope is akin to a magnifying lens with an additional inbuilt illuminating system that has more magnification to assess deeper structures like reticular dermis.<sup>40</sup>

**PRINCIPLE:** Dermoscopy uses a simple principle of transillumination of a lesion with higher magnification for proper visualization of subtle features of a lesion.<sup>41</sup> When light is incident on skin, it can get reflected, refracted, diffracted or absorbed, depending upon the properties of the skin. When the incident light falls on a dry and scaly skin, light is reflected, whereas on an oily skin, the light reaches up to reticular dermis. Hence, to observe the subsurface of the skin, linkage fluids like oil (immersion oil, mineral oil) or water or glycerin is used. Immersion oil is rarely used as it comprises of dibutyl phthalate and chlorinated paraffin which may lead to carcinogenic, teratogenic and fetogenic effects.<sup>42</sup> Oils are preferred since water evaporates quickly. Also, transillumination can further be enhanced by placing glass on an oil smeared skin since its refractive index is 1.52 and is similar to that of skin (1.55).<sup>43</sup> Here, the glass plate of the device comes in contact with the lesion

containing linkage fluid. In the latter, the lens is not in contact with skin. One advantage of non-contact technique is that it ensures no nosocomial infections. However it has decreased illumination and resolution.<sup>44</sup> There are 3 different modes in a dermoscope: non-polarized light, polarized light, blue light. Polarized light helps in visualization of deeper structures of skin whereas the non-polarised light helps to view skin superficially.<sup>45</sup>

DERMOSCOPY OF PIGMENTARY FEATURES IN NORMAL SKIN: A pseudonetwork pattern is seen which consists of a background of diffuse hyperpigmentation with broad mesh and holes due to pigment free terminal and vellus hair follicles, openings of sweat gland.<sup>40</sup> On examining the skin with the help of dermoscopy, different structural and chromatic arrangement of melanin are seen. Depending upon the location and depth of melanin, different colors of melanin is seen. Upper epidermis (consisting of stratum corneum and stratum spinosum) shows black color ; dermoepidermal junction shows light to dark brown color ; papillary and reticular dermis shows slate blue and steel blue color respectively.<sup>40</sup>

DERMOSCOPY OF MELASMA: Diagnosis of melasma can be made after comparing global and local features. Global features are the type of pattern present whereas local features are the minor changes appreciable. Global feature recognized in all types of melasma is the reticular pattern. Melasma lesions show reticular pigmentation in different shades of brown with sparing of follicles and openings of sweat glands resulting in pseudonetwork pattern exaggeration with borders that are concave, called the 'jelly sign'.<sup>46</sup> This pseudonetwork is superimposed by hyperpigmented globules, granules and blotches which are dark brown or blue-black in color predominantly in perifollicular areas, sparing the follicles.<sup>40</sup> Epidermal

melasma shows scattered islands of light brown reticular network with scattered dark fine granules on the surface. Small well defined patches of epidermal type of melasma has diffuse brownish blotchy reticular pattern with multiple granules and dark brown globules superimposed on reticular pattern.<sup>40</sup> Mixed type of melasma show dark brown diffuse reticular pigment network or irregularly shaped dark brown or black blotchy pigmentation with varying sizes. Surface of the pigmentation shows different morphologies such as arcuate, annular, star-like and honeycomb pattern. Dark brown globules and granules are seen in the perifollicular regions with sparing of the follicle.<sup>40</sup> Dermal type of melasma, based on pigment depth appear as dark brown to greyish hyperpigmented lesions. They can show grayish brown or grayish black pigmentd specs or arcuate, annular, start shaped or honeycomb pattern in perifollicular area sparing the follicles.<sup>40</sup>

**ROLE OF DERMOSCOPY IN MELASMA:** Dermoscopy is useful in detecting early cases of melasma. It helps us to differentiate melasma from other conditions associated with facial hyperpigmentation. Hence the need for biopsy on face can be avoided in many cases. It has a prognostic significance since it helps in identifying epidermal and dermal type of melasma as they have different shades of color when examined by a dermoscope, especially in dark skinned individuals where Wood's lamp is of minimal help. Dermoscopy aids in monitoring efficacy of the treatment and also helps in picking up complications like atrophy, telangiectasia, depigmentation, steroid dermatitis, exogenous ochronosis.<sup>40</sup>

**REFLECTANCE CONFOCAL MICROSCOPY:** It is a non invasive tool which is used for evaluation of skin up till the papillary dermis.<sup>5</sup> It helps to provide real time face images which matches with the histopathological examination. There are some

studies conducted to analyze the role of reflectance confocal microscopy in melasma. In case of epidermal type of melasma, RCM shows hyperrefractile cobblestone cells and loss of dermal papillary rings in the basal layer, whereas in dermal type of melasma, bright plump cells in the dermis with less refractile ragged lacy structures are seen.<sup>47</sup>

**HISTOPATHOLOGY:** When compared to the adjacent uninvolved skin, the lesional skin shows increased melanin in the epidermis, particularly in the basal layer. The pigment melanin is situated in a 'cap' overlying the nuclei of keratinocyte. There is increase in melanosomes in both basal and suprabasal keratinocytes.<sup>48</sup> There are increased dendritic projections from the melanocytes.<sup>11</sup> Other characteristic features such as atrophy of the epidermis, basal cell hyperpigmentation, pendulous melanocytes and solar elastosis were also found in the lesional melasma skin.<sup>49</sup> Mast cells are also increased in number.<sup>48</sup>

Ultrastructurally, melanocytes show increased number of melanosomes. Also, the mitochondria, golgi apparatus, and rough type of endoplasmic reticulum are increased in number.<sup>11</sup>

## **PROGNOSIS**

Melasma has a variable disease course and prognosis. Pigmentation of melasma fades after parturition, but it may stay for months to years.<sup>3</sup> In some women, it is more obvious just before menstruation. Pigmentation takes quite a long time to fade once the oral contraceptive pills are stopped and after pregnancy, but they may never fade completely.<sup>3</sup>

## **TREATMENT MODALITIES:**

Treatment of melasma can be at times very challenging due to its complex pathogenetic nature and relapses are very common. The mixed and dermal types of melasma are resistant to therapy when compared to that of epidermal type.<sup>18</sup>

## **TOPICAL THERAPY**

- **SUNSCREENS:** Sunscreens form an important treatment strategy in the management of melasma.<sup>18</sup> Patients of melasma need sunscreens of broad spectrum type covering ultraviolet A, ultraviolet B and visible light, with a sun protection factor of at least 30 or more. Inorganic sunscreens, especially those containing iron oxide are more beneficial since they protect from the entire spectrum. They also provide an additional camouflage effect. Application of the sunscreen should be generous and it should be reapplied every two to three hours. The patient should be advised to apply it even when they stay indoors since melasma can be aggravated by infrared light also.<sup>50</sup>
- **HYDROQUINONE (1,4-dihydroxybenzene):** It is the gold standard in the management of hyperpigmentation.<sup>18</sup> Hydroquinone is a prototype depigmenting agent which acts by inhibiting the enzyme tyrosinase. It also causes apoptosis of melanocytes by affecting the membrane of melanocytes. Hydroquinone is available as 2-4% cream formulation. Results of hydroquinone such as lightening of the pigment can be seen in 5-7 weeks. It is advised to be continued for at least three months, up to a maximum of one year. Side effects include worsening of hyperpigmentation, exogenous ochronosis.<sup>50</sup>

- **TOPICAL STEROIDS:** Topical steroids act by decreasing the epidermal turnover and by antimetabolic effect, and hence reduces the pigmentation. Commonly used topical steroids include hydrocortisone (1%), fluocinolone acetonide (0.01%), clobetasol propionate (0.05%), betamethasone valerate (0.1%) in a cream base. It is advised not be used for more than three weeks. Monotherapy is not recommended due to plethora of adverse effects like atrophy, telangiectasia, hirsutism and acneiform eruptions.<sup>50</sup>
- **TOPICAL RETINOIDS:** Retinoids increase the epidermal cell turnover, interrupts transfer of melanosomes, inhibits transcription of tyrosinase, and hence inhibits melanin synthesis. It also helps in enhancing the penetration of other topical agents.<sup>51</sup> Tretinoin 0.025-1% and adapalene 0.1% are used.<sup>18</sup> It shows better results when combined with various other topical therapies. It has been found to be beneficial when used for around 40 weeks. Side effects include irritation and inflammation which may cause melasma to worsen.<sup>51</sup>
- **AZELAIC ACID:** It is a naturally obtained nonphenolic dicarboxylic acid synthesized by *Malassezia* yeast.<sup>51</sup> It competitively inhibits the enzyme tyrosinase. It also inhibits mitochondrial enzymes and DNA synthesis causing cytotoxic and anti-proliferative effects on abnormal melanocytes. It doesn't affect the normally pigmented skin.<sup>50</sup> Azelaic acid is applied as 20% in cream formulation twice a day.<sup>51</sup>
- **KOJIC ACID:** It is a fungal derivative which acts by interfering with copper at the active tyrosinase site and hence inhibits the enzyme tyrosinase<sup>51</sup> It is used in a concentration of 1-4%. It shows good results when combined with other topical therapies.<sup>50</sup> Newer agents include N-acetyl-4-S-cysteaminylphenol,

ascorbic acid, alpha-tocopheryl ferulate, niacinamide, liquorice, flavonoids, lumixyl, beta carotene, rucinol, dioic acid, tranexemic acid, antisense oligonucleotides, methimazole.<sup>18</sup>

**COMBINATION THERAPY** – it is considered to be first line therapy in melasma

- Kligman's regimen – consists of combination of hydroquinone 5%, tretinoin 0.1%, dexamethasone 0.1%.<sup>18</sup> The reason for its effectiveness is that tretinoin prevents hydroquinone oxidation thereby improving epidermal penetration while corticosteroid minimizes the irritation caused by them and also inhibits melanin synthesis.<sup>1</sup> There is significant improvement seen in 4 weeks. However it should not be continuously for more than 8 weeks.<sup>18</sup>
- There are various modifications which have been formulated over many years
- Modified Kligman's regimen – 4% hydroquinone, 0.05% tretinoin, 0.01% fluocinolone acetonide.<sup>18</sup>
- Other combinations used are 2% hydroquinone, 0.05% tretinoin and 0.1% betamethasone valerate ; 2% hydroquinone, 1% mometasone and 0.025% tretinoin ; tretinoin 0.05 or 0.1% with azelaic acid 20% ; HQ 4%, azelaic acid 20% and glycolic acid 20% ; arbutin with aloesin ; licorice extract with soy and ascorbic acid ; hydroquinone with kojic acid; azelaic acid with hydroquinone; hyaluronic acid with hydroquinone and glycolic acid.<sup>18</sup>

**SYSTEMIC THERAPY:**

- **TRANEXEMIC ACID:** It inhibits the plasmin/plasminogen pathway, and interferes with keratinocyte and melanocyte interactions thereby it inhibiting melanin synthesis.<sup>52</sup> It also inhibits vascular endothelial growth factor (VEGF)

and hence decreases angiogenesis in the dermal capillaries.<sup>53</sup> The standard dose is 500 mg/day as single or two divided doses for a duration of 2 to 6 months.<sup>54</sup> Side effects such as nausea, diarrhoea, drowsiness, pain abdomen, skin rashes, alopecia, and irregular menstruation may be seen.<sup>55</sup>

- **GLUTATHIONE:** It is a thiol peptide with low molecular weight. It is used in melasma since it inhibits tyrosinase enzyme by binding to active sites containing copper and also exerts antioxidant effect by depleting free radicals and peroxides. Also, by forming sulfhydryl-dopa conjugates, there is shift in the production of eumelanin to pheomelanin. It may be used in oral preparations as 20-40mg/kg/day in two divided doses. Results are seen within 12 weeks.<sup>54</sup>
- **POLYPODIUM LEUCOTOMOS EXTRACT:** It is derived from polypodium leucotomos fern. It inhibits metalloproteinase enzyme and helps in collagen remodeling. It also has an anti-inflammatory and antioxidant effect. It is given orally at a dose of 480-1200mg/day for 3 months.<sup>54</sup>
- **ORAL ANTIOXIDANTS:** Oral antioxidants such as vitamin A, C, E are also used as adjuncts in melasma treatment. Vitamin C is taken orally as 500mg tablet twice a day.<sup>51</sup> They are taken twice daily for 8 weeks to get desired benefits.<sup>54</sup>
- **PYCNOGENOL/PROCYANIDIN:** Pycnogenol is an extract obtained from pine tree bark. It contains procyanidin, catechins, eocatechins and ferrulic acid. It has a significant antioxidant and anti-inflammatory activity. It also

inhibits nuclear factor  $\kappa\beta$  thereby reducing ultraviolet induced erythema. Desirable effects are seen when it is taken 25mg thrice daily for 30days.<sup>54</sup>

- MELATONIN: It is a hormone which is synthesized by the pineal gland. It is a strong antioxidant and a free radical scavenger, hence reduces the generation of ultraviolet induced free radicals. Also, it interferes with alpha-melanocyte stimulating hormone, progesterone and estrogen. It is given at a dose of 3mg/day for 90days.<sup>54</sup>

### **CHEMICAL PEELS:**

Chemical peels, also known as controlled chemical burns cause epidermal and/or dermal destruction resulting in exfoliation and resurfacing of epidermis. It also helps in collagen and elastic fibre remodeling in the dermis. Chemical peels can be superficial, medium or deep.<sup>55</sup> In case of melasma, due to a darker complexion and hypersensitivity of the melanocytes, superficial peels are commonly used. Its efficacy can be improved by priming the skin with 0.025-0.1% tretinoin cream, <15% glycolic acid cream, sunscreens. Commonly used chemical peeling agents include 20-70% glycolic acid,<sup>56</sup> 10-35% trichloroacetic acid,<sup>55,57</sup> 20-30% salicylic acid,<sup>58</sup> Jessner's solution,<sup>59</sup> pyruvic acid peels,<sup>60</sup> phytic acid peels<sup>61</sup>, amino fruit peels,<sup>62</sup> tretinoin peels,<sup>63</sup> and others. Newer peels include Effective results are seen with side effects of inflammation, post inflammatory hyperpigmentation or rebound of melasma.<sup>51</sup>

### **LASER AND LIGHT SOURCES:**

Commonly used lasers in treating melasma are Q switched laser, ablative lasers, fractional lasers, pulse dye laser and intense pulsed light laser.

