A Dissertation on

"AN ANALYTICAL STUDY OF THE OCULAR EFFECTS IN PATIENTS ON LONG TERM CORTICOSTEROIDS"

Dissertation Submitted for

M.S.Degree in Ophthalmology

May 2019

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CHENNAI, TAMILNADU.

DECLARATION

I hereby declare that this dissertation entitled **"AN ANALYTICAL STUDY OF THE OCULAR EFFECTS IN PATIENTS ON LONG TERM CORTICOSTEROIDS''** is a bonafide and genuine research work carried out by me under the guidance of **Dr.S.Padmanaban M.S.,D.O** Associate Professor, Department of Ophthalmology, Coimbatore Medical College & Hospital, Coimbatore.

This is submitted to The Tamilnadu Dr.M.G.R. Medical University, Chennai in partial fulfillment of regulations required for the M.S Ophthalmology, Branch III Degree Examination to be held in May 2019.

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CERTIFICATE

This is to certify that the dissertation entitled **"AN ANALYTICAL STUDY OF THE OCULAR EFFECTS IN PATIENTS ON LONG TERM CORTICOSTEROIDS"** is a bonafide and research work done by **Dr. Shalini. G** Post Graduate in M.S. Ophthalmology under my direct guidance and supervision to my satisfaction in partial fulfillment of the requirement for the degree of Master of Surgery in Ophthalmology, Branch III .

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Dissertation Topic	:	**An analytical study of the ocular effects in patients on long term corticosteroids**

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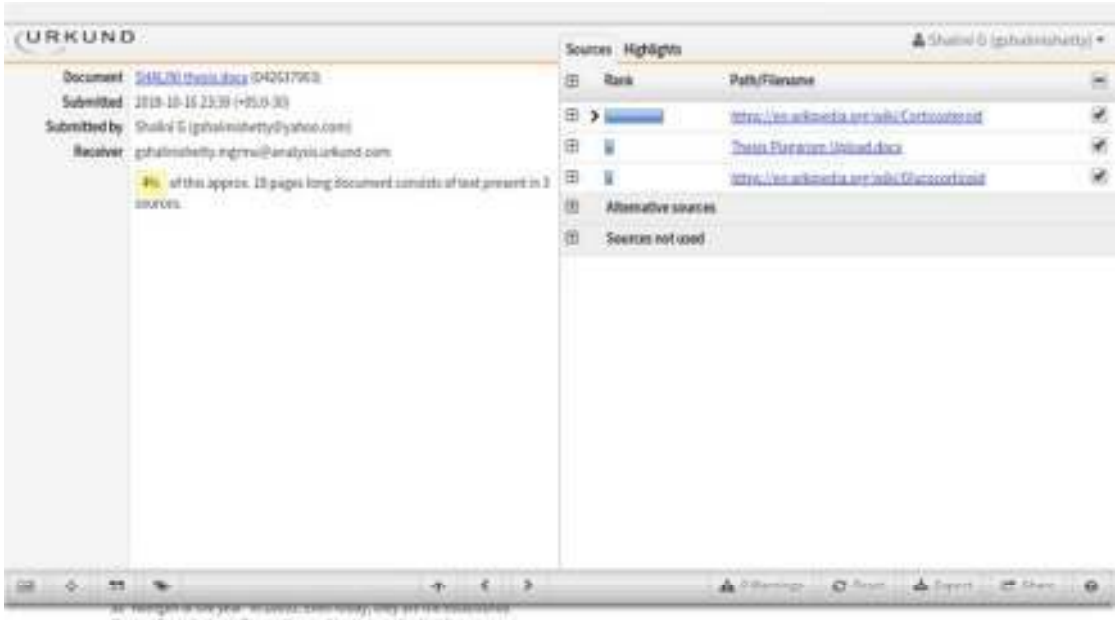

therapy for reducing inflammation and immune activation in numerous disease conditions like asthma, rheumatoid, vascular, allergic, collagen, inflammatory bowel, dermatological, ocular and other systemic diseases and also in allo transplantation. Their utilization has leaping up continuously in recent years as their therapeutic effects are indispensable and had made marvels in managing certain disease conditions in spite of their adverse effects. For appropriate use of corticosteroids, a basic knowledge of pharmacology, clinical usage guidelines and adverse effects are essential. In this study, the prevalence of various ocular manifestation in patients on long term corticosteroids in multiple routes of administration had been analyzed.

REVIEW OF LITERATURE

Corticosteroids are a group of 21 -carbon steroid hormones produced by adrenal cortex of vertebrates, and

the synthetic analogues of these hormones

were synthesized. Corticosteroids were first made accessible for general use in 1950. Edward Calvin Kendall, Tadeus Reichstein and Philip Showalter Hench were awarded The Noble Prize in Physiology or Medicine in 1950 "for their discoveries relating to the hormones of the adrenal cortex, their structure and biological effects."

CLASSES AND THEIR FUNCTIONS : Two main division of corticosteroids are glucocorticoids (GC) and mineralocorticoids. Natural steroid hormones are cortisol or hydrocortisone, corticosterone, cortisone and aldosterone. Zona fasciculata and zona reticularis of adrenal cortex produce cortisol, a glucocorticoid. Zona glomerulosa of adrenal cortex produce the mineralocorticoids aldosterone and corticosterone2. The

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Date:

Place: **DR.SHALINI.G.**

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ABBREVIATIONS & ACRONYMS

CS	-	Corticosteroids
GS	-	Glucocorticoids
NSAIDS	-	Non-Steroidal anti-inflammatory drugs
PSCC	-	Posterior subcapsular cataract type
IOP	-	Intra-ocular pressure
ACTH	-	Adrenocorticotropic hormone
POAG	-	Primary open angle galucoma
C:D	-	cup:disc ratio
TM	-	Trabecular meshwork
TIGR	-	Trabecular meshwork inducible glucocorticoid response
CSCR	-	Central serous chorioretinopathy
OCT	-	Optical coherence tomography
FFA	-	Fundus flurosceine angiography
LOCS-III	-	Lens opacities classification system-III
NC	-	Nuclear color
NO	-	Nuclear opalescence
C	-	Cortical

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INTRODUCTION

Corticosteroids (CS) are the most important class of anti-inflammatory drugs, used frequently. The therapeutic outcome of corticosteroids have been known and are employed for more than 65 years. Though the major advancement in discovering the hidden molecular mechanisms has been made in the last 20-25 years. The use of corticosteroids for their highly potent action was at its peak during the 1960s and 1970s and ineluctably they were used inappropriately and uncritically, when the untoward effects became apparent and a stage to think about their lavish use in all forms arrived.

Adverse effects ranging from acne to intestinal perforation and adrenal crisis has been documented. Both short term or long-term corticosteroids use has their own side-effects involving major systems of the body. Potency, dose, duration, frequency and form of the drug used in various routes also contributes to the manifestation of adverse effects.

Corticosteroids treatment brought adverse events of such a proportion that the upcoming major group of anti-inflammatory drugs, were named as nonsteroidal anti-inflammatory drugs (NSAIDs). Corticosteroids were voted by the American Contact Dermatitis Society as “Allergen of the year” in 2005[1].

Even today, they are the established therapy for reducing inflammation and immune activation in numerous disease conditions like asthma, rheumatoid, vascular, allergic, collagen, inflammatory bowel, dermatological, ocular and other systemic diseases and also in allo-transplantation. Their utilization has leaping up continuously in recent years as their therapeutic effects are indispensable and had made marvels in managing certain disease conditions in spite of their adverse effects. For appropriate use of corticosteroids, a basic knowledge of pharmacology, clinical usage guidelines and adverse effects are essential.

In this study, the prevalence of various ocular manifestation in patients on long term corticosteroids in multiple routes of administration had been analysed.

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CLASSES AND THEIR FUNCTIONS :

Two main division of corticosteroids are glucocorticoids (GC) and mineralocorticoids. Natural steroid hormones are cortisol or hydrocortisone, corticosterone, cortisone and aldosterone. Zona fasiculata and zona reticularis of adrenal cortex produce cortisol, a glucocorticoid. Zona glomerulosa of adrenal cortex produce the mineralocorticoids aldosterone and corticosterone[2].

The principal function of glucocorticoids is to balance carbohydrates, fat and protein metabolism by stimulating gluconeogenesis, inhibition of glucose uptake in muscle and adipose

tissue, mobilization of aminoacids from extra-hepatic tissues, and stimulation of fat breakdown in adipose tissue. They also got cardinal role as anti-inflammatory agent mediated by transrepression[3] which is by blocking the reaction of the inflammatory mediators, and by transactivation which is by generating anti-inflammatory mediators. The immunosupressive action of GC are mediated by suppressing delayed hypersensitivity reactions by direct effect on T-lymphocytes. The anti-proliferative action of GC are mediated by DNA synthesis inhibition and turnover of epidermal cell. The vaso-constrictive effect of GC is by inhibiting the response of vaso-constrictive mediators like histidine[3].

Mineralocorticoids main role is to regulate electrolyte and water balance by regulating ion transport in epithelial cells of the renal tubules of the kidney[3]. It does so by active re-absorption of sodium and an associated passive re-absorption of water with active secretion of potassium in the principal cells of the renal tubules. This results in an increase of blood pressure and blood volume[2].