Q switched laser : Here, the chromophore targeted is melanin and depending on the wavelength, epidermal and dermal melanin can be targeted. Low energy Q-switched laser has a larger spot size and causes selective melanocyte damage due to its low fluency. It is done once or twice a week for 5-10 sessions. Q Switched Nd:Yag (1064nm), Q Switched Alexandrite (752nm) and Q Switched Ruby lasers (694nm) can be used <sup>64</sup>

Erbium:Yttrium-Aluminium-Garnet laser (2940nm) and ablative non-fractional carbon dioxide laser also helps in initial improvement of melasma.<sup>65</sup>

Fractional lasers : Fractional non-ablative and ablative lasers create microscopic thermal damage and microscopic holes respectively in the skin which causes rapid correction of the defect by neighboring keratinocytes resulting in less downtime and less complications.<sup>66</sup>

Intense pulsed light : It works in millisecond pulse duration. The thermal relaxation time in dermal melanosomes is in nanosecond range, hence this laser provides improvement of epidermal type of melasma and not dermal type. The disruption of epidermis can cause post inflammatory hyperpigmentation.<sup>67,68</sup>

Others : fractional thulium fiber 1927nm, pulsed dye laser etc. are also other types of lasers used in the treatment of melasma.<sup>51</sup>

## MATERIALS AND METHODOLOGY

- Study source: This study was conducted in the Department of Dermatology, Venereology and Leprosy, in tertiary care hospital, Belgaum as a part of the MD academic curriculum.
- Study duration: The study was conducted between 1<sup>st</sup> January 2020 to 31<sup>st</sup> December 2020
- **Ethical clearance:** Clearance was taken from the Ethical Committee of the institute.
- **Study design:** Hospital based cross sectional study.
- **Sample size:** Cochran's formula was used for sample size calculation which is given by,

$$n = \frac{Z_{1-\alpha/2}^2 * p(1-p)}{r^2}$$

Where  $Z_{1-\alpha/2}^2 = 1.645$  for 90% Confidence interval, p is prevalence and r = relative precision (20% of prevalence) = 0.06.

From Hospital data, melasma was noticed in an average of 11 cases among an average 38 cases of facial hypermelanosis per month. Hence, melasma prevalence in facial hypermelanosis subjects was calculated to be 28.95%.

$$n = \frac{(1.645)^2 * (0.2895) * (1 - 0.2895)}{(0.06)^2} = 155.55$$

$\approx 156$

So a minimum of 156 samples were required for the study.

- Hence, a total number of 160 patients with melasma were taken into the study.
- **Sample selection criteria:**

All patients with clinically diagnosed cases of melasma attending KLE'S Dr Prabhakar Kore Hospital and Medical Research Centre, Belagavi were recruited.
- **Inclusion criteria:**
  - All patients regardless of age and sex, with clinical examination suggestive of melasma as diagnosed by the dermatologists.
- **Exclusion criteria:**
  - Non consenting patients.
  - Exclusion of cases suspicious of other facial hypermelanosis.
  - Received any treatment for the condition in the past 3 months.
- **Data collection:**
  - Informed consent was taken from all the study patients.
  - All the study subjects were made to go through a detailed history taking, general physical, systemic and dermatological examination.
  - Data was collected by a single examiner and recorded in case record proforma.
  - All participants underwent clinical, Wood's lamp and dermoscopic examination (Dinolite premier AM4113ZT model, under 50X magnification) with findings being noted along with recording of both clinical and dermoscopic images.
  - Records were maintained and analyzed statistically

- **Statistical Method for Data Analysis:**

- The data was analyzed using statistical software R version 4.0.2 and Microsoft Excel.
- Continuous variables were depicted by mean  $\pm$  sd/median (range) and categorical variables by frequency.
- To check the association between categorical variables, Chi-square test was used.
- To check the consensus between two methods Cohen's Kappa was used.
- P-value lesser than or equal to 0.05 indicated statistical significance.

## RESULTS

In our study, a total of 160 subjects were enrolled. Out of them, 32 were males and 128 were females with female to male ratio of 4:1. The average age of presentation was  $35.64 \pm 7.86$  years. Below table gives the summary of the variables. Minimum age observed in the sample was 19 years and maximum observed was 66 years. Minimum and maximum duration of symptoms observed was one month and 20 years respectively.

**Table 1: Summary of variables.**

Variables	Sub-category	Number of subjects (%)
Age (in years)	$\leq 20$	3 (1.88%)
	21-30	43 (26.88%)
	31-40	81 (50.63%)
	41-50	27 (16.88%)
	51-60	4 (2.5%)
	$> 60$	2 (1.25%)
Age (in years)	$35.64 \pm 7.86$	35 (19, 66)
Gender	Female	128 (80%)
	Male	32 (20%)
Duration of symptoms (in years)	$\leq 5$	140 (87.5%)
	5-10	19 (11.88%)
	$> 10$	1 (0.63%)
Duration of symptoms	$2.27 \pm 2.34$	2 years (1 month, 20 years)
Site	Malar, Nose	68 (42.5%)
	Malar	33 (20.63%)
	Malar, Nose, Forehead	14 (8.75%)
	Nose	7 (4.38%)
	Malar, Nose, Upperlip	7 (4.38%)

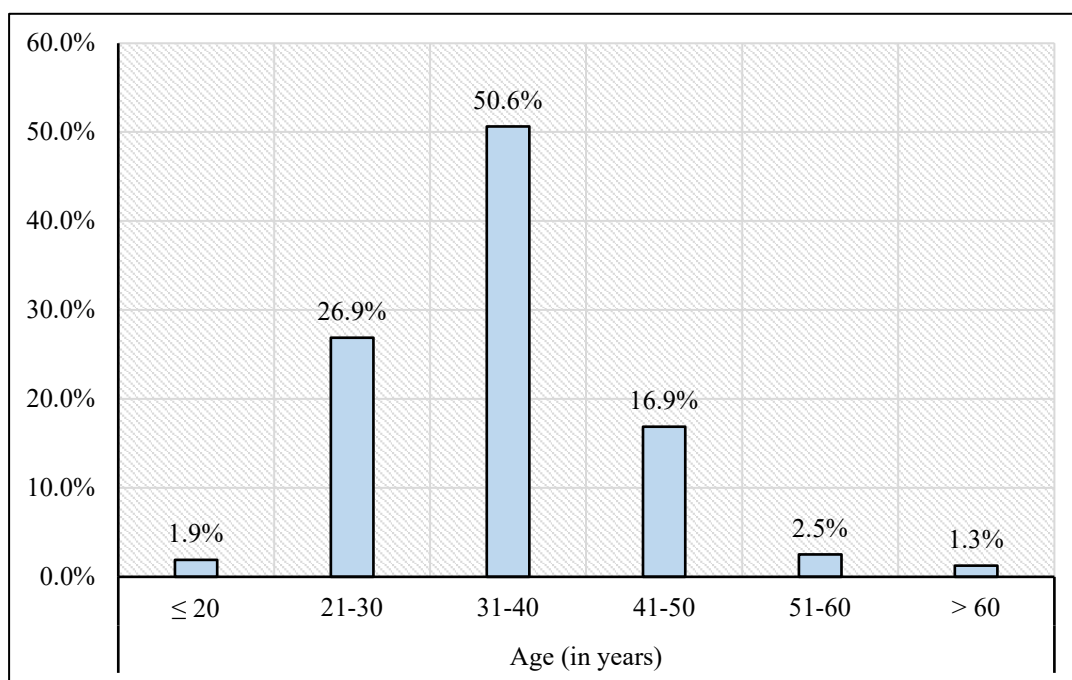
<b>Site (contd.)</b>	Malar, Nose, Forehead, Upperlip	7 (4.38%)
	Malar, Nose, Upper Lip	7 (4.38%)
	Malar, Forehead Forehead	3 (1.88%)
	Malar, Nose, Upper Lip, Forehead	3 (1.88%)
	Malar, Nose, Chin	3 (1.88%)
	Malar, Nose, Upper Lip, Chin	2 (1.25%)
	Malar, Nose, Forehead, Upperlip, Chin	1 (0.63%)
	Malar, Nose, Upper Lip, Forehead, Chin	1 (0.63%)
	Malar, Nose, Chin, Forehead	1 (0.63%)
	Malar, Upperlip, Chin	1 (0.63%)
	Malar, Nose, Chin, Upperlip, Nose, Upperlip	1 (0.63%)
	<b>Color</b>	DB
LB		40 (25%)
DB, BG		24 (15%)
<b>Type based on distribution</b>	Malar	102 (63.75%)
	Centrofacial	58 (36.25%)
<b>Clinical Impression</b>	Mixed	98 (61.25%)
	Epidermal	40 (25%)
	Dermal	22 (13.75%)
<b>Woods Lamp Impression</b>	Mixed	79 (49.38%)
	Epidermal	42 (26.25%)
	Dermal	39 (24.38%)
<b>Dermoscopic Impression</b>	Mixed	91 (56.88%)
	Dermal	41 (25.63%)
	Epidermal	28 (17.5%)

(DB : dark brown; BG : brown grey; LB : light brown)

Below plots visualize the above table.

**1. Age distribution**

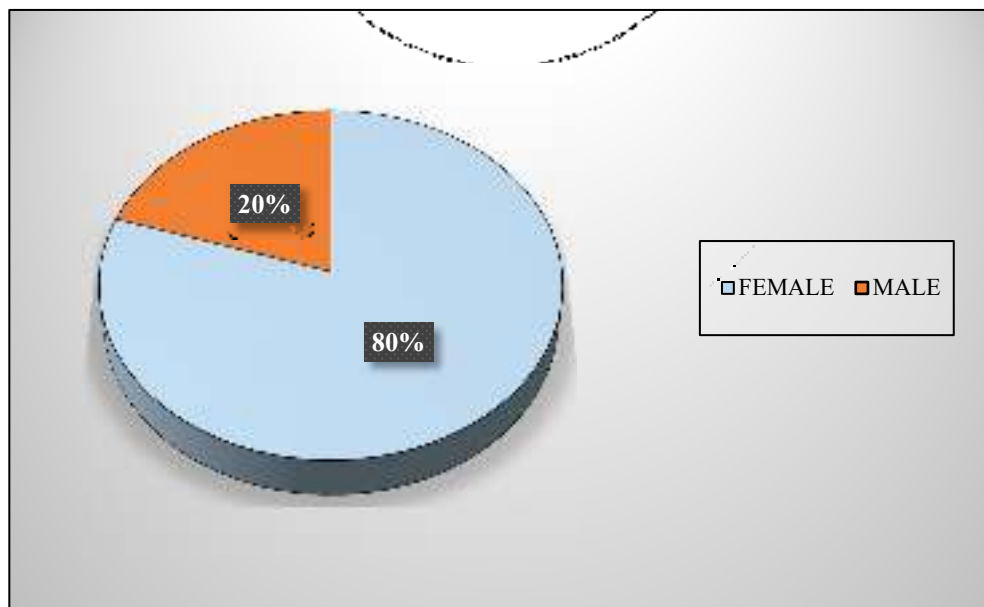
Out of 160 patients of melasma, majority of them i.e., 50.6% (n=81) were in the age group of 31-40 years. 26.9% (n=43) of them were between 21-30 years. This was followed by 16.9% (n=27) belonging to age group of 41-50 years. 2.5% (n=4) were in 51-60 years age group. 1.9% (n=3) were below or equal to 20 years and 1.3% (n=2) patients aged more than 60 years.



**Figure 1: Distribution of subjects by age.**

**2. Gender distribution :**

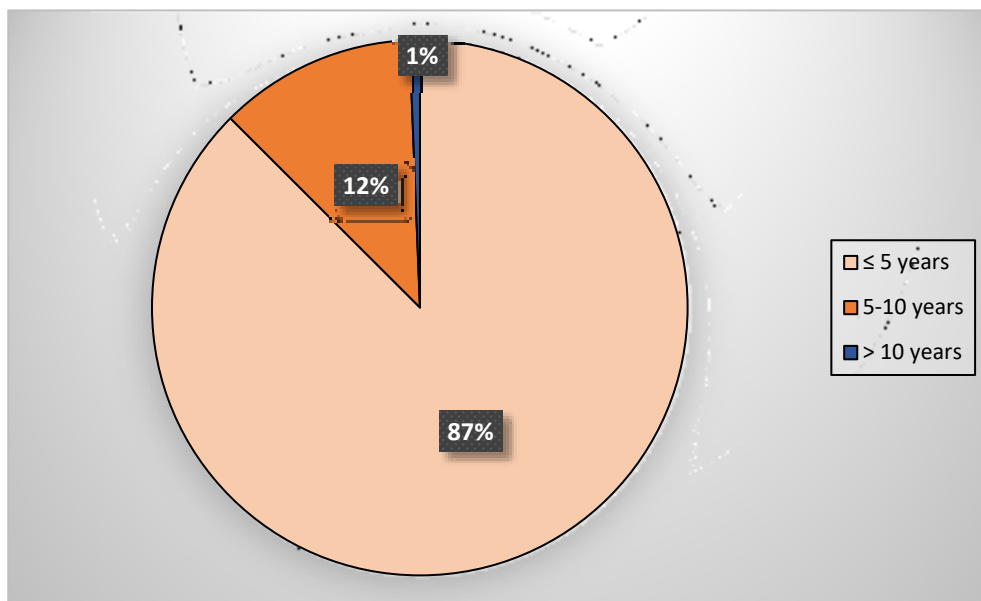
There was a female predominance seen i.e, 80% (n=128) of the study population were females and the remaining 20% (n=32) were males.



**Figure 2: Distribution of subjects by gender.**

**3. Distribution of the subjects by duration of symptoms :**

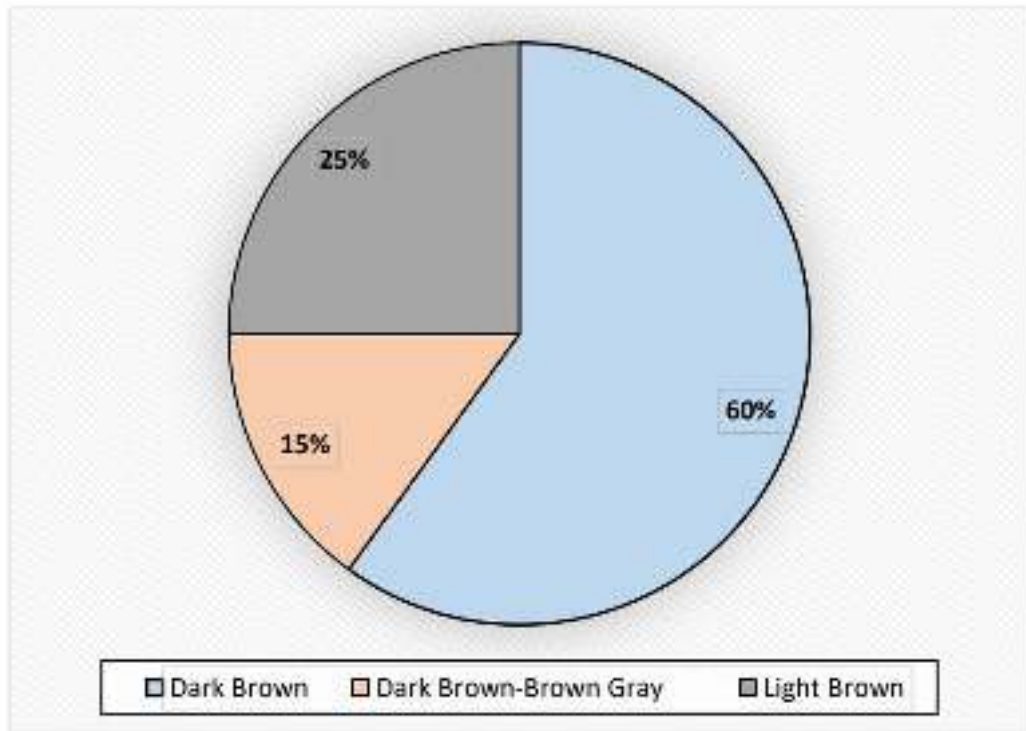
According to the study, symptoms in majority, i.e, 87% (n=140) of them were less than five years. 12% (n=19) of them had onset of the symptoms ranging between 5-10 years. Only 1% (n=1) had symptoms lasting for more than ten years. Mean duration of onset was 2.27 years with standard deviation of 2.34 years. Minimum and maximum duration of symptoms observed were one month and 20 years respectively.