BIOSYNTHESIS OF CORTICOSTEROIDS:

Corticosteroids are naturally produced within the adrenal cortex from cholesterol in the body, catalysed by enzymes of cytochrome p450 family, which are located in the mitochondrial inner membrane and needs adrenodoxin as co-factor except for 21-hydroxylase and 17-alpha hydroxylase. In lysosomes cholesterol esters are converted to free cholesterol[2].

First synthetic steroid was produced using a 36-step process that started with deoxycholic acid from ox bile by Lewis & Co at a higher cost[4]. Russell Marker produced much cheaper steroid from diosgenin by a four steps process from wild Mexican yams. This resulted in much reduction in price[5.] Hence corticosteroids were considered as a wonder cure in 1950s and prescribed liberally.

BIOSYNTHESIS OF CORTICOSTERIDS

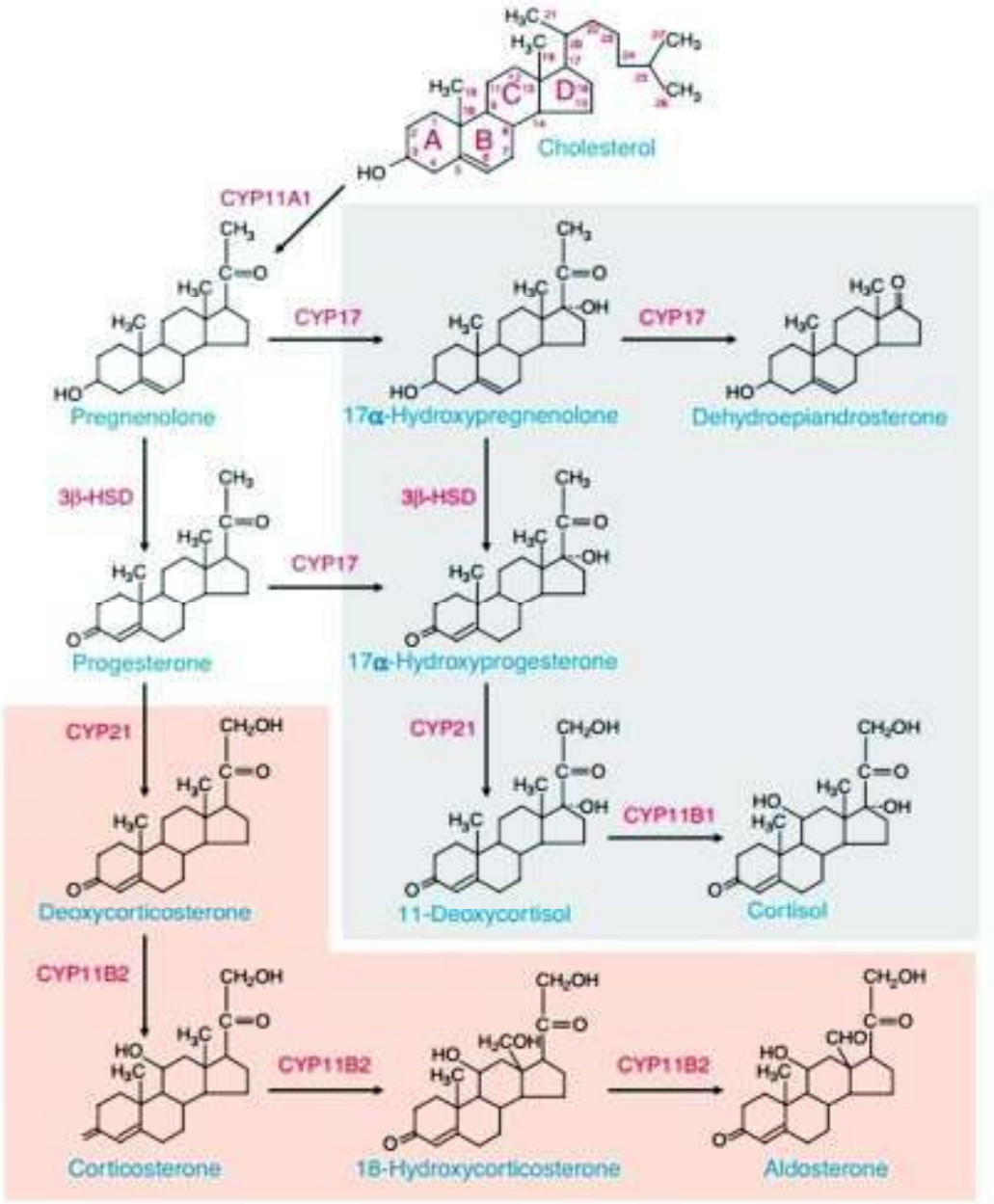


Figure 1: Pathway of corticosteroid bio-synthesis. Orange color box shows the pathway in Zona glomerulosa and gray color box shows pathway in zona fasciculata and zona reticularis. CYP11A1, cholesterol side-chain cleavage enzyme; 3beta-HSD, 3beta-hydrosysteroid dehydrogenase; CYP17, steroid 17alpha-hydroxylase; CYP11B2, aldosterone synthase; CYP11B1, steroid 11beta-hydroxylase[2].

MECHANISM OF ACTION OF STEROIDS:

Corticosteroids in any form will cross the cell membrane and forms a steroid-receptor complex by reacting with cytoplasmic receptor proteins. This complex proceed into the nucleus and binds to DNA, which changes the transcription of mRNA. This binding process results in production of glycoprotein, especially lipocortin, which inhibits the enzyme phospholipase A2 activity that cascade the reactions for inflammatory mediators production ie., by inhibiting arachidonic acid metabolite like prostaglandins, leukotrienes and their oxygen free radicals[6,7].

Corticosteroids also produce lipoprotein that inhibits the synthesize of proinflammatory cytokines like interleukin-1, interleukin-2, IL-2 receptors, interferon-gamma, tumor necrosing factor-alpha and various colony stimulating factors. This will manifests the anti-inflammatory, immunosupressive and anti-myogenic action of the corticosteroids.

Figure 2: MECHANISM OF ACTION OF CORTICOSTEROIDS

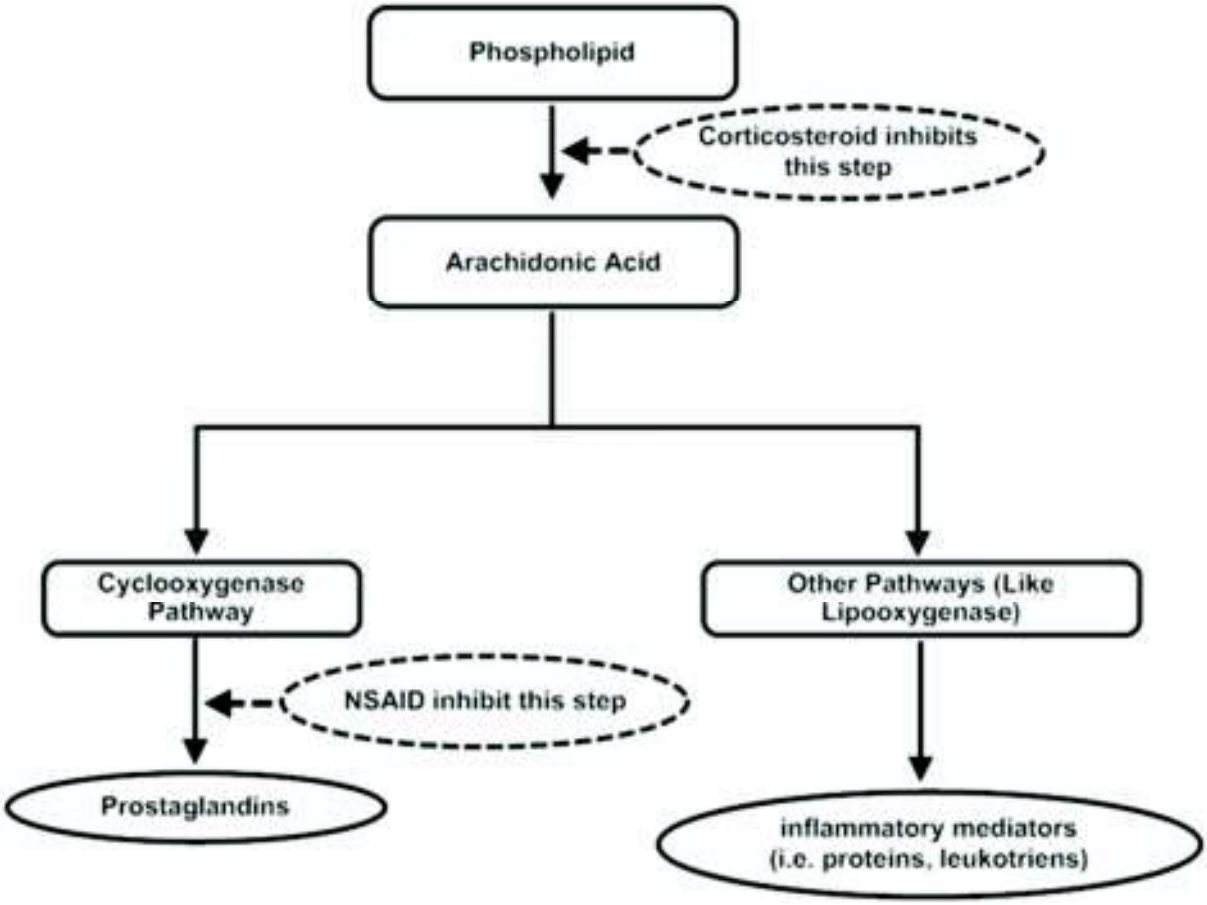


Figure 3:

Effects of Glucocorticoids on Components of Inflammatory/Immune Responses

CELL TYPE	FACTOR	COMMENTS
Macrophages and monocytes	Arachidonic acid and its metabolites (prostaglandins and leukotrienes)	Mediated by glucocorticoid inhibition of COX-2 and PLA_2.
	Cytokines, including: interleukin (IL)-1, IL-6, and tumor necrosis factor-α (TNF-α)	Production and release are blocked. The cytokines exert multiple effects on inflammation (e.g., activation of T cells, stimulation of fibroblast proliferation).
	Acute phase reactants	These include the third component of complement.
Endothelial cells	ELAM-1 and ICAM-1	ELAM-1 and ICAM-1: critical for leukocyte localization.
	Acute phase reactants Cytokines (e.g., IL-1) Arachidonic acid derivatives	Same as above, for macrophages and monocytes.
Basophils	Histamine, LTC_4	IgE-dependent release inhibited by glucocorticoids.
Fibroblasts	Arachidonic acid metabolites	Same as above for macrophages and monocytes. Glucocorticoids also suppress growth factor–induced DNA synthesis and fibroblast proliferation.
Lymphocytes	Cytokines (IL-1, IL-2, IL-3, IL-6, TNF-α, GM-CSF, interferon-γ)	Same as above for macrophages and monocytes.

ELAM-1, endothelial-leukocyte adhesion molecule-1; ICAM-1, intercellular adhesion molecule-1.

USES OF CORTICOSTEROIDS:

Synthetic corticosteroids have a extensive scope of uses in a wide range of disease conditions from skin diseases to brain tumors due to their anti-inflammatory, anti-allergic action and immunomodulator action.

Replacement Therapy : In acute adrenal insufficiency, hydrocortisone bolus of 100 mg is given intravenously. In chronic adrenal insufficiency where patients present with adrenal crisis, need daily therapy of corticosteroids (Coursin & Wood, 2002)[9].

In all classical congenital adrenal hyperplasia patient replacement therapy with hydrocortisone is required.

Rheumatic disorders : Inflammatory rheumatic diseases like systemic lupus erythematosus and vasculitis like Wegener's granulomatosis, polyarthritis nodosa, giant cell arthritis, Churg-Strauss sundrome. Initially with high oral dose of prednisone (1 mg/kg), then taper to minimal effective dose.

Renal diseases : In nephrotic syndrome, prednisolone of 1-2 mg/kg given for 6 weeks, then tapered over 6-8 weeks[8].

Allergic disease : acute allergic conditions like urticaria, hay fever, bee sting, serum sickness, contact dermatitis and angioneurotic edema can be treated with glucocorticoids in adequate dose as supplements to the primary therapy.

Bronchial asthma and other pulmonary conditions : Steroids commonly used for bronchial asthma in inhalational or oral form. In chronic obstructive lung diseases and interstitial lung diseases, corticosteroids were employed if there is some evidence of reversible obstructive disease.

Ocular diseases : In a large number of ocular inflammatory conditions, corticosteroids are used in topical, local or systemic form. 0.1% dexamethasone sodium phosphate, 1% prednisolone acetate drops were

potent steroids in use. Low potent topical steroids used are fluromethalone, loteprednol etabonate.

Skin diseases : 1% hydrocortisone ointment is used for eczematous eruptions. Systemic steroids are used for lepra reaction, pemphigus vulgaris, and in many connective tissue disorders.

Gastrointestinal diseases : Inflammatory bowel disease can be treated with corticosteroids in selected patients with hydrocortisone, prednisolone, and budesonide.

Hepatic diseases : Glucocorticoids are used in autoimmune hepatitis.

Malignancies : Antilymphocytic effects of glucocorticoids is used in the chemotherapy of acute lymphocytic leukemia and lymphomas.

Cerebral edema : In cerebral edema associated with trauma or cerebrovascular accidents, neoplasms and parasites, corticosteroids are used to reduce the inflammation.

Miscellaneous diseases and conditions : Sarcoidosis with lung involvement, prednisone is employed.

Organ transplantation : High-dose of prednisone is given at the time of transplant surgery along with immunosuppressive therapy and maintenance regimen is continued.

Spinal cord injury : Spinal cord injuries treated with intravenous large dose of methylprednisolone within 8 hours showed significant decrease in neurological defects.

ROUTE OF ADMINISTRATION :

Corticosteroids are used in many routes for the desired therapeutic effect like topical, inhalational, oral, intra-venous, intra-muscular, intra-articular, intra-vitreal, sub-conjunctival, sub-tenon and intra-lesional.

Topical steroids are utilized as eye drops/ointments, ear drops, nasal drops, local creams, lotions and ointments. They are mainly used in eye conditions like uveitis, keratoconjunctivitis and post-ope inflammation and in dermatological conditions like pemphigus and contact dermatitis. Topical steroids exhibits their anti-inflammatory, immunosupressive, anti-proliferative action on keratinocytes and suppress collagen synthesis by fibroblast and prevent hypertrophic scar or keloid formation. Topical steroids are classified as four classes based on their potency, antigenic behavior and cross reactivity as demonstrated by patch test. Similarly, S.Coopman in 1989[10,11] grouped them in four classes based on their chemical structure. Allergic reactions to any one member of a class typically indicates an intolerance of all members of the class.

Group A : Hydrocortisone type

Hydrocortisone, methylprednisolone, prednisolone, prednisone and triamcinolone (short to medium acting GC).

Group B : Acetonides (and related substances)

Amcinonide, budesonide, desonide, flucinolone acetonide, fluocinonide, halcinonide and triamcinolone acetonide.

Group C : Betamethasone type

Beclometasone, betamethasone, dexamethasone, flucortolone, halometasone and mometasone.

Group D : Esters.

Group D1- Halogenated (less labile)

Alclometasone dipropionate, betamethasone dipropionate, betamethasone valerate, clobetasol propionate, clobetasone butryate, fluprednidene acetate and mometasone furoate.

Group D2- Labile prodrug esters.

Ciclesonide, cortisone acetate, hydrocortisone aceponate, hydrocortisone acetate, hydrocortisone butepranete, hydrocortisone butyrate, hydrocortisone valerate, prednicarbate and tixocortol pivalate.

Inhalational steroids are used as inhaler or nebulizer form mainly in chest medicine department. Example: fluticasone furoate, fluticasone propionate, triamcinolone acetonide, beclomethasone dipropionate, mometasone, flunisolide and budesonide[12,13].

Oral steroids are used in almost all chronic conditions like rheumatoid arthritis, lupus nephritis, lepra reaction,etc,. in all specialities. Examples : Prednisone, prednisolone and dexamethasone.

Systemic steroids in all other forms are used for acute conditions like angioedema, acute allergy, anaphylaxis, adrenal insufficiency crisis, atopic dermatitis and so on[14]. Example: Methlyprednisolone, dexamethasone and cortisol. Intra-venous steroids are widely used in treating post-traumatic head injuries.

Other routes like intra-vitreal where triamcinolone acetonide is used in ocular pathologies like diabetic macular edema, retinal vein occlusion, cystoid macular edema, age-related macular degeneration and uveitis, posterior sub-tenon injection, depot or repository or sub-conjunctival injection used in ocular inflammatory conditions[15]. Intra-articular steroids are used in rheumatoid arthritis and intra-lesional steroids are used in carpal-tunnel syndrome, keloid and gout.

ADVERSE EFFECTS OF STEROIDS :

Corticosteroids have diverse adverse effects ranging from very subtle to very severe forms involving all parts of the body[16].

1. Central nervous system : steroid psychosis, depression, anxiety, euphoria, insomnia and pseudotumor cerebri.

2. Cardiovascular : Fluid retention and hypertension.

3. Metabolic : moon-face, buffalo hump, truncal obesity, muscle wasting (anti-anabolic effect), hypocalcemia, hypokalemia, hyperlipidemia

4. Endocrine : weight gain, glycosuria, hyperglycemia, diabetes, impaired growth.

5. Bone and muscle : osteoporosis, proximal myopathy and wasting, aseptic necrosis of hip, pathological fracture.

6. Gastrointestinal : gastritis, peptic ulcer, colitis, pancreatitis and intestinal perforation.

7. Eyes: cataract and glaucoma, central serous chorio-retinopathy rarely.

8. Skin : easy bruising and thinning.

9. Increased susceptibility to infections, reactivation of TB.

10. Physiological : adrenal and/or pituitary suppression, withdrawal syndrome, and adrenal crisis.

Pregnancy has low but significant teratogenicity effect like few birth defects in pregnant women treated with steroids. Hence corticosteroids are contra-indicated in pregnancy.

RISK FACTORS FOR SIDE EFFECTS:

Possible side-effects in topical steroids depends on steroid type and vehicle like cream, ointment, lotion or gel, application method like frequency and duration, nature and extent of skin disease and patient factors like age and site of lesion.

Side effects of systemic steroids use is based on the drug potency, dose, frequency and duration of use of the drug.

OCULAR MANIFESTATIONS OF LONG-TERM USE OF STEROIDS :

Corticosteroids are widely used in numerous disease conditions. Following corticosteroids utility in any form for a long duration regardless of their indications, adverse effects on the eyes have been demonstrated and documented. Very common adverse effects are like the development of cataract, elevated intra-ocular pressure (IOP) and glaucoma, and also vary rare complications like retinal emboli and central serous choroido-retinopathy has been documented so far[17].