**Figure 3: Distribution of the subjects by duration of symptoms in years.**

**4. Distribution of the subjects by color of the lesion :**

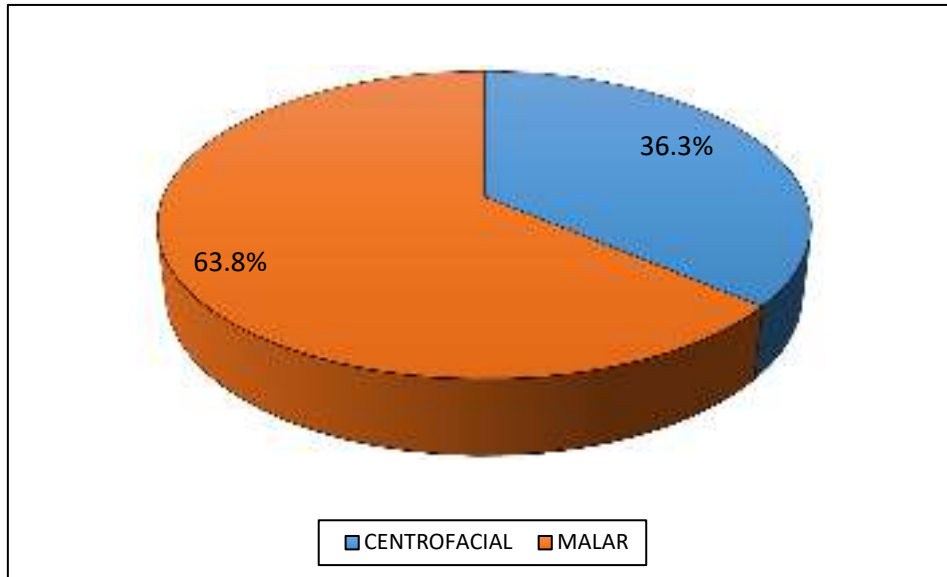
On clinical examination, dark brown color could be appreciated in 60% (n=96) of the patients. In 25% (n=40) the lesions were light brown in color. In 15% (n=24) a dark brown - brown grey pigment could be appreciated.



**Figure 4: Distribution of subjects by color of the lesion**

**5. Type of melasma based on location of the pigment :**

Majority of the study subjects i.e, 63.8% (n=102) had malar melasma. 36.3% (n=58) of them had centrofacial melasma.



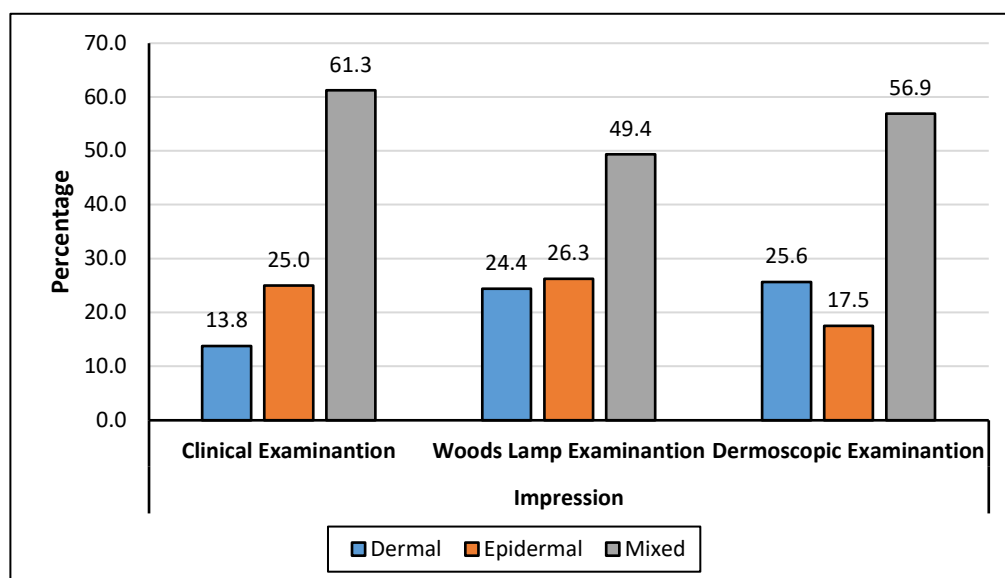
**Figure 5: Distribution of subjects by type of melasma based on distribution.**

## 6. Distribution based on clinical examination, Wood's lamp examination and dermoscopic examination :

On clinical examination, out of 160 patients, 61.3% (n=98) had dark brown color, suggestive of mixed type of melasma; light brown color was seen in 25% (n=40) indicative of epidermal type of melasma; 13.8% (n=22) had dark brown to brown gray color which was suggestive of dermal type of melasma.

On Wood's lamp examination, 49.4% (n=79) showed accentuation in few areas of the lesions suggestive of mixed type of melasma, 26.3% (n=42) showed accentuation in all areas suggestive of epidermal type of melasma and 24.4% (n=39) of them did not show any accentuation suggestive of dermal type of melasma.

On dermoscopic examination, 56.9% (n=91) showed features suggestive of mixed melasma, 25.6% (n=41) had dermal melasma and 17.5% (n=28) had epidermal melasma.



**Figure 6: Distribution of subjects based on clinical examination, Wood's lamp examination, dermoscopic examination.**

**7. Comparison between the color of lesion as per different methods of examination**

On clinical examination, patients with dark brown color were classified as mixed type of melasma, patients with light brown color were classified into epidermal type and those with dark brown-brown gray color were classified as dermal type of melasma.

On comparison of findings of Wood's lamp examination and dermoscopic examination, majority of the patients with dark brown (DB), light brown (LB) and dark brown-brown gray (DB-BG) color had features suggestive of mixed, epidermal and dermal type respectively.

This suggested significant association present between color of lesion with the diagnosis made by Chi-square test.

**Table 2: Comparison of color of skin lesions with diagnosis across different methods of examination.**

		Color			p-value
		DB	DB, BG	LB	
<b>Clinical examination</b>	Dermal	0 (0%)	22 (91.7%)	0 (0%)	0.00004998* <sup>MC</sup>
	Epidermal	0 (0%)	0 (0%)	40 (100%)	
	Mixed	96 (100%)	2 (8.3%)	0 (0%)	
<b>Woods Lamp examination</b>	Dermal	19 (19.79%)	15 (62.5%)	5 (12.5%)	0.00004998* <sup>MC</sup>
	Epidermal	15 (15.63%)	3 (12.5%)	24 (60%)	
	Mixed	62 (64.58%)	6 (25%)	11 (27.5%)	
<b>Dermoscopic examination</b>	Dermal	16 (16.67%)	23 (95.83%)	2 (5%)	0.00004998* <sup>MC</sup>
	Epidermal	4 (4.17%)	0 (0%)	24 (60%)	
	Mixed	76 (79.17%)	1 (4.17%)	14 (35%)	

*Abbreviations: MC: Monte-Carlo's simulation used in Chi-square test; DB : Dark Brown, LB : Light brown, DB-BG : Dark Brown-Brown gray.*

Below plot visualizes the above table.

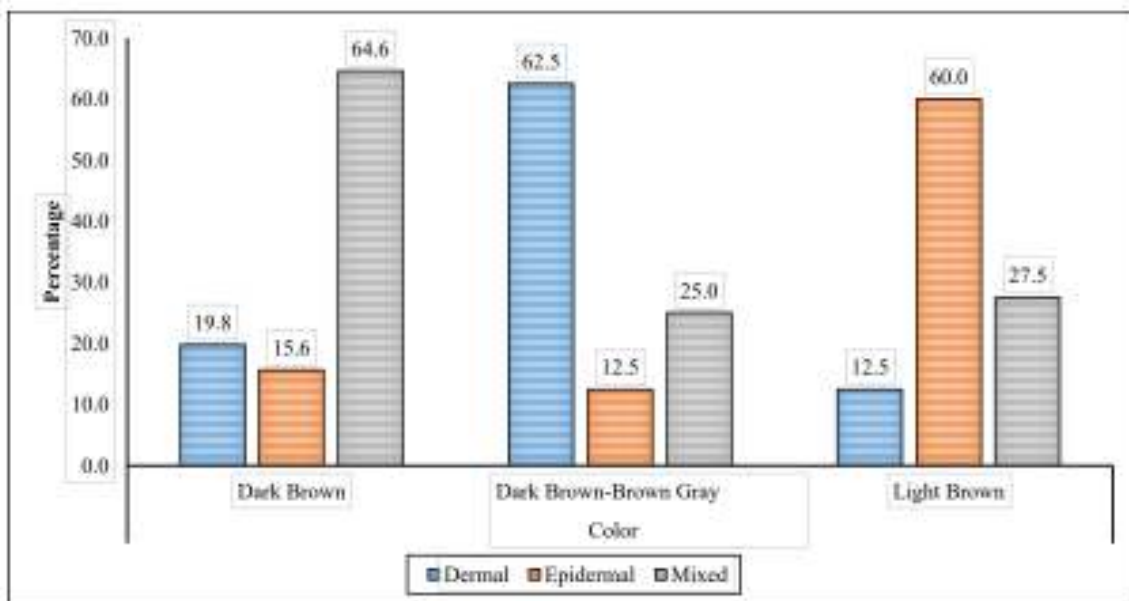


Figure 7: Comparison between the color of lesion with Wood's lamp examination findings

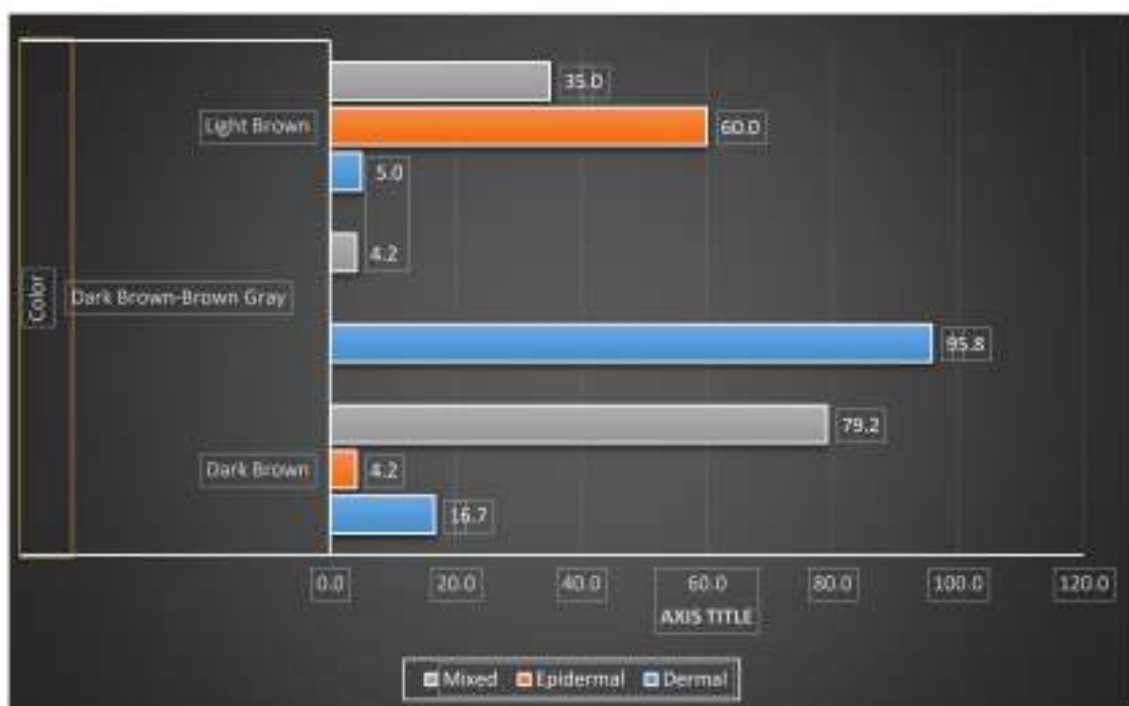


Figure 8: Comparison between the color of lesion and type of melasma on dermoscopy.

**Dermoscopic findings in different types of melasma**

On examination with dermoscopy, epidermal type of melasma had light brown pigment network in 100% (n=28) of the cases, dark brown pigment network in 46.43% (n=13) of the cases. Only 3.57% (n=1) of the patients showed pseudoglobular pattern. 100% (n=28) of them had perifollicular sparing. Vascular features such as erythema was seen in 35.71% (n=10) and telangiectasia was seen in 21.43% (n=6) of the cases.

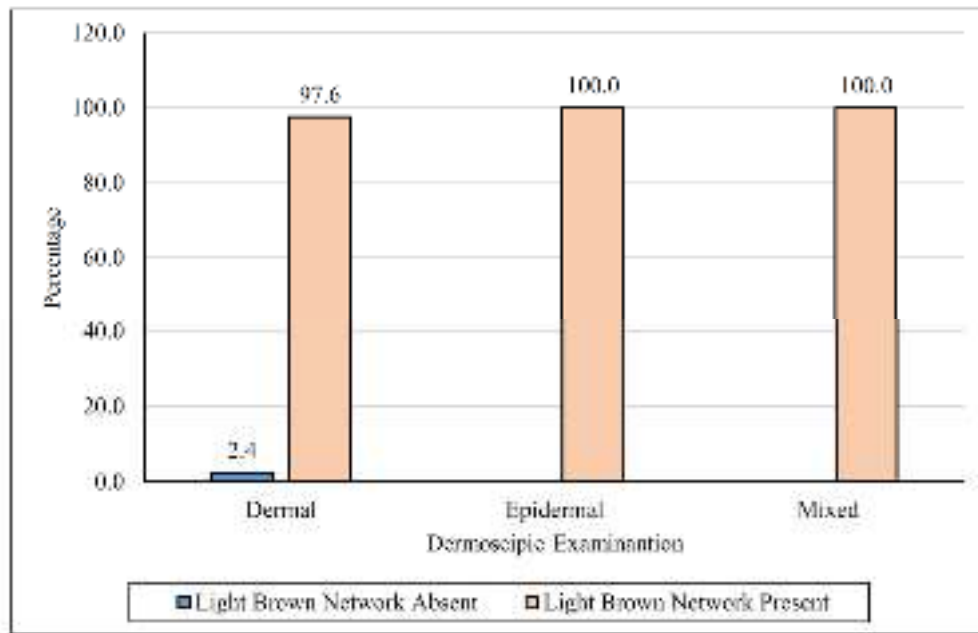
Dermal type of melasma showed light brown pigment network in 97.56% (n=40) cases, dark brown network 100% (n=41) cases and grey brown network 90.24% (n=37) cases. Pseudoglobular pattern was seen in 90.24% (n=37) of the patients. Perifollicular arciform pattern was seen in 100% (n=41) of them, whereas complete perifollicular hyperpigmentation was seen in 97.56% (n=40) of the patients. Erythema and telangiectasias were seen in 65.85% (n=27) and 24.39% (n=10) of the patients respectively.