Corticosteroids are most precious topical drug following keratoplasty, cataract surgery and trabeculectomy. They are also used in keratitis and allergic conjunctivitis.

Common ocular manifestations of **topical** corticosteroids encountered includes,

- Keratitis: viral, bacterial, fungal.
- Glaucoma.
- Others: mydriasis, blurred vision, refractive changes, ptosis, lens opacities.

Ocular manifestations of **systemic** corticosteroids are,

- Cataract,
- Papilledema in children.

CATARACT :

The posterior subcapsular cataract type (PSCC) is the type of cataract that typically complicate in long-term systemic corticosteroid therapy, although nuclear lesions may be seen very rarely[18,19]. Cataracts association with steroid therapy was first recognized in patients treated for rheumatoid arthritis and later, in bronchial asthma[20,21,22].

Black et al., 1960 proposed a well association between PSCC and systemic steroids[21].

Garbe et al., 1998 proposed that an inhaled or intranasal corticosteroids of high dose (> 1 mg/day) and low to medium (<1 mg/day) average daily doses, after prolonged period (> 2 years), the likelihood of incidence of cataract extractions in elderly people with relative risk, 3.06 and 1.63 respectively[26,27].

Cumming et al., 1997 did a cross-sectional study and reported the association of inhaled corticosteroid with an increased risk of cataract formation[28].

Bonomi L., 1989 reported association of cataract formation induced by topical ocular corticosteroids and miotics[29].

The use of high-dose intra-ocular steroids to treat retinal neovascularization and inflammation also results in the developement of PSCC.

The prevalence of cataract was found to be influenced by the daily dose and the cumulative dose of the drug and duration of the treatment, age of the patient and ethnic origin based on previous studies[20-24]. Children and Hispanic people may be more susceptible. The lesions may resolve partially or completely after withdrawal of the drug or may progress despite withdrawal[30].

Mechanisms involved in the corticosteroid induced cataract formation includes elevation in glucose levels, caused by an increased gluconeogenesis rate leading to Na+ /K+ -ATPase inhibition, increased permeability to cations and glucose-6-phosphate-dehydrogenase and RNA synthesis inhibition, finally loss of ATP; and covalent binding of steroids to lens proteins[31].

Glucocorticoids establish a stable covalent bonding with the lysine residues of lens proteins in a non-enzymatic way[32]. These bonds are seen only in steroid-induced cataracts, but not in other human cataracts or

normal human lenses. Hence, DNA-independent nongenomic mechanisms mainly seem to be associated in developing these glucocorticoid receptor mediated effects in lens opacification and cataract formation.

Histologically, PSCC is associated with posterior migration of the lens epithelial cells from the lens equator to the visual axis on the inner surface of the posterior capsule. During their migration to or after their arrival at the posterior axis; the cells undergo aberrant enlargement. These swollen cells are termed as Wedl (or bladder) cells[33].

Clinically or histologically, PSCC formation occurring follwing corticosteroid use cannot be distinguished from senescent PSCC formation[34].

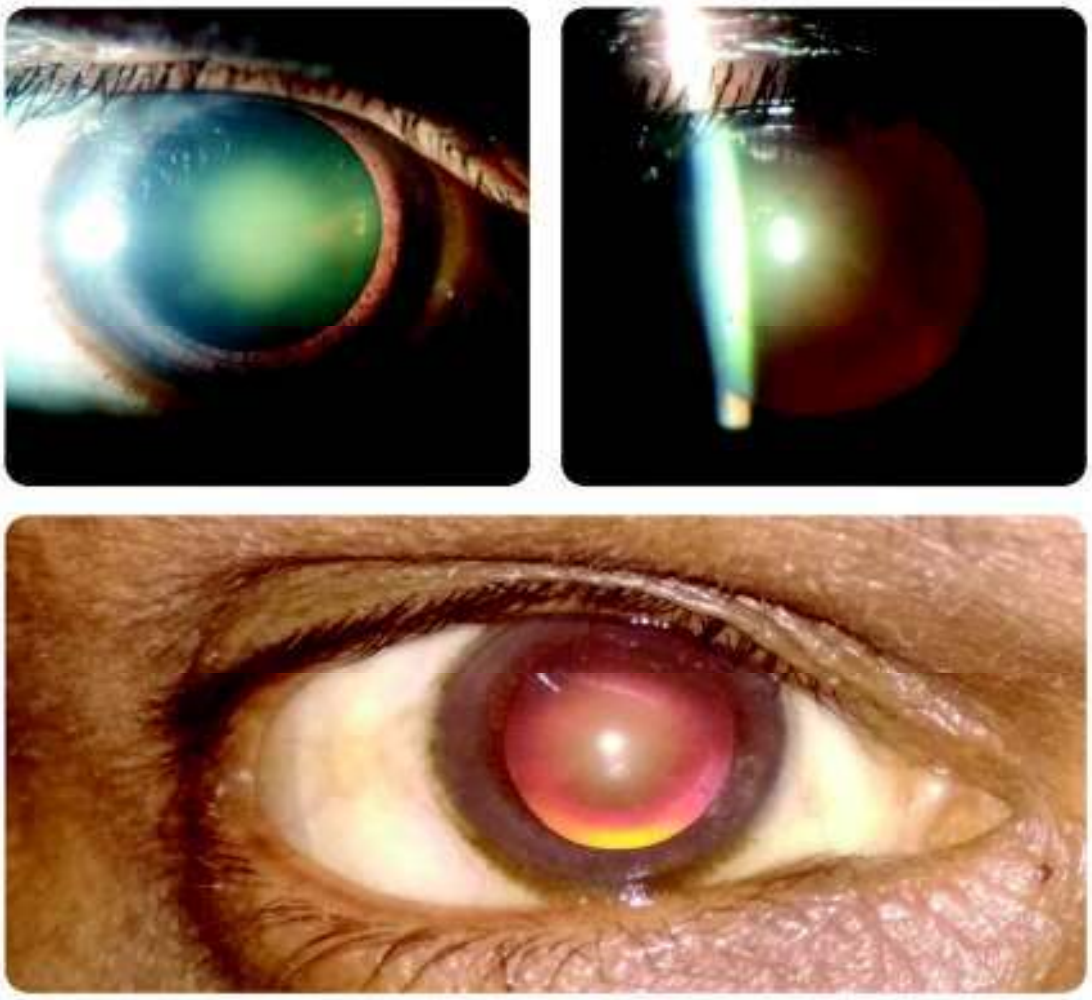


Figure 4: Posterior sub-capsular cataract in diffuse and retro-illumination in slit-lamp.

GLAUCOMA :

A rise in intraocular pressure (IOP) is the second most common adverse effect of corticosteroid therapy. If the elevation in IOP effect is of ample magnitude, for an adequate duration, optic nerve damage and corresponding visual field defect (steroid-induced glaucoma) may occur.

McLean in 1950 reported an increase in IOP induced by systemic administration of adrenocorticotropic hormone (ACTH)[35].

Francois in 1954 documented the first case of elevated IOP induced by local administration of steroid (cortisone)[36].

It has long been known fact that IOP alter diurnally and it has been suggested that this may be associated to cortisol levels. The diurnal IOP culminate at around 0700 hours and the trough occurs during the early evening, since the daily fluctuation in IOP closely correlates with the plasma cortisol levels[37]. Secondary rise in IOP in adrenal gland hyperplasia cases had been reported[38,39].

Corticosteroid can give rise to a clinical picture closely resembling that of primary open angle galucoma (POAG), with elevated IOP, decrease in outflow facility, open angles, and eventually optic nerve cupping and visual field loss.

Steroid-induced elevation of IOP has been observed to occur with various routes of steroid administration, but is most often identified as an adverse effect of topical corticosteroid used as drops or ointment with drug like dexamethasone or prednisolone[40,41,77] and also with chronic inhaled or nasal steroids[42], subconjunctival, sub-Tenon's injection[423]and systemic steroid therapy[44]. No gender or racial predilection exists.

Classic studies of **Armaly and Becker** indicates that 5-6% of normal individuals develop marked IOP rise after 4-6 weeks of topical dexamethasone or betamethasone administration[45,46].This outcome increases in greater frequency, on higher dose, or for a longer period[47]. **Weinreb et al reported** acute rise of IOP within hours of initiating intensive topical steroid therapy[48].

In responsive patients, the IOP typically rises after several weeks of continual corticosteroid therapy and returns to normal following cessation of such therapy. Steroid induced elevated IOP or glaucoma also documented when steroids used as lotions and creams by penetrating the eyelid skin.

Systemic steroids also produce steroid induced glaucoma based upon the dose, frequency and duration. Periocular steroids injections in the form of repositories[47] or depot preparations are also capable of elevating the IOP.

Recently, intra-vitreal injection of triamcinolone acetonide for diabetic macular edema or retinal vein occlusion has become popular. 30% of eyes having this treatment will show a transient rise in IOP. In some patients , the IOP may persist and may require topical medications, laser trabeculoplasty or even trabeculectomy to lower the IOP and prevent optic nerve damage.

Jonas JB et al.2005 did a meta-analysis study of 272 patients (305 eyes) receiving an intravitreal injection of 20 mg triamcinolone acetonide as treatment for diffuse diabetic macular edema, exudative age-related macular degeneration, retinal vein occlusions, uveitis, pseudophakic cystoid macular edema and other reasons[88]. With mean follow-up of 10.4+/-6.7 months, intraocular pressure higher than 21 mm Hg, 30 mm Hg, 35 mm Hg, 40 mm Hg were observed in 41.2%,11.4%, 5.5%, 1.8% patients respectively. All were treated with anti-glaucoma medications but in 3 eyes filtering surgery was done. Younger age was significantly associated with triamcinolone-induced ocular hypertension. No association was found between triamcinolone-induced ocular hypertension and gender, refractive error, diabetes mellitus and reason for treatment.

Vasconcelos et al.2008 did a retrospective study of 150 patients receiving 4 mg of intravitreal triamcinolone acetonide for diabetic

macular edema, neovascular age-related macular degeneration, choroidal neovasularization due to other etiology, central retinal vein occlusions and branch retinal vein occlusion. Secondary ocular hypertension (SOH) defined as intraocular pressure of >/=21 mm Hg was recorded in 32.0% eyes during a mean follow-up of 7.7 months. No association was found between SOH and age, sex, systemic hypertension, diabetes mellitus, indication for IVTA injection, prior cataract surgery, or concurrent photodynamic therapy. Peak IOP was lower in vitrectomized eyes. Risk factors for SOH are patients with prior galucoma and higher baseline IOP[89].

Mechanism of the corticosteroid induced glaucoma:

Corticosteroids causes rise in IOP by decreasing aqueous outflow facility[49-52]. Steroid specific receptors on the trabecular meshwork cells may be involved in the occurrence of steroid-induced glaucoma[53]. In recent studies the possible role of genetic influences in the pathophysiology has been elucidated.

The principal mechanism of action of steroids that is accountable for elevation of IOP is by their membrane stabilizing action[54]. Hyaluronidase sensitive glysosaminoglycans (mucopolysaccharides) are usually present in the aqueous outflow system. These

glycosaminoglycans in the polymerized state may get hydrated producing a 'biological edema'. Hence, these are persistently break down by the hyaluronidase within the lysosomes of the goniocytes.

Francois and Armaly both proposed that corticosteroids stabilize the lysosomal membrane of the goniocytes,that could decrease the release of lysosomal hyaluronidase, thus ends with relative inhibition of hyaluronate depolymerisation. The following collection of polymerised glycosaminoglycans in the trabecular meshwork, results in an increased outflow resistance[55,56,61,78]. Glucocorticoid use increases expression of collagen[57], fibronectin[58] and elastin[59] in the extracellular matrix within the trabecular meshwork and encourage expression of sialoglycoprotein[60].

Two designs of extracellular deposition have been described in the TM of steroid-induced glaucoma patients; collection of fine fibrillar material in the juxtacanalicular region and fingerprint-like deposition of the material in the uveal meshwork.

A decrease in the production of prostaglandins by corticosteroids, that regulates aqueous facility has also been put forward as one of the mechanisms leading to elevation of IOP[62].

Fig 05- FUNDUS IMAGE SHOWING LEFT OPTIC DISC WITH C:D-0.6 IN COLOR & RED FREE MODE.

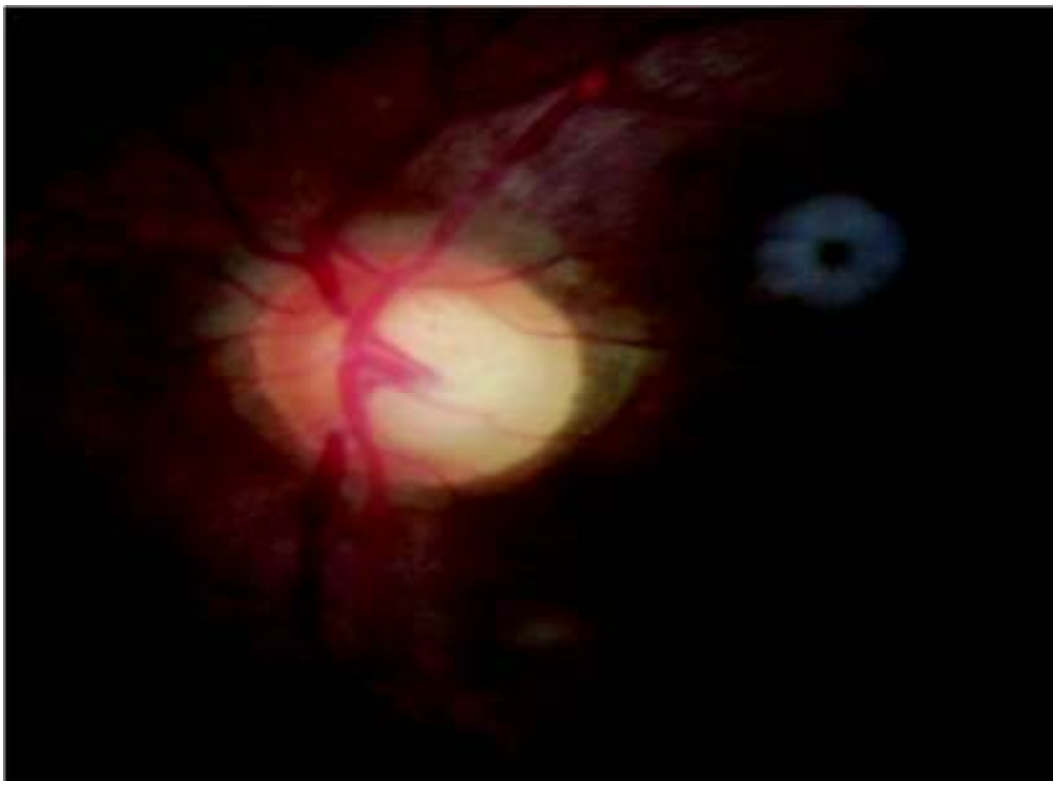
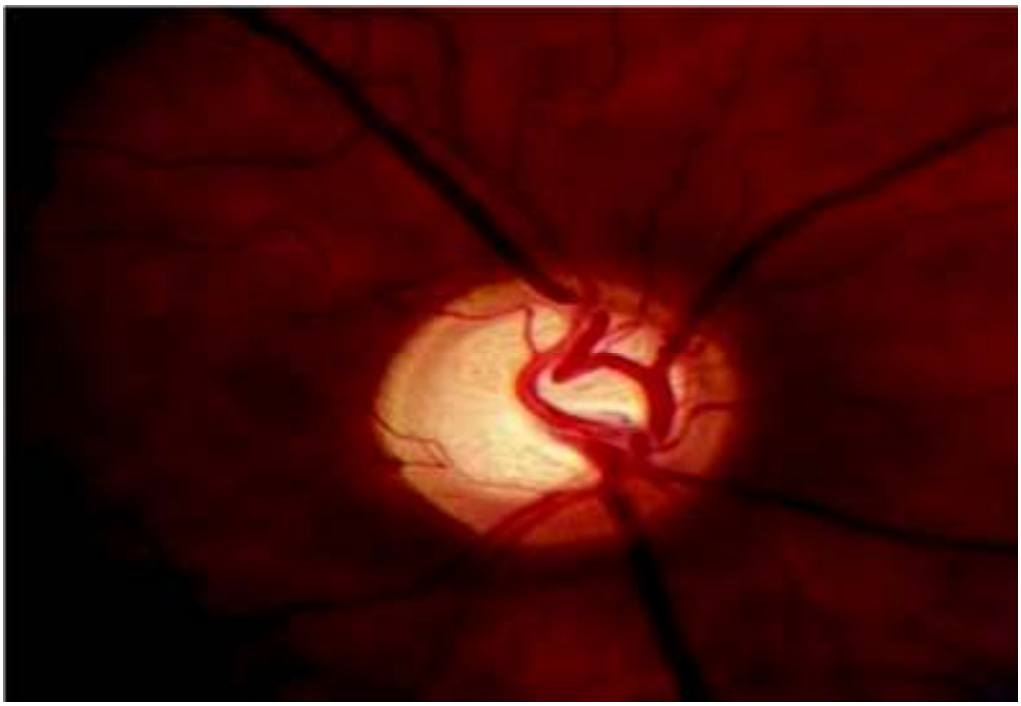