On dermoscopic examination, mixed type of melasma showed light brown and dark brown network in 100% (n=91) of the cases. 74.73% (n=68) of the patients showed pseudoglobular pattern. Perifollicular sparing and perifollicular arciform pattern was seen in 92.31% (n=84) and 98.9% (n=90) of the cases. Vascular involvement in the form erythema and telangiectasia was seen in 49.45% (n=45) and 27.47% (n=25) of the cases.

Table 3: Dermoscopic findings in different types of melasma

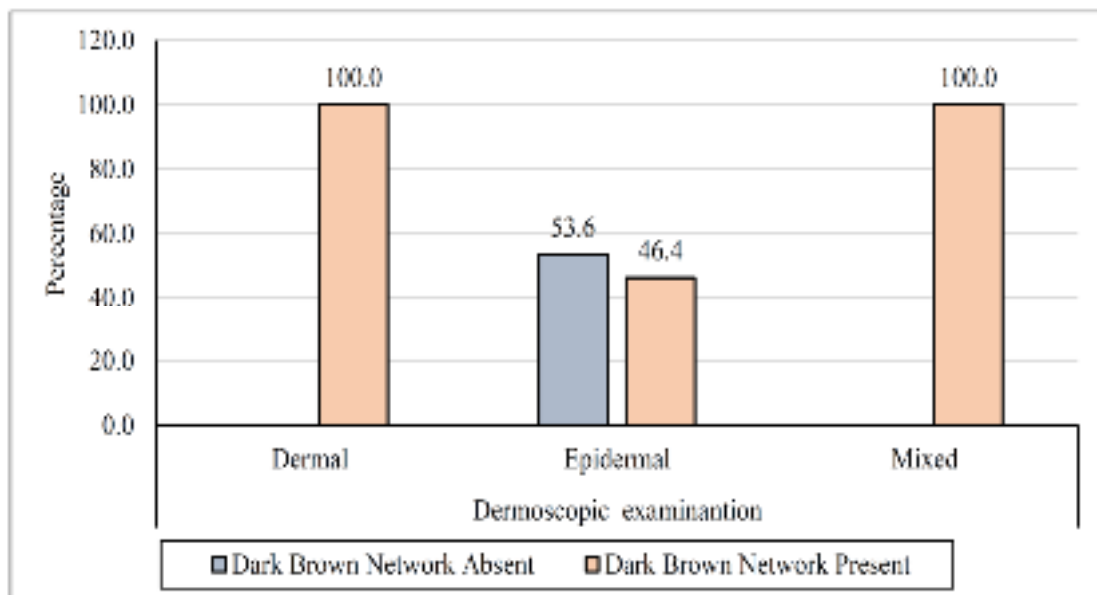
		Dermoscopic examination			p-value
		Dermal	Epidermal	Mixed	
<b>Light Brown Network</b>	Absent	1 (2.44%)	0 (0%)	0 (0%)	0.4223 <sup>MC</sup>
	Present	40 (97.56%)	28 (100%)	91 (100%)	
<b>Dark Brown Network</b>	Absent	(0%)	15 (53.57%)	0 (0%)	0.0004998* <sup>MC</sup>
	Present	41 (100%)	13 (46.43%)	91 (100%)	
<b>Brown Grey Brown Network</b>	Absent	4 (9.76%)	28 (100%)	90 (98.9%)	0.0004998* <sup>MC</sup>
	Present	37 (90.24%)	0 (0%)	1 (1.1%)	
<b>Pseudoglobular Pattern</b>	Absent	4 (9.76%)	27 (96.43%)	23 (25.27%)	0.0004998* <sup>MC</sup>
	Present	37 (90.24%)	1 (3.57%)	68 (74.73%)	
<b>Perifollicular Sparing</b>	Absent	40 (97.56%)	0 (0%)	7 (7.69%)	0.0004998* <sup>MC</sup>
	Present	1 (2.44%)	28 (100%)	84 (92.31%)	
<b>Perifollicular Hyperpigmentation</b>	Absent	1 (2.44%)	28 (100%)	76 (83.52%)	0.0004998* <sup>MC</sup>
	Present	40 (97.56%)	0 (0%)	15 (16.48%)	
<b>Perifollicular Arciform pattern</b>	Absent	0 (0%)	28 (100%)	1 (1.1%)	0.0004998* <sup>MC</sup>
	Present	41 (100%)	0 (0%)	90 (98.9%)	
<b>Erythema</b>	Absent	14 (34.15%)	18 (64.29%)	46 (50.55%)	0.04098* <sup>MC</sup>
	Present	27 (65.85%)	10 (35.71%)	45 (49.45%)	
<b>Telangiectasia</b>	Absent	31 (75.61%)	22 (78.57%)	66 (72.53%)	0.7967
	Present	10 (24.39%)	6 (21.43%)	25 (27.47%)	

Abbreviations: MC: Monte-Carlo's simulation used in Chi-square test.



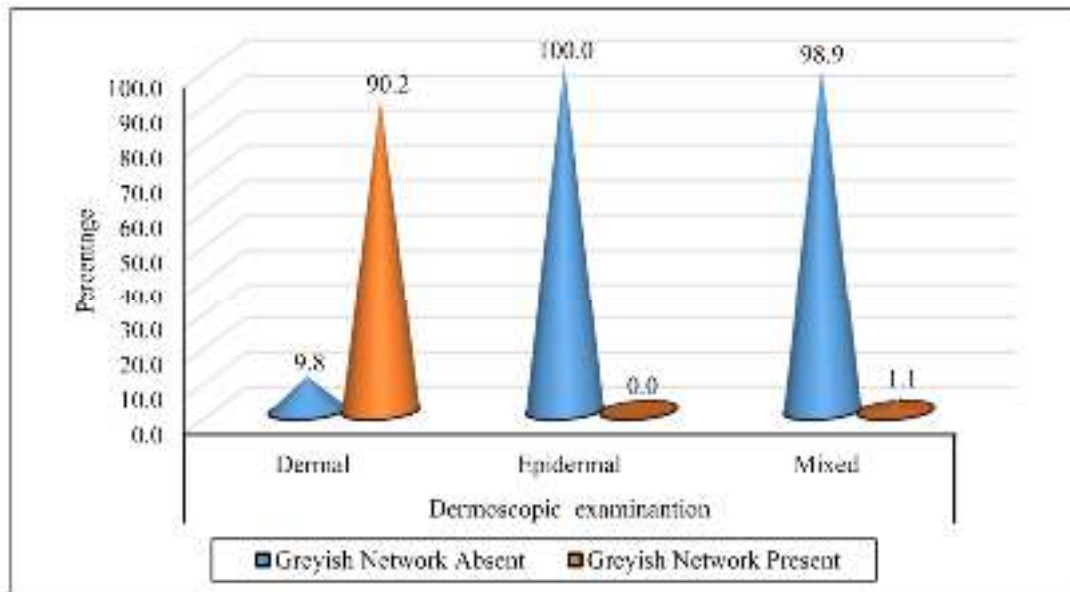
**Figure 9: Distribution of subjects by light brown pigment network on dermoscopic examination.**

Above figure depicts the percentage of light brown pigment in 97.6% (n=40) cases of dermal melasma and 100% cases of epidermal (n=28) and mixed type (n=91) of melasma.



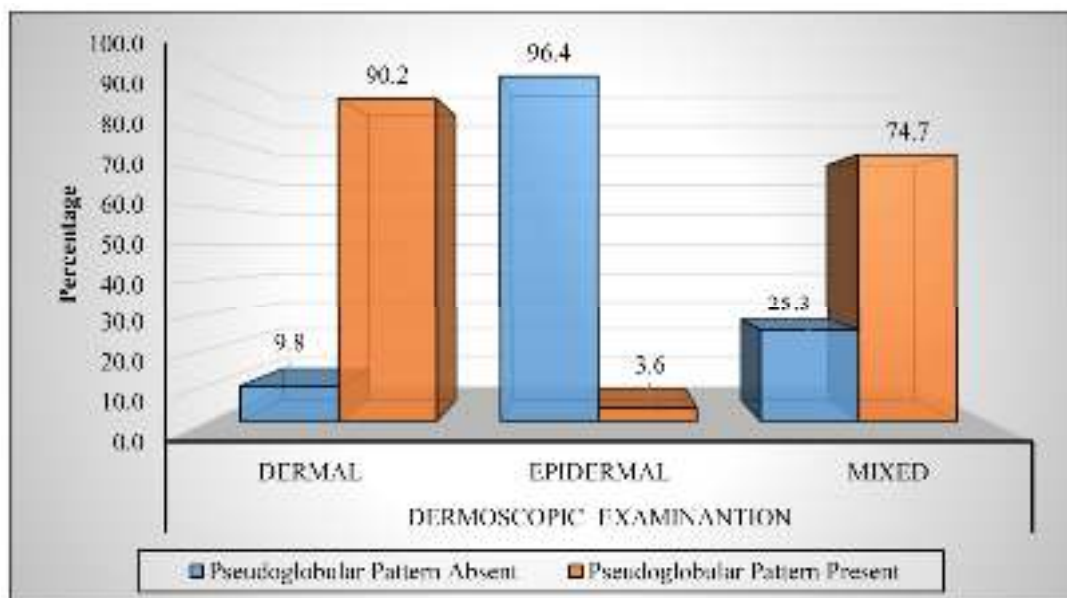
**Figure 10: Distribution of subjects by dark brown pigment network on dermoscopic examination.**

Above figure shows dark brown pigment in 100% of the cases of dermal melasma, 46.4% cases of epidermal type and 100% cases of mixed type of melasma.



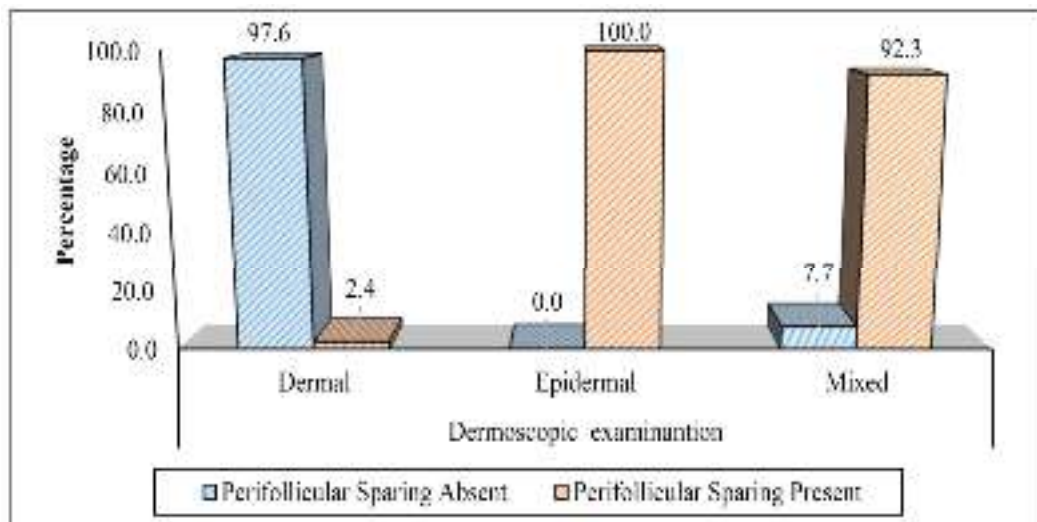
**Figure 11: Distribution of subjects by greyish network on dermoscopic examination.**

Above graph depicting presence of greyish network in 90.2% of cases of dermal type of melasma, 1.1% cases of mixed type and no cases of epidermal type of melasma.



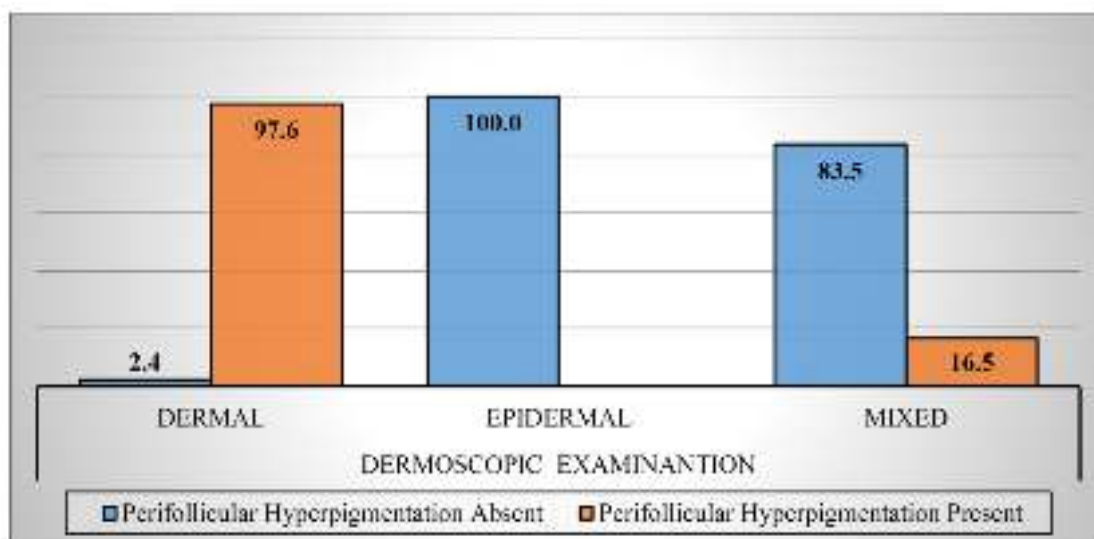
**Figure 12: Distribution of subjects by pseudoglobular pattern on dermoscopic examination.**

Here we see graph depicting percentage of cases with pseudoglobular appearance which was seen 90.2% of dermal type, 3.6% of epidermal type and 74.7% of mixed type of melasma.