Fig 06- FUNDUS IMAGE SHOWING RIGHT OPTIC DISC WITH C:D-O.7 IN COLOR & RED FREE MODE



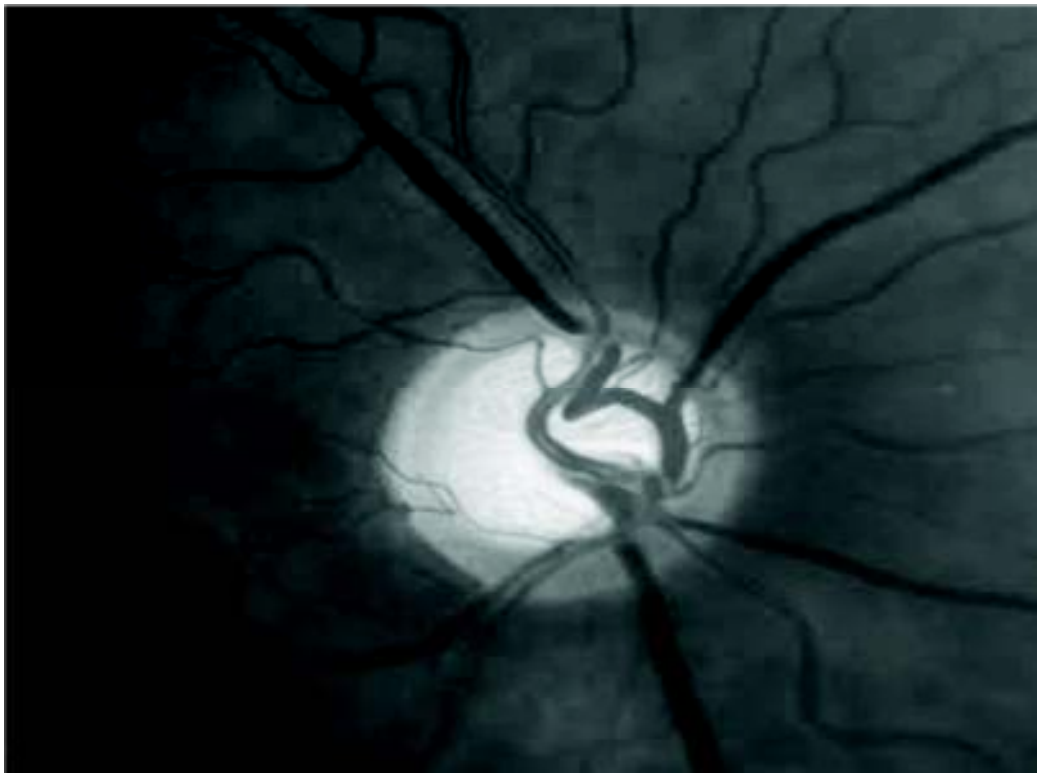
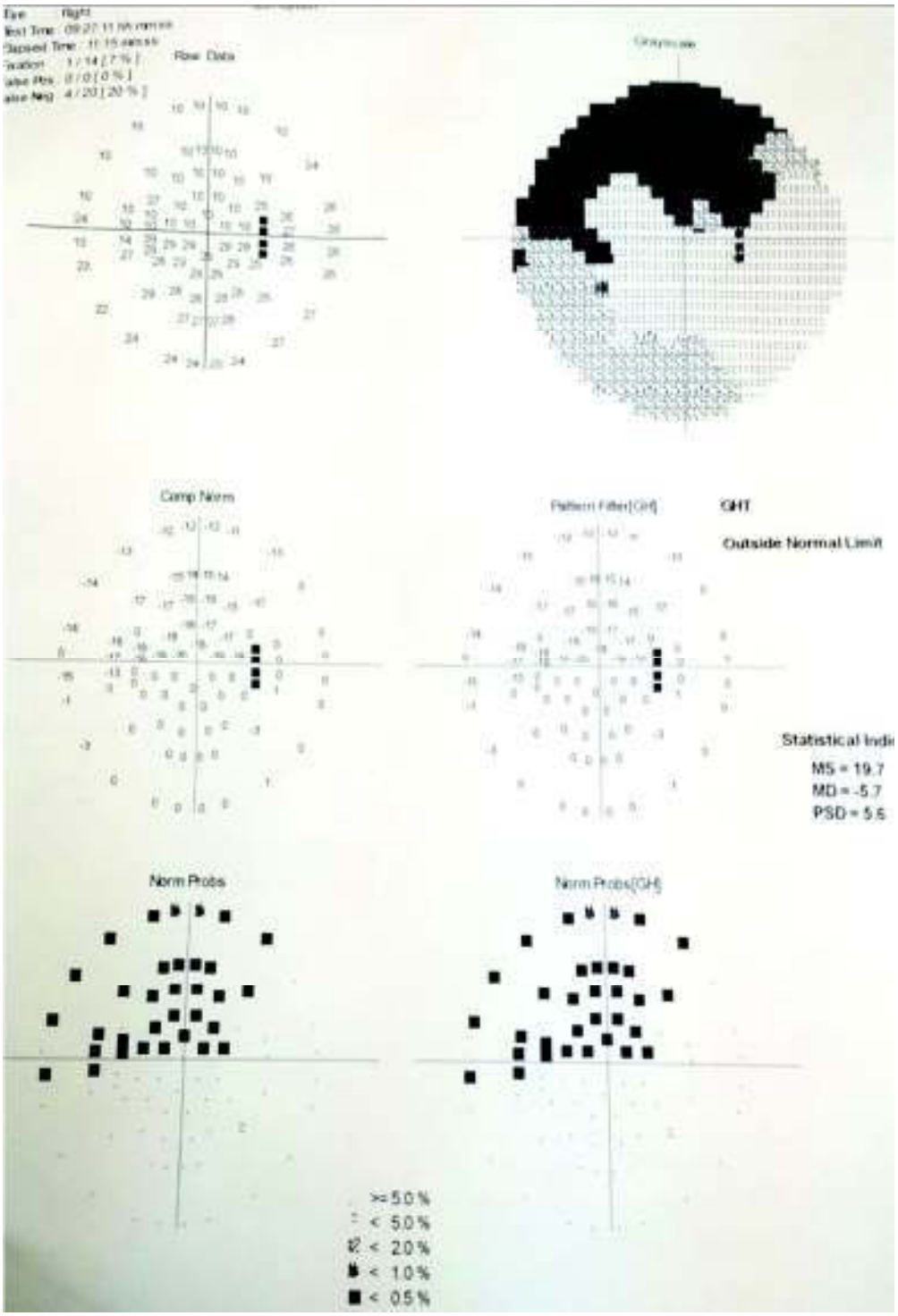


Figure 07- Humphrey Field Analysis of right eye showing arcuate scotoma



GENETICS:

Several authors have put forwarded a genetic susceptibility for corticosteroids[50,52,64]. Becker and Hahn in 1964, proposed that patient response to corticosteroids could be explained by a monogenic autosomal mechanism. Armaly and Becker refined this, and proposed that medium responders were heterozygotes while high responders were homozygotes.

Several genes have been demonstrated to be up-regulated in dexamethasone-treated TM cells, of which myocilin gene (TM-inducible glucocorticoid response or TIGR, gene product)[65-68], which is a 55 kDa protein is extensively studied. The role of myocilin in steroid-induced elevated IOP and glaucoma has been proposed because: 1. it is extremely expressed in trabecular cells exposed to glucocorticoids, 2. the delay in its expression is similar to the delay in the pressure rise in glucocorticoids treated eyes and 3. the dose required to cause the protein expression is similar to that needed to raise the IOP[69].

Risk factors for rise in IOP in patients on steroid therapy have been identified, although its mechanism is partly understood.

1. Patients with primary open-angle glaucoma[50,63]

2. Their first-degree relatives with POAG[70,71].

3. High myopia[72].

4. Diabetes mellitus[73].

5. A history of connective tissue disorders, especially rheumatoid arthritis[74].

6. Pigment dispersion syndrome[75].

7. Eyes with traumatic recession of the anterior chamber angle and their fellow eyes[76].

8. Endogenous hypercortisolism[39].

9. The relative potency, concentration, frequency, and duration of use of the steroids.

10. Combined us of topical and systemic steroids has an additive effect on IOP.

No sex or racial predilection exists for steroid-induced glaucoma.

CENTRAL SEROUS CHORIORETINOPATHY :

CSCR is an idiopathic ocular condition which is distinguished by pathologic accumulation of serous fluid at the posterior pole of the fundus, producing a localized retinal detachment[82]. Patients usually present with diminished vision, central scotoma, metamorphopsia and/or chromatopsia when the macular retina is associated, but are mostly asymptomatic with extrafoveal or eccentric lesions.

Although, the **pathogenesis** of the disease is partly understood, it has been accredited to dysfunction in the retinal pigment epithelium (RPE)[83], the choroid[84], or both. CSCR is generally seen in young or middle-aged adults, with some male predominance.

Glucocorticoids have been strongly incriminated as a pathogenic factor[85], since CSCR occurs both in conditions of endogenous glucocorticoids administered exogenously[86].

CSCR may manifest when exogenous corticosteroids are used by any route like systemic, inhalational, local , dermatologic[87] and topical. Even some forgotten exogenous corticosteroids use also had caused central serous chorioretinopathy.

Lowdew et al 1981, Wakakura et al 1987, Tittl et al 1999 have documented the prevalence of CSCR with exogenous corticosteroids use

as 10 percent[90,91,92]. Few more recent studies reported the prevalence as 29% and 52%, since CSCR can develop from few days to several years after the start of exogenous steroids and also even in low dose as 10-15 mg per day orally93,97. The incidence increases with the older people as they are more vulnerable even at small doses of steroids[94].

Accordingly, some authors have argued that CSCR should be added to the list of ocular complications of steroids, given by any route[95,96,97].

Figure 8: Fundus image of left eye showing central serous chorioretinopathy in color and red free mode

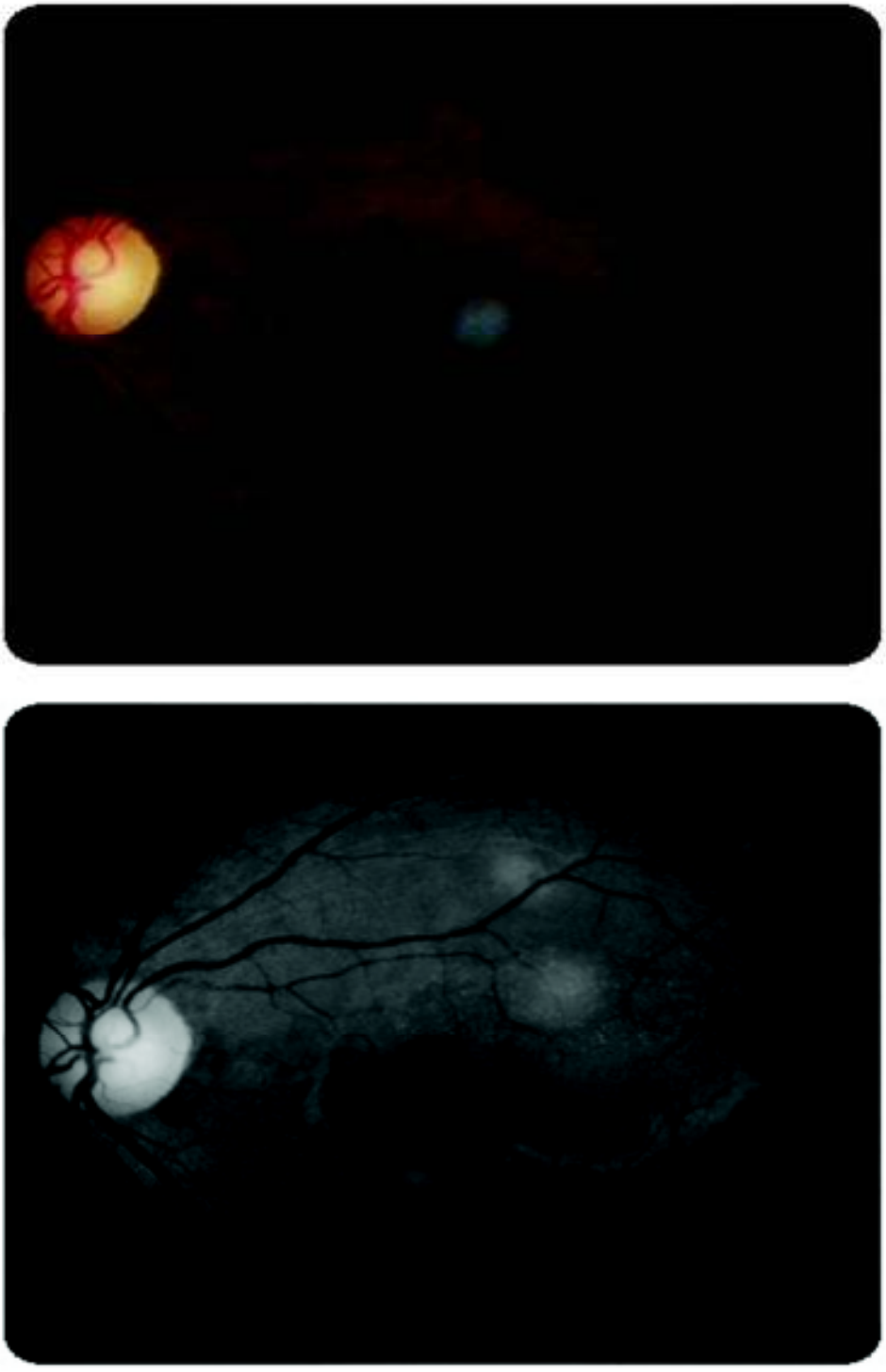


Figure 9: Optical coherence topography showing CSCR in left eye.

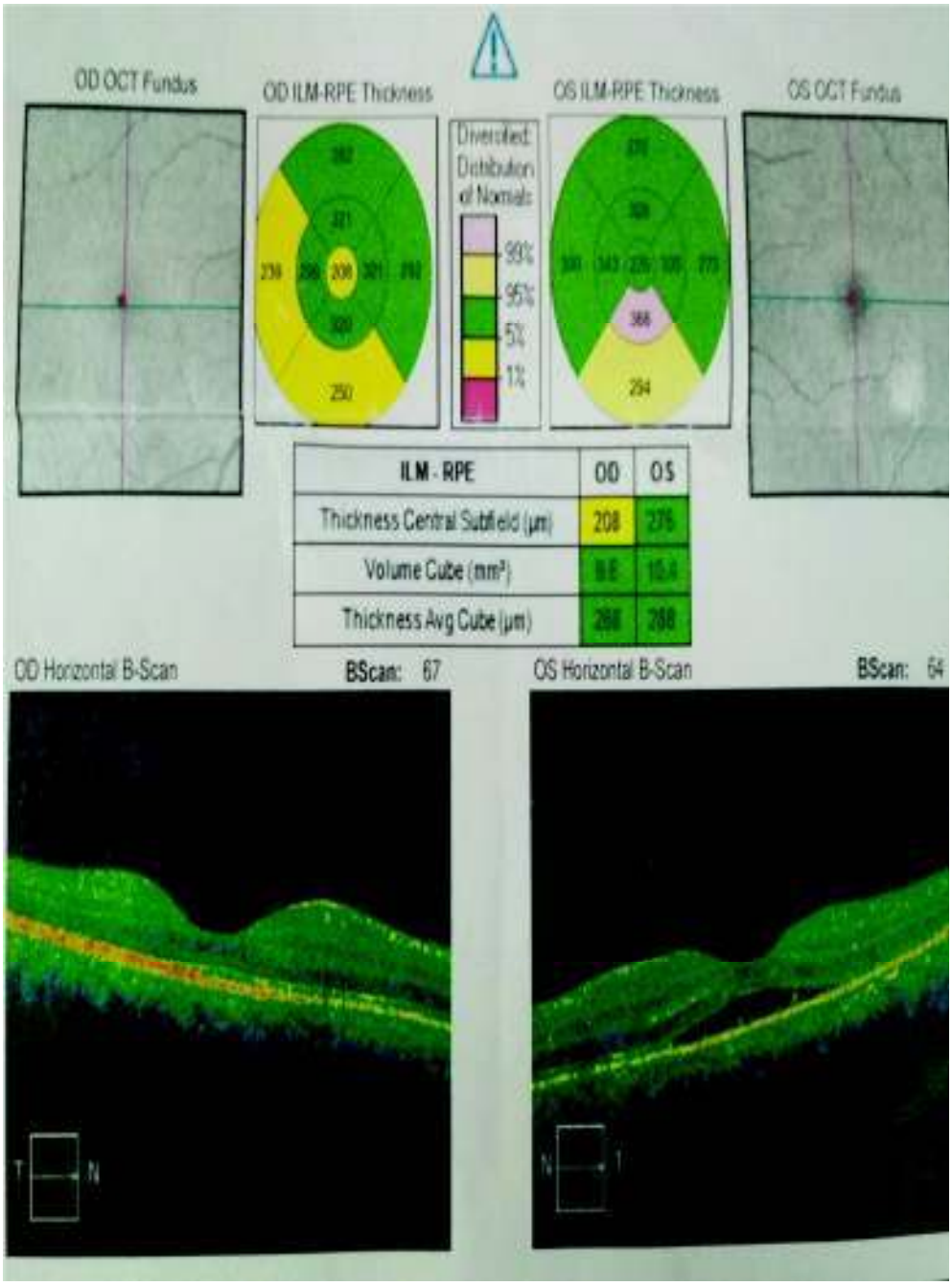
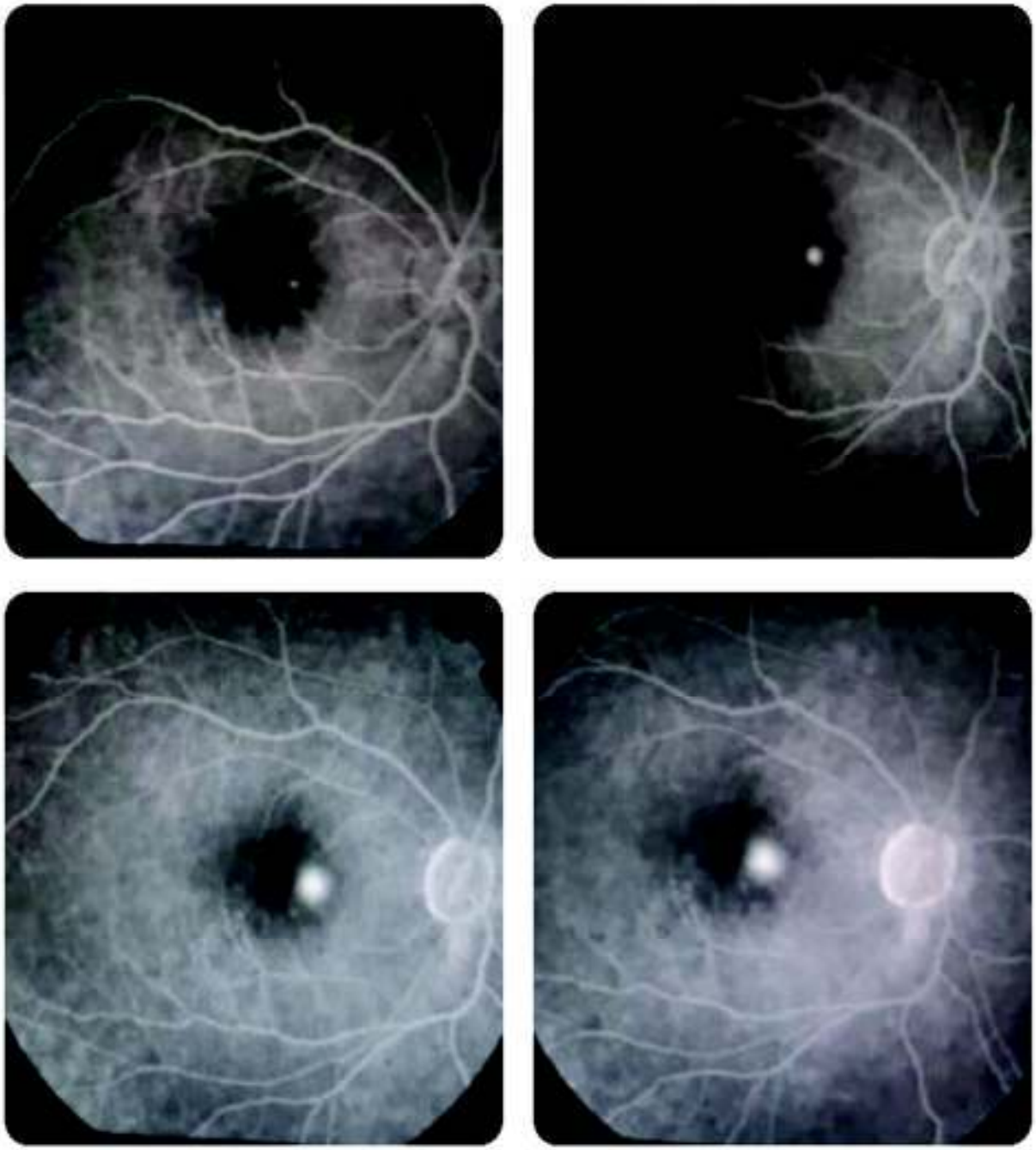