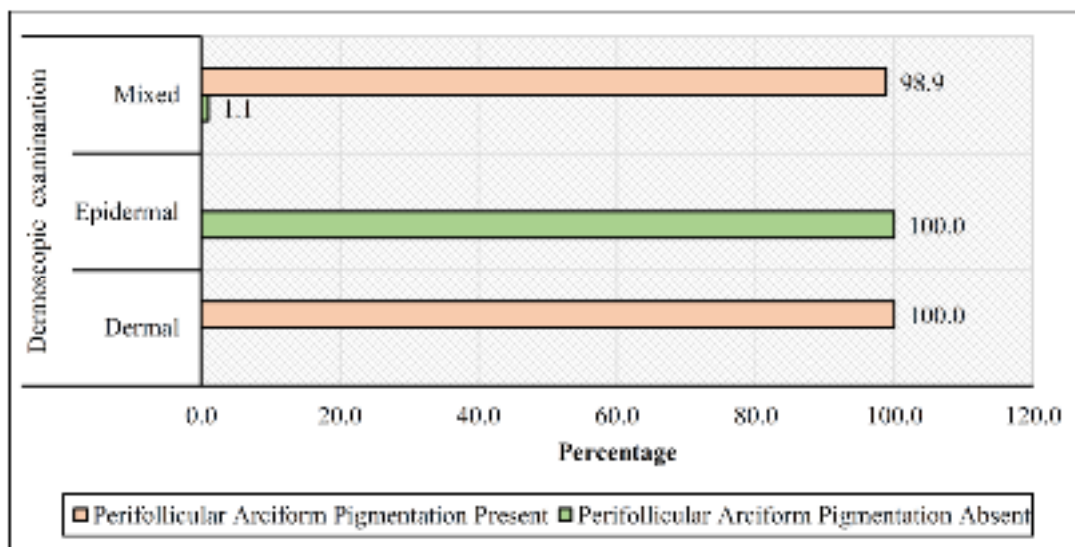
**Figure 13: Distribution of subjects by perifollicular sparing on dermoscopic examination.**

Perifollicular sparing was seen in 2.4% cases of dermal type, all cases (100%) of epidermal type and 92.3% cases of mixed type of melasma.



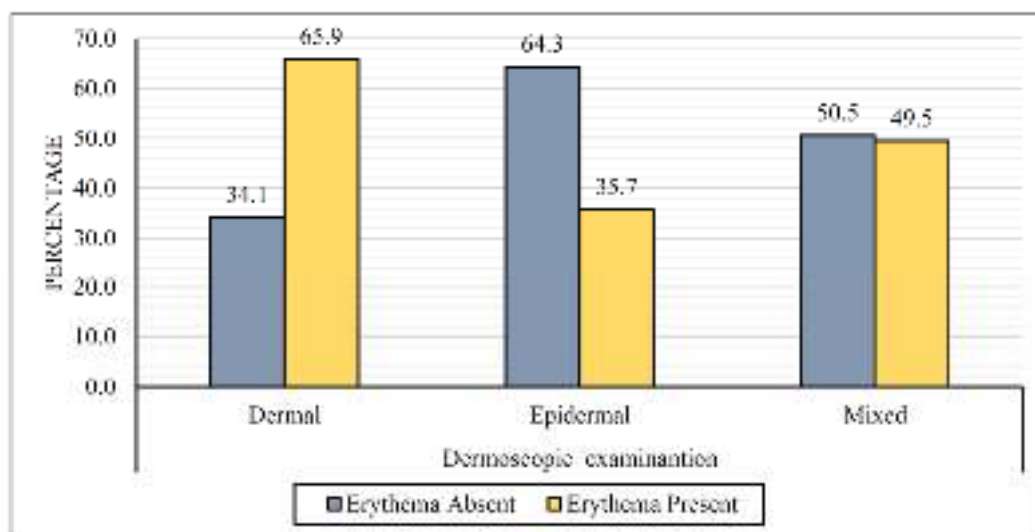
**Figure 14: Distribution of subjects by perifollicular hyperpigmentation on dermoscopic examination.**

Perifollicular hyperpigmentation was seen in 97.6% cases of dermal type, 16.5% cases of mixed type and no cases of epidermal type of melasma.



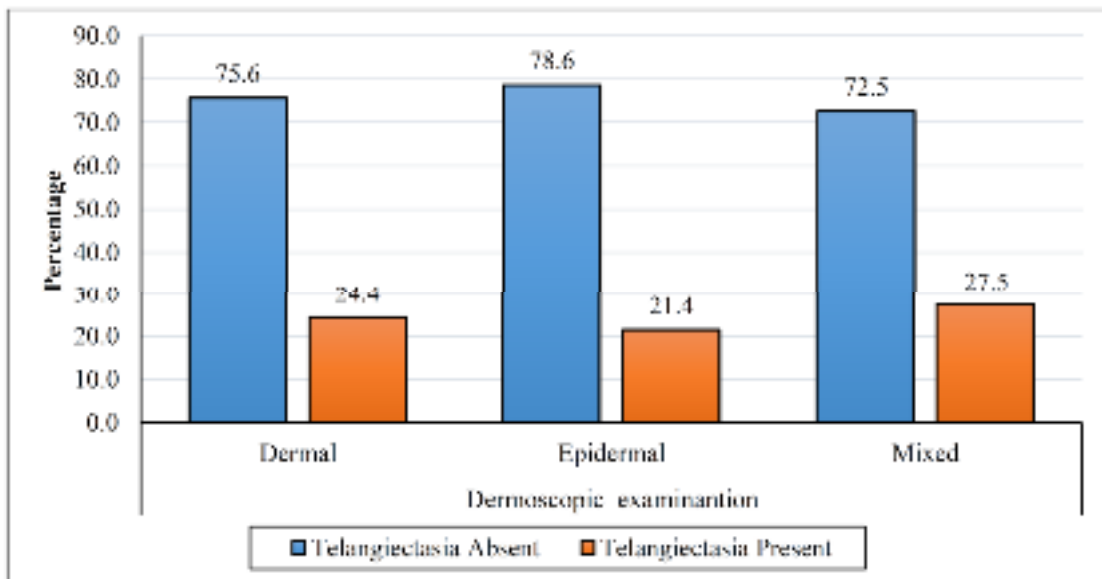
**Figure 15: Distribution of subjects by perifollicular arciform pigmentation on dermoscopic examination.**

Graph depicting perifollicular arciform pattern of pigmentation in 98.9% cases of mixed type, all cases (100%) of dermal type and none in epidermal type of melasma



**Figure 16: Distribution of subjects by erythema on dermoscopic examination.**

Erythema was seen in 65.9% cases of dermal type, 35.7% cases of epidermal type and 49.5% cases of mixed type of melasma.



**Figure 17: Distribution of subjects by telangiectasia on dermoscopic examination.**

Above diagram shows telangiectasia present in 24.4% cases of dermal type, 21.4% cases of epidermal type and 27.5% cases of mixed type of melasma.

**8. Agreement of Woods lamp examination and dermoscopic examination with clinical examination :**

As shown by the below table, 13 (8.13%), 24 (15%) and 62 (38.75%) patients were classified as dermal, epidermal and mixed in both Woods lamp examination and clinical examination respectively. Agreement between Woods lamp impression and clinical impression was 61.87%. By Cohen’s Kappa there was a fair agreement present between clinical impression and woods lamp.

Similarly, 21 (13.13%), 24 (15%) and 76 (47.5%) patients were classified into dermal, epidermal and mixed according to dermoscopic examination and clinical examination respectively. Agreement between dermoscopic impression and clinical impression was 75.62%. By Cohen’s Kappa there was a moderate agreement present between clinical impression and dermoscopic impression.

**Table 4: Agreement between Woods lamp examination and dermoscopic examination with clinical examination.**

		Clinical examination			Kappa Statistic	p-value
		Dermal	Epidermal	Mixed		
<b>Woods Lamp examination</b>	Dermal	13 (8.13%)	5 (3.13%)	21 (13.13%)	0.3629	<0.00001*
	Epidermal	3 (1.88%)	24 (15%)	15 (9.38%)		
	Mixed	6 (3.75%)	11 (6.88%)	62 (38.75%)		
<b>Dermoscopic examination</b>	Dermal	21 (13.13%)	2 (1.25%)	18 (11.25%)	0.5774	<0.00001*
	Epidermal	0 (0%)	24 (15%)	4 (2.5%)		
	Mixed	1(0.63%)	14 (8.75%)	76 (47.5%)		

**9. Agreement between Wood's lamp examination and dermoscopic examination:**

From the below table, 28 (17.5%), 25 (15.63%) and 69 (43.13%) patients were classified into dermal, epidermal and mixed in both Wood's lamp examination and dermoscopic examination respectively. Agreement between Wood's lamp examination and dermoscopic examination was 76.25%. By Cohen's Kappa a substantial agreement was present between dermoscopic and Wood's lamp examination.

**Table 5: Agreement between Wood’s lamp examination and dermoscopic examination.**

		Woods Lamp examination			Kappa Statistic	p-value
		Dermal	Epidermal	Mixed		
Dermoscopic examination	Dermal	28 (17.5%)	3 (1.88%)	10 (6.25%)	0.6112	<0.00001*
	Epidermal	3 (1.88%)	25 (15.63%)	0 (0%)		
	Mixed	8 (5%)	14 (8.75%)	69 (43.13%)		

Below table gives the interpretation of Kappa Statistic value for agreement between two methods.

**Table 6: Interpretation of Kappa statistic value for agreement between two methods**

Kappa Statistic value	Agreement between methods
< 0	No agreement
0 – 0.2	Slight agreement
0.21 – 0.4	Fair agreement
0.41 – 0.6	Moderate agreement
0.61 – 0.8	Substantial agreement
0.81 – 1.0	Perfect agreement

**10. Comparison between clinical examination and Wood’s lamp examination :**

On comparison of clinical examination with Wood’s lamp examination, 62 cases were correctly identified as mixed type of melasma, hence the sensitivity of clinical examination was 78.5% and specificity was 55.5%.

In case of epidermal type of melasma, 24 cases were rightly identified as epidermal type resulting in 57.1% sensitivity and 86.4% specificity.

In dermal type of melasma, sensitivity of clinical examination was 33.3% and specificity was 92.6% when compared to the Wood’s lamp examination.

Accuracy of clinical examination in the diagnosis of mixed, epidermal and dermal type of melasma were. 66.8%, 78.7% and 78.1% respectively.

**Table 7: Sensitivity and specificity of clinical impression versus Wood’s lamp impression**

		Woods Lamp Examination					
		Dermal		Epidermal		Mixed	
		Present	Absent	Present	Absent	Present	Absent
Clinical Examination	Present	13	9	24	16	62	36
	Absent	26	112	18	102	17	45
Sensitivity		33.3%		57.1%		78.5%	
Specificity		92.6%		86.4%		55.5%	
Positive predictive value		59%		60%		63%	
Negative predictive value		81%		85%		73%	
Accuracy		78.1%		78.7%		66.8%	
Area under Curve (AUC)		0.7013		0.725		0.6792	

### 11. Comparison of Dermoscopic impression with Woods Lamp Examination :

On comparing dermoscopic examination with Wood's lamp examination, dermoscopic examination could correctly identify 69 cases of mixed type of melasma resulting in 87.3% sensitivity and 72.8% specificity.

In epidermal type of melasma, 25 cases were rightly diagnosed by dermoscopic examination, sensitivity and specificity were 59.5% and 97.4% respectively.

28 cases were accurately diagnosed as dermal type of melasma and hence the sensitivity and specificity were 71.8% and 89.5% respectively.

Accuracy of dermoscopic examination in the diagnosis of mixed, epidermal and dermal type of melasma were 80%, 87.5% and 85% respectively.

**Table 8: Sensitivity and specificity of dermoscopic impression versus Wood's lamp impression**

		Woods Lamp Examination					
		Dermal		Epidermal		Mixed	
		Present	Absent	Present	Absent	Present	Absent
Dermoscopic Examination	Present	28	13	25	3	69	22
	Absent	11	108	17	115	10	59
Sensitivity		71.8%		59.5%		87.3%	
Specificity		89.5%		97.4%		72.8%	
Positive predictive value		68%		60%		76%	
Negative predictive value		91%		97%		86%	
Accuracy		85%		87.5%		80%	
Area under Curve (AUC)		0.7952		0.882		0.8067	

## **DISCUSSION**

Our study was a hospital based cross sectional study conducted over a period of 12 months from January 2020 to December 2020 in the department of Dermatology, Venereology and Leprosy, KLE's Dr Prabhakar Kore Hospital and Medical Research Centre, Belagavi.

A total of 160 patients clinically diagnosed as melasma, who satisfied the inclusion and exclusion criteria were included in the study. After obtaining their consent, all the patients were made to undergo clinical, Wood's lamp and dermoscopic examination (Dino-Lite Premier AM4113ZT dermoscope). Appropriate photographs of the patients were taken. After compiling these records, the data was analyzed.

Patients belonging to diverse age groups with different types of melasma were studied. Out of them, melasma was seen in an age group ranged from 19-66 years with average age being  $35.64 \pm 7.86$  years. This was near similar to the study conducted by Manjunath K G et al.<sup>2</sup> where average age of onset was 39.133 years.

There was a female predominance observed in our study, i.e, out of 160 patients, there were 128 females and 32 males (female to male ratio of 4:1). This was found to be consistent to the study made by Najundaswamy et al,<sup>1</sup> and Jagannathan et al.<sup>9</sup> who also had female predominance with 4:1 female to male ratio. Female predominance of about 87.5% (n=70) was seen in a study conducted by Dharni et al.<sup>4</sup>

In our study, majority (87.5%, n=140) of the patients had onset of melasma less than five years when they first consulted, whereas according to the study

conducted by Jagannathan et al.<sup>9</sup> most patients sought therapy after 6.43 years respectively following its onset.

Depending upon the distribution of the pigment, our study showed that majority (63.8%; n=102) of the subjects had malar type of melasma, followed by centrofacial melasma (36.3%; n=58). There were no documented cases of mandibular type of melasma. This was in accordance with other studies made in south India by Nanjundaswamy et al.<sup>1</sup> Manjunath K G et al.<sup>2</sup> and Jagannathan et al.<sup>9</sup> where malar melasma was more commonly encountered than centrofacial type of melasma. However, according to Dharni et al.<sup>4</sup> who conducted the study in central India found that centrofacial type (47.5%, n=38) was commoner than malar type (38.75%, n=31), with few having mandibular type of melasma (13.75%, n=11). This may be due to differences in the region or environment.

On clinical examination, we observed that dark brown pigment, which was classified as mixed type of melasma was seen in the majority, i.e. 61.25% (n=98) of the patients. This was followed by epidermal type of melasma, seen as uniform light brown pigmentation in 25% (n=40) patients and dermal type, appreciated as dark brown-brownish gray color in 13.75% (n=22) of the patients. Similar classification was employed by Manjunath K G et al.<sup>2</sup> and Victor et al.<sup>69</sup>

Wood's lamp examination of melasma patients in our study showed 49.38% (n=79) cases of mixed type of melasma which was seen as accentuation of few areas of lesions, 26.25% (n=42) cases of epidermal melasma identified as accentuation of entire lesion, and 24.38% (n=39) cases of dermal type of melasma in which there was no accentuation of the lesions. This however differed from the study conducted by Manjunath K G et al.<sup>2</sup> where dermal type (54%) was more common followed by

epidermal (38%) and mixed type (8%) respectively. Study by Dharni et al.<sup>4</sup> showed that epidermal type of melasma (48.75%) was more commonly seen than dermal (45%) and mixed type (6.25%) of melasma.

On dermoscopic examination, findings such as light brown pigment network, perifollicular sparing were considered for classifying melasma into epidermal type, which was seen in 17.5% (n=28) patients. For analyzing dermal type of melasma, greyish brown pigmentation, perifollicular hyperpigmentation, perifollicular arciform pattern, erythema and telangiectasias were considered, and this was seen in 25.63% (n=41) patients. A combination of both epidermal and dermal type of melasma were classified into mixed type of melasma, which was seen in the majority of the patients (56.88%, n=91). It varied from the study conducted by Manjunath K G et al.<sup>2</sup> where dermal type (46%) was more frequently seen followed by epidermal (36%) and mixed type (18%) of melasma and from study conducted by Dharni et al.<sup>4</sup> which had epidermal type(57.5%) as majority of cases followed by dermal (36.25%) and mixed types (6.25%) respectively.

In our study, we found that 38.75% (n=62), 15% (n=24) and 8.13% (n=13) patients belonged to mixed, epidermal and dermal type of melasma respectively on both Wood's lamp and clinical examination. The agreement between Wood's lamp and clinical examination was 61.87% and by Cohen's Kappa, there was fair agreement present between clinical and Wood's lamp examination. This was consistent with the study conducted by Nanjundaswamy et al.<sup>1</sup> where clinical examination showed significant association with Wood's lamp confirmed dermoscopic impression.

On dermoscopic examination and clinical examination, 47.5% (n=76), 15% (n=24) and 13.13% (n=21) patients were classified as mixed type, epidermal type and dermal type of melasma. The agreement between dermoscopic examination and clinical examination was found to be 75.62% and by Cohen's Kappa, there was a moderate agreement present between clinical impression and dermoscopic impression. This was in accordance with the study conducted by Nanjundaswamy et al.<sup>1</sup> where significant association was present between clinical and dermoscopic examination.

On Wood's lamp and dermoscopic examination, 43.13% (n=69), 17.5% (n=28) and 15.63% (n=25) of the patients belonged to mixed type, dermal type and epidermal type of melasma. The agreement between Wood's lamp examination and dermoscopic examination was found to be 76.25%, showing a substantial agreement present between Wood's lamp and dermoscopic examination on Cohen's Kappa. This was consistent with the study carried out by Manjunath K G et al.<sup>2</sup> and Dharni et al.<sup>4</sup> who also found substantial agreement between examination by Wood's lamp and dermoscopy. However, it differed from the study conducted by Tamler et al.<sup>70</sup> where the agreement between Wood's lamp and dermoscopic examination was found to be weak. This may be contributed by difference in the skin phototypes.

In our study, on comparing clinical examination with Wood's lamp examination, 62 cases were correctly identified as mixed type of melasma, therefore sensitivity and specificity of clinical examination were 78.5% and 55.5% respectively. In identifying epidermal type of melasma, 24 cases were rightly diagnosed, thus sensitivity and specificity were 57.1% and 86.4% respectively. For dermal type of

melasma, the sensitivity and specificity of clinical examination with respect to Wood;s lamp examination was 33.3% and 92.6% respectively.

Similarly, on comparing dermoscopic examination with that of Wood's lamp examination, sensitivity and specificity in rightly diagnosing mixed type (69 cases) of melasma were 87.3% and 72.8% respectively. In case of epidermal type of melasma, sensitivity and specificity of dermoscopic examination were 59.5% and 97.4% respectively. For dermal type of melasma, 28 cases were accurately diagnosed as dermal type of melasma and sensitivity and specificity were 71.8% and 89.5% respectively.

Altogether, the sensitivity and specificity of dermoscopy was unarguably high, hence making it an important prognostic tool in the assessment of melasma.

## **CONCLUSION**

The study included a total of 160 patients who were clinically diagnosed as melasma cases.

We noted a female predominance, with female to male ratio of 4:1. Most common age group affected was 31-40 years and the average age of presentation was  $35.64 \pm 7.86$  years.

In our study, malar type of melasma was seen in the majority (63.75%, n=102) of the patients, followed by centrofacial type of melasma (36.25%, n=58). We however did not encounter any cases of mandibular type of melasma. This may be due to racial or environmental differences.

On clinical examination, majority of the patients belonged to mixed type of melasma (61.25%, n=98) since they had dark brown pigment, it was followed by epidermal (25%, n=40) and dermal type (13.75%, n=22) of melasma, characterized by light brown and dark brown-brownish gray color respectively.

On Wood's lamp examination, most of the lesions (49.38%, n=79) showed accentuation in few areas and hence were classified into mixed type of melasma. This was followed by epidermal type of melasma (26.25%, n=42) which showed accentuation of the entire lesion, which was then followed by dermal type (24.38%, n=39) with no accentuation of the lesion.

On dermoscopic examination of the lesions, characteristic features such as light brown pigment network, perifollicular sparing with or without vascular features were considered to classify melasma into epidermal type. Features such as greyish

brown pigmentation, perifollicular hyperpigmentation, perifollicular arciform pattern, vascular features such as erythema and telangiectasias were considered to classify melasma into dermal type. A combination of both these features were taken in account to classify into mixed type of melasma. In our study we found that mixed type of melasma (56.88%, n=91) was more common, followed by epidermal (17.5%, n=28) and dermal type (25.63%, n=41) of melasma on dermoscopic examination.

Hence, from the above three methods, we found that mixed type of melasma was more common and it was followed by epidermal type and dermal type respectively.

Dermoscopy acts as a simple diagnostic tool which helps us to study subtle clinical pattern of skin lesions which cannot be seen by unaided eye. In melasma, it is useful in detecting early melasma changes. It also helps us to differentiate melasma from other causes of facial hyperpigmentation, hence avoiding the need for biopsy in most of the cases. Dermoscopy also has a prognostic importance as it helps in identifying epidermal, dermal and mixed type of melasma, therefore helping in further management of melasma and monitoring the efficacy of treatment.

In our study we found that the overall sensitivity and specificity of dermoscopy to be unarguably high. Hence, it should be incorporated as a routine method for examining all the cases of melasma.

The limitation in our study was that there was no histopathological correlation done. Perhaps the histopathology of the lesion might aid further in standardizing dermoscopic features in each type of melasma.

## **SUMMARY**

The study was a hospital based cross sectional study carried over a 12 month period from January 2020 to December 2020. The primary objective was to classify melasma based on clinical examination, Wood's lamp examination and dermoscopic examination. The secondary objective was to correlate between the different methods of examination.

The sample size in our study was 160 patients. After recruiting the study subjects, clinical examination, Wood's lamp examination and dermoscopic examination were carried out and the recorded findings were analyzed.

It was found that there was a female predominance (80%, n=128) with female to male ratio of 4:1.

The mean presenting age in the patients of melasma was  $35.64 \pm 7.86$  years.

Depending upon the pigment distribution, malar type of melasma (63.75%, n=102) was the commonest followed by centrofacial type (36.25%, n=58).

On clinical examination, mixed type of melasma (61.25%, n=98) was more common than epidermal (25%, n=40) and dermal type of melasma (13.75%, n=22).

On Wood's lamp examination, it was found that mixed type of melasma (49.38%, n=79) was more common than epidermal (26.25%, n=42) and dermal type of melasma (24.38%, n=39).

On dermoscopic examination, features such as light brown pigment network and perifollicular sparing was considered for epidermal type of melasma; greyish

brown pigment network, perifollicular hyperpigmentation, perifollicular arciform pattern, erythema and telangiectasias were reckoned for dermal type of melasma and a concoction of both epidermal and dermal type were classified into mixed type of melasma. It was found that mixed type of melasma (56.88%, n=91) was more frequently encountered than dermal types (25.63%, n=41) and epidermal types (17.5%, n=28).

The agreement between dermoscopy and clinical examination was found to be significant and there was substantial agreement between dermoscopy and Wood's lamp examination.

On comparing dermoscopy with that of Wood's lamp examination, the sensitivity of dermoscopy in rightly diagnosing mixed type, epidermal type and dermal type of melasma were 87.3%, 59.5% and 71.8% respectively and the specificity were 72.8%, 97.4% and 89.5% respectively.

Hence, it can therefore be said that dermoscopy acts as an effective tool and aids in identifying the type of melasma and assists in further management of melasma.

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**ANNEXURE I - ETHICAL CLEARANCE LETTER**

**K. J. S. ACADEMY OF HIGHER EDUCATION AND RESEARCH**  
(Deemed to be University)  
Accredited 'A' Grade by NAAC 12<sup>th</sup> Cycle | Placed in Category 'A' by MHRD (Govt.)  
**JAWAHARLAL NEHRU MEDICAL COLLEGE,**  
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)  
Website: <http://www.jnmc.edu> | Phone: (+91-0831) Office : 2472550  
E-Mail : [dome@jnmc.edu](mailto:dome@jnmc.edu) | Principal: 2471701  
Fax No. : (+91-0831) : 2470759

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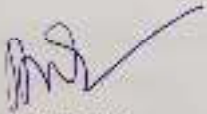
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To,

PG student in Dermatology, Venereology & Leprosy,  
J.N.Medical College,  
BELAGAVI

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled  
**"A HOSPITAL BASED CROSS SECTIONAL STUDY OF CLINICAL AND DERMOSCOPIIC FINDINGS IN MELASMA"**, is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

  
**(Dr. Anita Dalal)**  
Member Secretary  
JNMC Institutional Ethics Committee  
on Human Subjects Research,  
J.N.Medical College, Belagavi

  
**(Dr. Roshni M Bellad)**  
Chairman,  
JNMC Institutional Ethics Committee  
on Human Subjects Research,  
J.N.Medical College, Belagavi.

**ANNEXURE II - INFORMED CONSENT FORM**

I.D.NO. 

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**Title of the study. : “A HOSPITAL BASED CROSS SECTIONAL STUDY OF CLINICAL, WOOD’S LAMP AND DERMOSCOPIC FINDINGS IN MELASMA”**

The study is conducted by Dr \_\_\_\_\_ Post Graduate (M.D) student in Dermatology under the guidance of Dr. \_\_\_\_\_ MD, DVD, FIDD, Professor, Department of Dermatology, Venereology and Leprosy, JNMC, BELAGAVI.

**Respected Sir/Madam,**

We invite you to participate in our study as you are eligible for the same. During the study you will be asked some questions in detail regarding your present complaints.

**Purpose of the study:**

Melasma is a common hypermelanosis condition wherein the changes can be seen using an instrument called dermoscope. Hence this study intends to observe those changes/findings using the dermoscope. You are being requested to participate in this study because you have been diagnosed to have melasma.

**Procedure:**

Should you choose to participate, you will be asked to give a detailed history of your disease and undergo physical examination. Following this, Wood’s lamp

examination and dermoscopic examination of the lesions will be done along with appropriate clinical picture documentation.

**Risks and Benefits:**

The result of you taking part in this research would help health care providers towards a better understanding of the disease, and thus we will be able to provide improved patient care.

**Alternatives:**

If you decide not to participate in this study, you will still be receiving the usual standard care for your disease.

**Privacy and confidentiality:**

Your privacy will be respected and all information collected about you during the course of this study will be kept confidential. Your identity will remain undisclosed.

**Relations with the Institutional policy:**

The J N Medical College will provide, within the limitations of the laws of the State of Karnataka, facilities and medical attention to patients who suffer injuries as a result of participating in this project.

**Financial incentives:**

You shall not be receiving any payment or any financial incentives for participating in this study.

**Authorization to publish results:**

The results of this study may be published for scientific purpose or presented to a scientific group. Your identity, however, will be maintained confidential at all times.

**Voluntary participation:**

Your participation in this study is voluntary. Your decision whether or not to participate will neither affect the care of your current disease, nor your future relations with the doctor or the hospital. In the event if you suffer any physical injury as the result of your participation in this study, you may contact Dr. \_\_\_\_\_, or DR. \_\_\_\_\_ MD, DVD, FIDD , Professor. In the event of an emergency, you should contact KLE'S Dr.PrabhakarKore Hospital and MRC on Telephone No. 0831-247-3777.

In case you need further information regarding your rights as a study participant, you may please contact DR.ROOPA M BELLAD, chairman of the ethical committee, J N Medical College, Belagavi.

**STATEMENT OF CONSENT**

**I.D.NO:**

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I Mr/Ms/Mrs ----- volunteer and consent to participate in this study. I have read the consent document or it has been read to me in my vernacular language. I accept to participate in the study. All the information regarding this study is provided to me and I have understood the same. I have been given the opportunity to ask questions and obtain appropriate answers.

**Participant's name:**

Signature or left thumb print of participant:

**Witness name:**

Signature of witness:

**Signature of the investigator:**

Date:

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**ANNEXURE III - PROFORMA**

**TITLE - "A HOSPITAL BASED CROSS-SECTIONAL STUDY OF CLINICAL  
AND DERMOSCOPIC FINDINGS IN MELASMA"**

Name : Case no. :

Age : Date :

Gender :

Occupation :

Address :

**PRESENTING COMPLAINTS:**

**HISTORY OF PRESENTING ILLNESS:**

1. Onset : Sudden  Gradual
2. Duration : Days  Months  Years
3. Progression : Stationary  Progressive
4. Location : Malar area  Nose  Forehead  Upper lip  Chin   
Mandibular area  Others
5. H/O cosmetic application : Present  Absent

**PAST HISTORY:**

1. Diabetes mellitus : Present  Absent
2. Thyroid disorders : Present  Absent
3. Addisons disease : Present  Absent
4. Hypertension : Present  Absent
5. Other diseases : Present  Absent



CLINICAL IMPRESSION:

**WOODS LAMP EXAMINATION:**

Accentuation : Present  Absent  Few areas

WOOD'S LAMP IMPRESSION:

**DERMOSCOPIC EXAMINATION:**

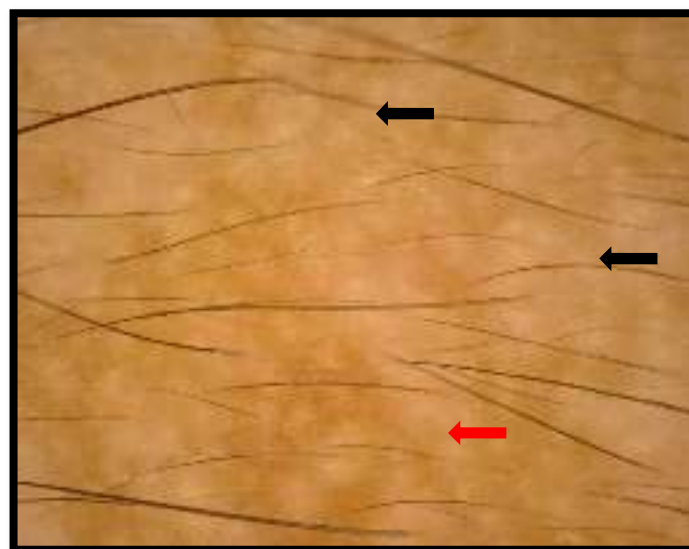
1. Light Brown network : Yes  No
2. Dark Brown network : Yes  No
3. Scattered granules : Yes  No
4. Greyish-dark brown discoloration : Yes  No
5. Prominent brown network / pseudoglobular pattern : Yes  No
6. Perifollicular sparing: Yes  No
7. Non sparing of perifollicular areas : Yes  No
8. Arciform pattern around hair follicle : Yes  No
9. Vascular features present : Yes  No
10. Any other pattern seen :

DERMOSCOPIC IMPRESSION:

**ANNEXURE IV – PHOTOGRAPHS**



**Figure 1a**



**Figure 1b**

**Figure 1a and 1b - Clinical image of centropacial type of melasma with light brown pigmentation suggestive of epidermal type of melasma; dermoscopic (50x) image showing light brown reticular pigment (red arrow) with sparing of perifollicular areas (black arrow).**



Figure 2a

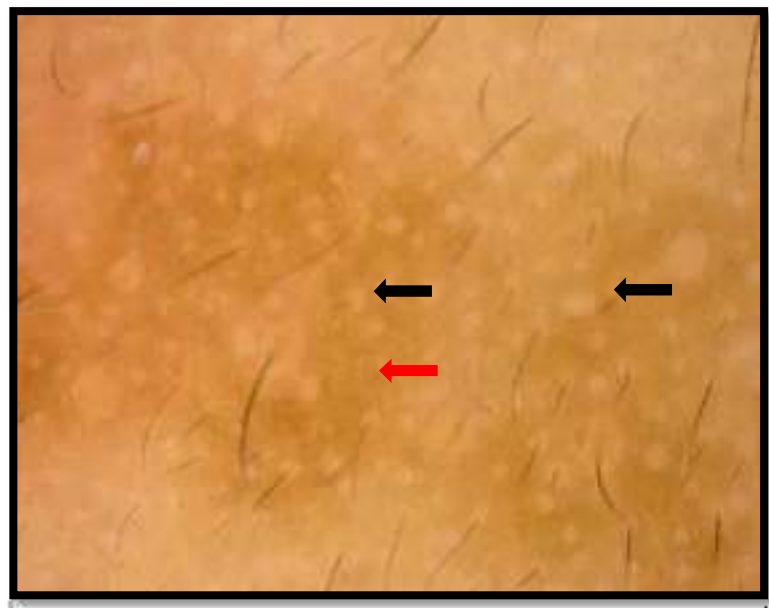


Figure 2b

Figure 2a and 2b - Clinical image of malar type of melasma showing light brown pigmentation suggestive of epidermal type of melasma; dermoscopic (50x) image showing light brown reticular pattern (red arrow) with perifollicular sparing (black arrow).



Figure 3a

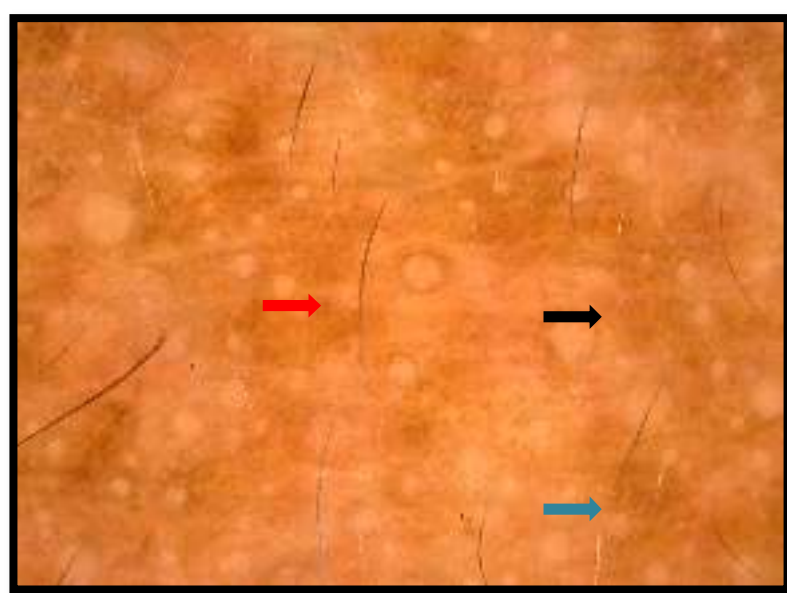


Figure 3b

**Figure 3a and 3b – Clinical image of malar type of melasma showing dark brown pigmentation suggestive of mixed type of melasma; dermoscopic (50x) image showing light to dark brown reticular pattern (red arrow), perifollicular arciform pattern (black arrow) with few areas of sparing (blue arrow)**



Figure 4a

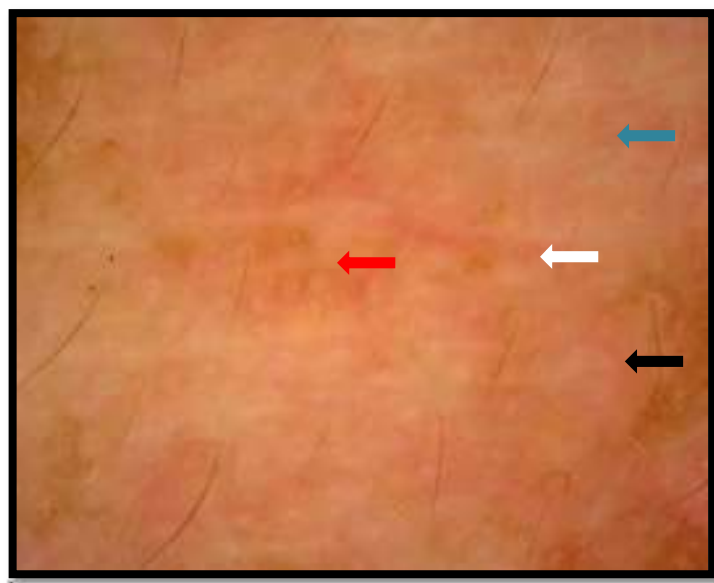


Figure 4b

Figure 4a and 4b – Clinical image of centrofacial type of melasma showing dark brown pigmentation suggestive of mixed type of melasma; dermoscopic (50x) image showing light and dark brown reticular pattern (red arrow), perifollicular arciform pattern (black arrow) with few areas of sparing (blue arrow), areas of erythema and telangiectasia (white arrow).



Figure 5a

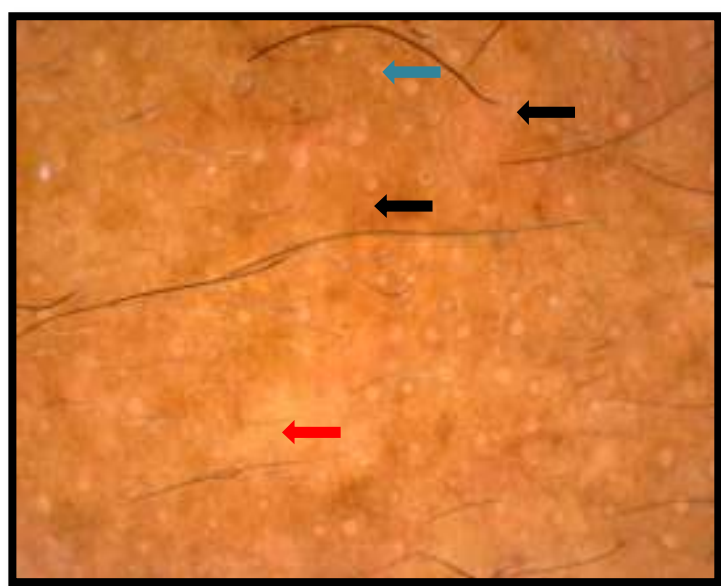


Figure 5b

Figure 5a and 5b – Clinical image of centropacial type of melasma showing dark brown to brownish gray pigmentation suggestive of dermal type of melasma; dermoscopic (50x) image showing dark brown (red arrow) and grayish (blue arrow) reticular pattern, perifollicular hyperpigmentation (black arrow)



Figure 6a

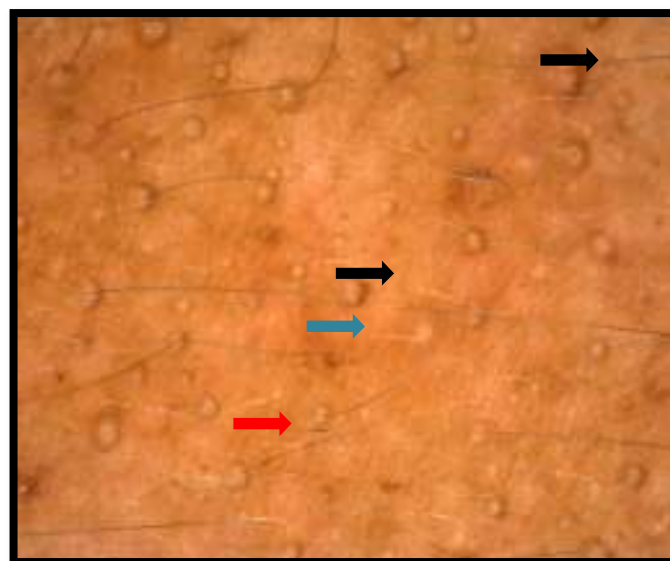


Figure 6b

**Figure 6a and 6b – Clinical image of centrofacial type of melasma showing dark brown to brownish gray pigmentation suggestive of dermal type of melasma; dermoscopic (50x) image showing dark brown (red arrow) and grayish (blue arrow) reticular pattern, perifollicular hyperpigmentation (black arrow)**

**ANNEXURE V - KEY TO MASTER CHART**

COLOR:

- LB : Light brown
- DB : Dark brown
- DB-BG : Dark brown to brownish gray

DERMOSCOPIC EXAMINATION & WOOD'S LAMP EXAMINATION:

- ✓ : Present
- - : Absent

**ANNEXURE VI - MASTER CHART**

SL NO.	AGE (in years)	SEX	DURATION OF SYMPTOMS	SITE	COLOUR	DERMOSCOPIC EXAMINATION							WOODS LAMP EXAMINATION			TYPE BASED ON DISTRIBUTION	CLINICAL IMPRESSION	WOODS LAMP IMPRESSION	DERMOSCOPIC IMPRESSION	
						LB NETWORK	DB NETWORK	GREYISH NETWORK	PSEUDOGLOBULAR PATTERN	PERIFOLLICULAR SPARING	PERIFOLLICULAR HYPERPIGMENTATION	PERIFOLLICULAR ARCIFORM PIGMENTATION	ERYTHEMA	TELANGIECTASIA	ACCENTUATION PRESENT					ACCENTUATION ABSENT
1	34	FEMALE	4 YEARS	MALAR	DB	<	-	-	-	<	-	-	-	-	-	-	MALAR	MIXED	EPIDERMAL	EPIDERMAL
2	36	FEMALE	2 YEARS	MALAR	LB	<	<	-	-	<	-	-	-	<	-	-	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL
3	44	FEMALE	3 YEARS	MALAR, NOSE	DB	<	<	-	<	<	-	-	<	-	-	-	MALAR	MIXED	MIXED	MIXED
4	26	FEMALE	2 MONTHS	MALAR, NOSE, UPPER LIP, CHIN	DB	<	<	-	<	-	<	<	<	<	<	-	CENTROFACIAL	MIXED	DERMAL	MIXED
5	30	MALE	8 MONTHS	MALAR	DB	<	<	-	<	-	<	<	<	<	<	-	MALAR	MIXED	DERMAL	MIXED
6	41	FEMALE	4 MONTHS	MALAR, NOSE	DB	<	<	-	-	-	<	-	<	-	<	-	MALAR	MIXED	MIXED	MIXED
7	65	FEMALE	1 YEAR	MALAR, NOSE	DB	<	<	-	<	<	<	<	<	<	<	-	MALAR	MIXED	MIXED	MIXED
8	35	FEMALE	3 MONTHS	MALAR	DB	<	<	-	<	<	<	<	<	-	-	-	MALAR	MIXED	MIXED	MIXED
9	30	FEMALE	10 YEARS	MALAR, NOSE, UPPER LIP	DB	<	<	<	<	-	<	<	<	<	<	-	CENTROFACIAL	MIXED	DERMAL	DERMAL
10	34	FEMALE	5 YEARS	MALAR, NOSE, UPPER LIP, CHIN	DB-BG	<	<	<	<	<	-	<	<	<	<	-	CENTROFACIAL	DERMAL	DERMAL	DERMAL
11	32	FEMALE	6 YEARS	MALAR, NOSE, UPPER LIP	LB	<	<	-	<	-	<	<	<	<	-	-	CENTROFACIAL	EPIDERMAL	MIXED	MIXED
12	28	FEMALE	4 YEARS	MALAR, NOSE, UPPER LIP, FOREHEAD	DB	<	<	-	<	<	<	<	<	-	-	-	CENTROFACIAL	MIXED	MIXED	MIXED
13	26	FEMALE	7 YEARS	MALAR, NOSE	LB	<	<	-	<	<	<	<	<	-	-	-	MALAR	EPIDERMAL	MIXED	MIXED
14	38	FEMALE	20 YEARS	MALAR, NOSE, UPPER LIP, FOREHEAD	LB	<	<	-	<	<	<	<	<	-	-	-	CENTROFACIAL	EPIDERMAL	MIXED	MIXED
15	26	FEMALE	5 YEARS	MALAR, NOSE	DB	<	<	-	<	<	-	<	<	<	-	-	MALAR	MIXED	MIXED	MIXED
16	56	FEMALE	5 YEARS	MALAR, NOSE, UPPER LIP	DB	<	<	-	<	<	-	<	<	-	-	-	CENTROFACIAL	MIXED	MIXED	MIXED
17	28	FEMALE	6 YEARS	MALAR, NOSE, UPPER LIP	DB	<	<	-	<	<	-	<	<	-	<	-	CENTROFACIAL	MIXED	EPIDERMAL	EPIDERMAL
18	38	FEMALE	1 YEAR	MALAR, NOSE, UPPER LIP	DB	<	<	-	<	<	-	<	<	-	-	-	CENTROFACIAL	MIXED	MIXED	MIXED
19	40	FEMALE	1 YEAR	MALAR, NOSE	LB	<	<	-	<	<	-	<	<	-	-	-	MALAR	EPIDERMAL	MIXED	MIXED
20	45	FEMALE	6 YEARS	MALAR, NOSE, FOREHEAD	DB	<	<	-	<	<	-	<	<	-	-	-	CENTROFACIAL	MIXED	MIXED	MIXED
21	38	FEMALE	5 YEARS	MALAR, NOSE, UPPER LIP	DB	<	<	-	<	<	-	<	<	-	-	-	CENTROFACIAL	MIXED	MIXED	MIXED







SL NO.	AGE (in years)	SEX	DURATION OF SYMPTOMS	SITE	COLOUR	DERMOSCOPIC EXAMINATION										WOODS LAMP EXAMINATION	TYPE BASED ON DISTRIBUTION	CLINICAL IMPRESSION	WOODS LAMP IMPRESSION	DERMOSCOPIC IMPRESSION			
						LB NETWORK	DB NETWORK	GREYISH NETWORK	PSEUDOGLOBULAR PATTERN	PERIFOLLICULAR SPARING	PERIFOLLICULAR HYPERPIGMENTATION	PERIFOLLICULAR ARCIFORM PIGMENTATION	ERYTHEMA	TELANGIECTASIA	ACCENTUATION PRESENT						ACCENTUATION ABSENT	ACCENTUATION IN FEW AREAS	
88	25	MALE	1.5 YEARS	MALAR	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	MIXED	MIXED	MIXED	
89	45	FEMALE	3 YEARS	MALAR, NOSE	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	MIXED	MIXED	MIXED	
90	51	FEMALE	4 YEARS	MALAR, NOSE	DB-BG	✓	✓	✓	✓	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	DERMAL	MIXED	DERMAL
91	50	FEMALE	3.5 YEARS	MALAR, UPPERLIP, CHIN	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	CENTROFACIAL	MIXED	MIXED	MIXED	
92	25	FEMALE	2 YEARS	MALAR, NOSE	LB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	EPIDERMAL	MIXED	MIXED	
93	42	FEMALE	4 MONTHS	MALAR, NOSE, FOREHEAD	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	CENTROFACIAL	MIXED	MIXED	MIXED	
94	40	FEMALE	5 MONTHS	MALAR, NOSE	LB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL	
95	52	FEMALE	6 YEARS	MALAR, NOSE, UPPERLIP	DB-BG	✓	✓	✓	✓	-	✓	-	✓	-	✓	-	✓	-	✓	CENTROFACIAL	DERMAL	DERMAL	DERMAL
96	41	FEMALE	5 YEARS	MALAR, NOSE, UPPERLIP	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	CENTROFACIAL	MIXED	MIXED	MIXED	
97	29	FEMALE	3 MONTHS	MALAR	LB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL	
98	24	MALE	1 YEAR	MALAR, NOSE	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	MIXED	MIXED	MIXED	
99	34	FEMALE	2 YEARS	MALAR, NOSE, UPPERLIP	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	CENTROFACIAL	MIXED	EPIDERMAL	MIXED	
100	40	FEMALE	2.5 YEARS	MALAR	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	MIXED	MIXED	MIXED	
101	38	FEMALE	3 YEARS	MALAR, NOSE	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	MIXED	MIXED	MIXED	
102	30	FEMALE	3 MONTHS	MALAR, NOSE	LB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL	
103	27	MALE	1 YEAR	MALAR, NOSE	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	MIXED	EPIDERMAL	MIXED	
104	28	FEMALE	2 YEARS	MALAR, NOSE	LB	✓	-	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL	
105	35	FEMALE	3 YEARS	MALAR, NOSE	DB-BG	✓	✓	✓	✓	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	DERMAL	DERMAL	DERMAL
106	38	FEMALE	2 YEARS	MALAR, NOSE, CHIN, UPPERLIP, FOREHEAD	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	CENTROFACIAL	MIXED	MIXED	MIXED	
107	40	FEMALE	3 YEARS	MALAR, NOSE	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	MIXED	MIXED	MIXED	
108	36	FEMALE	1 YEAR	MALAR	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	MIXED	EPIDERMAL	MIXED	
109	34	MALE	3 YEARS	MALAR, NOSE	DB	✓	✓	-	-	✓	-	✓	-	✓	-	✓	-	✓	MALAR	MIXED	MIXED	MIXED	

SL NO.	AGE (in years)	SEX	DURATION OF SYMPTOMS	SITE	COLOUR	DERMOSCOPIC EXAMINATION										WOODS LAMP EXAMINATION	TYPE BASED ON DISTRIBUTION	CLINICAL IMPRESSION	WOODS LAMP IMPRESSION	DERMOSCOPIC IMPRESSION	
						LB NETWORK	DB NETWORK	GREYISH NETWORK	PSEUDOGLOBULAR PATTERN	PERIFOLLICULAR SPARING	PERIFOLLICULAR HYPERPIGMENTATION	PERIFOLLICULAR ARCIFORM PIGMENTATION	ERYTHEMA	TELANGIECTASIA	ACCENTUATION PRESENT						ACCENTUATION ABSENT
110	28	FEMALE	4 MONTHS	MALAR	LB	<	-	-	-	<	-	-	-	-	<	-	-	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL
111	30	FEMALE	6 MONTHS	MALAR	LB	<	-	-	-	<	-	-	-	<	-	-	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL	
112	39	FEMALE	1 YEAR	MALAR, NOSE, FOREHEAD	DB-BG	<	<	<	<	-	<	<	-	-	<	-	CENTROFACIAL	DERMAL	DERMAL	DERMAL	
113	42	MALE	2 YEARS	MALAR, NOSE	DB	<	<	-	<	<	-	-	-	<	-	MALAR	MIXED	EPIDERMAL	MIXED		
114	38	FEMALE	4 YEARS	MALAR, NOSE	DB	<	<	-	<	<	-	-	-	<	-	MALAR	MIXED	DERMAL	MIXED		
115	36	FEMALE	3 YEARS	MALAR, NOSE	DB	<	<	-	<	<	-	-	-	<	-	MALAR	MIXED	EPIDERMAL	EPIDERMAL		
116	34	FEMALE	1 YEAR	MALAR, NOSE, CHIN	DB	<	<	-	<	<	-	-	-	<	-	CENTROFACIAL	MIXED	MIXED	MIXED		
117	38	FEMALE	2.5 YEARS	MALAR, NOSE	DB	<	<	-	<	<	<	<	<	<	<	MALAR	MIXED	MIXED	MIXED		
118	35	FEMALE	1 YEAR	MALAR, NOSE, CHIN	DB	<	<	-	<	<	-	-	-	<	-	CENTROFACIAL	MIXED	MIXED	MIXED		
119	46	FEMALE	6 YEARS	MALAR	DB	<	<	-	<	<	-	-	-	<	-	MALAR	MIXED	EPIDERMAL	MIXED		
120	31	FEMALE	2 YEARS	MALAR, NOSE, FOREHEAD	DB	<	<	-	<	<	-	<	-	<	-	CENTROFACIAL	MIXED	EPIDERMAL	MIXED		
121	38	MALE	2 YEARS	MALAR, NOSE	DB	<	<	-	<	<	-	-	-	<	-	MALAR	MIXED	MIXED	MIXED		
122	30	FEMALE	1 YEAR	MALAR, NOSE, CHIN	DB	<	<	-	<	<	<	<	-	<	-	CENTROFACIAL	MIXED	MIXED	MIXED		
123	38	FEMALE	1.5 YEARS	MALAR, NOSE, UPPERLIP	DB	<	<	-	<	<	-	-	-	<	-	CENTROFACIAL	MIXED	MIXED	MIXED		
124	35	FEMALE	3 YEARS	MALAR, NOSE, FOREHEAD	DB-BG	<	<	<	<	-	<	<	-	-	<	-	CENTROFACIAL	DERMAL	EPIDERMAL	DERMAL	
125	30	FEMALE	3.5 YEARS	MALAR, NOSE, UPPERLIP	DB	<	<	-	<	<	-	-	-	<	-	CENTROFACIAL	MIXED	MIXED	MIXED		
126	50	FEMALE	2.5 YEARS	MALAR, NOSE	DB	<	<	<	<	-	<	<	-	-	<	-	MALAR	MIXED	DERMAL	DERMAL	
127	37	FEMALE	1 YEAR	MALAR, NOSE, FOREHEAD	DB	<	<	-	<	<	<	<	-	<	-	CENTROFACIAL	MIXED	MIXED	MIXED		
128	22	MALE	9 MONTHS	NOSE	DB	<	<	-	<	<	-	-	-	<	-	CENTROFACIAL	MIXED	MIXED	MIXED		
129	27	FEMALE	2 MONTHS	MALAR	DB	<	<	-	<	<	-	<	-	<	-	MALAR	MIXED	DERMAL	MIXED		
130	42	FEMALE	2 MONTHS	MALAR	LB	<	-	-	-	<	-	-	-	<	-	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL		
131	30	FEMALE	6 MONTHS	MALAR, NOSE	DB	<	<	-	<	<	-	<	-	<	-	MALAR	MIXED	MIXED	MIXED		

SL NO.	AGE (in years)	SEX	DURATION OF SYMPTOMS	SITE	COLOUR	DERMOSCOPIC EXAMINATION										WOODS LAMP EXAMINATION	TYPE BASED ON DISTRIBUTION	CLINICAL IMPRESSION	WOODS LAMP IMPRESSION	DERMOSCOPIC IMPRESSION
						LB NETWORK	DB NETWORK	GREYISH NETWORK	PSEUDOGLOBULAR PATTERN	PERIFOLLICULAR SPARING	PERIFOLLICULAR HYPERPIGMENTATION	PERIFOLLICULAR ARCIFORM PIGMENTATION	ERYTHEMA	TELANGIECTASIA	ACCENTUATION PRESENT					
132	20	FEMALE	1 MONTH	NOSE	DB	✓	✓	-	-	✓	-	-	-	-	-	-	CENTROFACIAL	MIXED	EPIDERMAL	EPIDERMAL
133	43	FEMALE	3 MONTHS	MALAR, NOSE	DB	✓	✓	-	-	✓	-	-	-	-	-	-	MALAR	MIXED	EPIDERMAL	MIXED
134	37	FEMALE	10 MONTHS	MALAR, NOSE	LB	✓	✓	-	-	✓	-	-	-	-	-	-	MALAR	EPIDERMAL	EPIDERMAL	MIXED
135	40	MALE	5 YEARS	MALAR, NOSE, FOREHEAD	DB-BG	✓	✓	-	-	✓	-	-	-	-	-	-	CENTROFACIAL	DERMAL	DERMAL	DERMAL
136	32	MALE	2 YEARS	MALAR, NOSE	DB	✓	✓	-	-	✓	-	-	-	-	-	-	MALAR	MIXED	MIXED	MIXED
137	30	FEMALE	2 YEARS	MALAR, NOSE, FOREHEAD, UPPERLIP	LB	✓	-	-	-	✓	-	-	-	-	-	-	CENTROFACIAL	EPIDERMAL	DERMAL	EPIDERMAL
138	37	MALE	4 MONTHS	MALAR, NOSE	DB-BG	✓	✓	✓	-	-	✓	-	-	-	-	-	MALAR	DERMAL	DERMAL	DERMAL
139	35	MALE	2 YEARS	MALAR, NOSE	DB	✓	✓	-	-	✓	-	-	-	-	-	-	MALAR	MIXED	MIXED	MIXED
140	27	MALE	3 MONTHS	NOSE	DB	✓	✓	-	-	✓	-	-	-	-	-	-	CENTROFACIAL	MIXED	MIXED	MIXED
141	31	FEMALE	4 MONTHS	MALAR, NOSE	DB	✓	✓	-	-	✓	-	-	-	-	-	-	MALAR	MIXED	DERMAL	MIXED
142	50	FEMALE	1 YEAR	MALAR	LB	✓	✓	-	-	✓	-	-	-	-	-	-	MALAR	EPIDERMAL	MIXED	MIXED
143	35	MALE	8 MONTHS	NOSE	DB	✓	✓	-	-	✓	-	-	-	-	-	-	CENTROFACIAL	MIXED	EPIDERMAL	MIXED
144	39	FEMALE	3 MONTHS	MALAR, NOSE	LB	✓	✓	-	-	✓	-	-	-	-	-	-	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL
145	40	FEMALE	2 YEARS	MALAR, NOSE	DB	✓	✓	-	-	✓	-	-	-	-	-	-	MALAR	MIXED	MIXED	MIXED
146	45	FEMALE	4 YEARS	MALAR, NOSE, FOREHEAD, UPPERLIP	DB-BG	✓	✓	-	-	✓	-	-	-	-	-	-	CENTROFACIAL	DERMAL	MIXED	MIXED
147	23	FEMALE	2 MONTHS	MALAR, NOSE	LB	✓	-	-	-	✓	-	-	-	-	-	-	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL
148	40	FEMALE	6 MONTHS	MALAR, NOSE	DB	✓	✓	✓	✓	-	✓	-	-	-	-	-	MALAR	MIXED	MIXED	DERMAL
149	30	FEMALE	2 YEARS	MALAR, NOSE	DB	✓	✓	✓	✓	-	✓	-	-	-	-	-	MALAR	MIXED	DERMAL	DERMAL
150	25	FEMALE	6 MONTHS	NOSE	DB	✓	✓	-	-	✓	-	-	-	-	-	-	CENTROFACIAL	MIXED	EPIDERMAL	MIXED
151	36	MALE	5 YEARS	MALAR, NOSE, FOREHEAD	DB-BG	✓	✓	✓	✓	-	✓	-	-	-	-	-	CENTROFACIAL	DERMAL	MIXED	DERMAL
152	33	FEMALE	4.5 YEARS	MALAR, NOSE	DB-BG	✓	✓	✓	✓	-	✓	-	-	-	-	-	MALAR	DERMAL	MIXED	DERMAL
153	28	MALE	3.5 YEARS	MALAR, NOSE	DB-BG	✓	✓	✓	✓	-	✓	-	-	-	-	-	MALAR	DERMAL	DERMAL	DERMAL

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						LB NETWORK	DB NETWORK	GREYISH NETWORK	PSEUDOGLOBULAR PATTERN	PERIFOLLICULAR SPARING	PERIFOLLICULAR HYPERPIGMENTATION	PERIFOLLICULAR ARCIFORM PIGMENTATION	ERYTHEMA	TELANGIECTASIA	ACCENTUATION PRESENT						ACCENTUATION ABSENT
154	34	FEMALE	2 MONTHS	MALAR, NOSE	LB	<	<	-	-	<	-	-	-	-	<	-	-	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL
155	42	FEMALE	3 YEARS	MALAR	LB	<	-	-	-	<	-	-	<	-	<	-	-	MALAR	EPIDERMAL	EPIDERMAL	EPIDERMAL
156	43	FEMALE	2.5 YEARS	MALAR, NOSE, FOREHEAD, UPPERLIP	DB	<	<	-	<	<	<	<	<	<	<	<	<	CENTROFACIAL	MIXED	MIXED	MIXED
157	39	MALE	4 YEARS	MALAR	DB	<	<	-	-	<	<	<	<	<	<	<	<	MALAR	MIXED	MIXED	MIXED
158	26	FEMALE	2 MONTHS	MALAR, NOSE	LB	<	<	-	-	<	-	<	-	-	<	-	-	MALAR	EPIDERMAL	EPIDERMAL	MIXED
159	46	FEMALE	4 YEARS	MALAR, NOSE, FOREHEAD, UPPERLIP	DB	<	<	-	<	<	<	<	<	<	<	<	<	CENTROFACIAL	MIXED	MIXED	MIXED
160	39	MALE	1.5 YEARS	MALAR	DB-BG	<	<	<	<	-	<	<	<	-	<	-	-	MALAR	DERMAL	EPIDERMAL	DERMAL