Figure10 : Fundus flurosceine angiography of right eye showing 'ink blot' appearance in CSCR



AIM AND OBJECTIVES

AIM :

To analyse the ocular effects of long term use of corticosteroids by various routes of administration for various disorders treated in a tertiary care hospital.

OBJECTIVES :

1. To study the prevalence of the ocular effects of long term use of corticosteroids in various diseases.
2. To emphasis the importance of regular ocular examination for the patients on long term steroid therapy.

MATERIAL AND METHODS

230 patients on long-term use of corticosteroids for various disorders attending eye op within our inclusion criteria were evaluated for any ocular manifestations in the department of Ophthalmology in Coimbatore medical college hospital for a period of one year from Jan-2017 to Dec-2017.

Detailed history including the past medical history and treatment history, form, frequency and duration of usage of corticosteroids was recorded. Blood pressure and blood sugar was recorded.

A comprehensive ophthalmological examination was done including visual acuity, intra-ocular pressure measurement, color vision, visual fields, slit lamp biomicroscopy and ophthalmoscopic examination.

Study design :

This is a cross-sectional study involving patients on long term use of corticosteroids for various systemic diseases.

Setting :

Study was conducted at the Department of Ophthalmology, Coimbatore Medical College Hospital, Coimbatore.

Duration of the study :

One year period – from January 2017 to December 2017.

Study population :

Patients attending the Dermatology, Thoracic medicine, Rheumatology and Ophthalmology OPD in Coimbatore medical college hospital were included in the study based on selection criteria.

Inclusion criteria :

1. Patients on long term use (> 6 months) of corticosteroids for any disease.
2. Age group:15-50 years.
3. Patients on various routes of corticosteroids administration (topical, inhalation and systemic).

Exclusion criteria :

1. Patients with history of any previous primary ocular diseases.
2. Patients with diabetes, hypertension.
3. Patients with history of ocular trauma.

STUDY METHODOLOGY :

The study population of 230 patients between 15-50 years of age on long-term use of steroids in all forms were taken up for study for ocular manifestations of corticosteroids.

Informed consent was obtained from the patients selected for study.

Data were collected using structured questionnaire which comprises socio-demographic characteristics like age, gender, detailed medical history, form and duration of usage of corticosteroids.

Clinical Examination includes :

1. Uncorrected and best corrected Visual Acuity for distant vision using Snellen's distance vision chart and Snellen's near vision chart for near vision.
2. Intra-ocular pressure measurement using Goldmann applanation tonometry.
3. Anterior segment examination including slit lamp bio-microscopy with undilated and dilated pupil.
4. Fundus examination using slit lamp bio-microscopy with +90D lens and indirect ophthalmoscope.

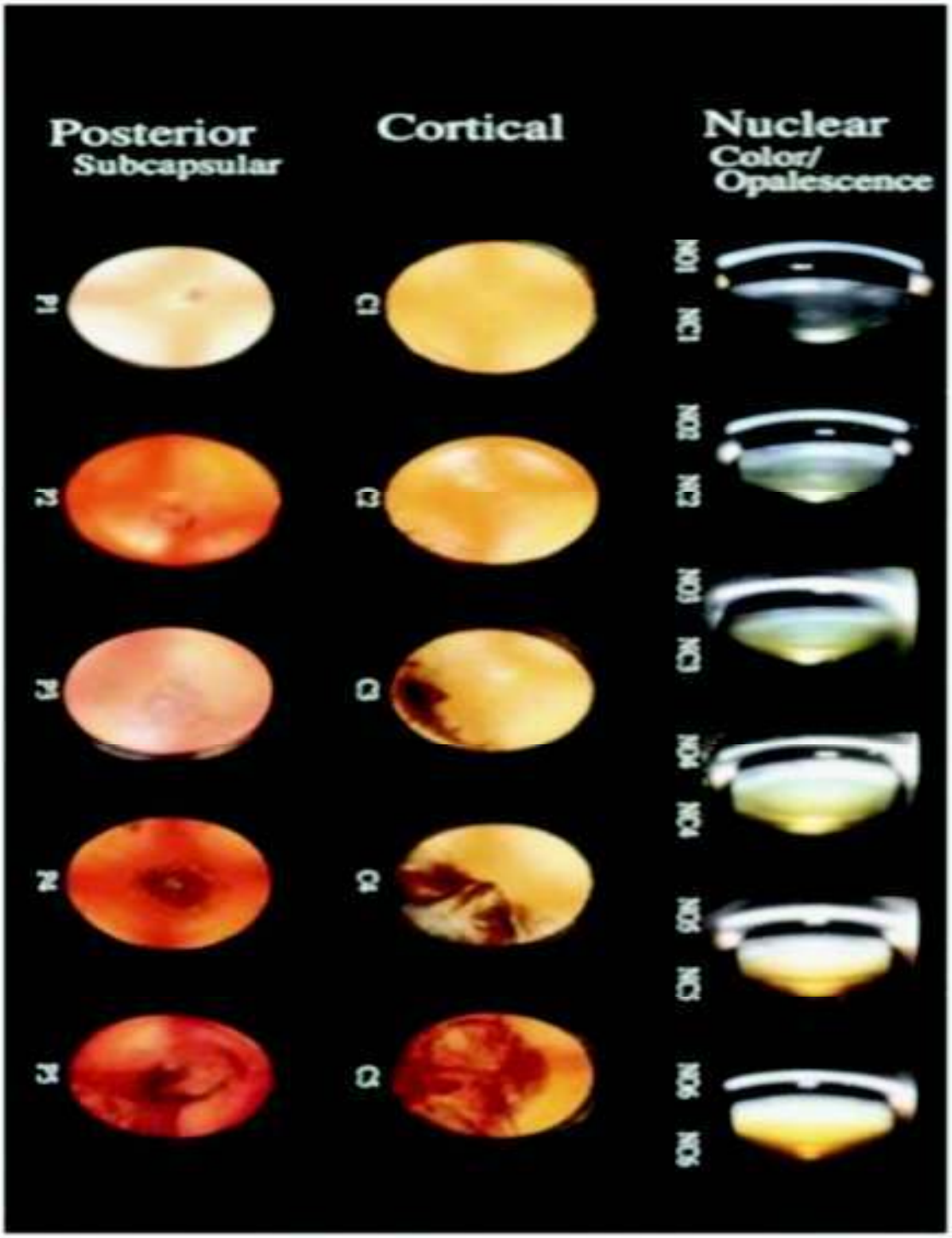
5. Color vision using Ishihara chart.

6. Visual fields using Humphrey field analyzer.

Data were analysed for the prevalence of ocular effects.

On slit lamp bio-microscopy, anterior segment is inspected and lens changes are documented based on Lens Opacities Classification system III (LOCS III). It is a standardized photographic comparison system for grading the features of the human age-related cataract[98]. It consists of six slit-lamp images for grading nuclear color (NC) and nuclear opalescence (NO), five retro-illumination images for grading cortical cataract (C), and five retro-illumination images for grading posterior subcapsular (P) cataract. Cataract severity is graded on a decimal scale, and the standards have regularly spaced intervals on a decimal scale.

Figure 11 : Lens Opacities Classification system III (LOCS III)



STATISTICAL ANALYSIS

Data analysis was performed using statistical software package SPSS version 22.9. Both descriptive and inferential statistics were used. The data of categorical and ordinal variable were represented as frequencies and proportions. The data of continuous variable was represented as mean +/- standard deviation or mean based inter quartile range depending on the distribution of data. The comparison of continuous variable across different subgroups was done using one way analysis of variance (ANOVA). The comparison of categorical and ordinal variable across different subgroups were done using chi-square test. Correlation analysis was done by estimating Pearson estimation coefficient. P value of less than 0.05 was considered significant.

RESULTS AND OBSERVATION

DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

Demographic and clinical data of 230 patients are presented below

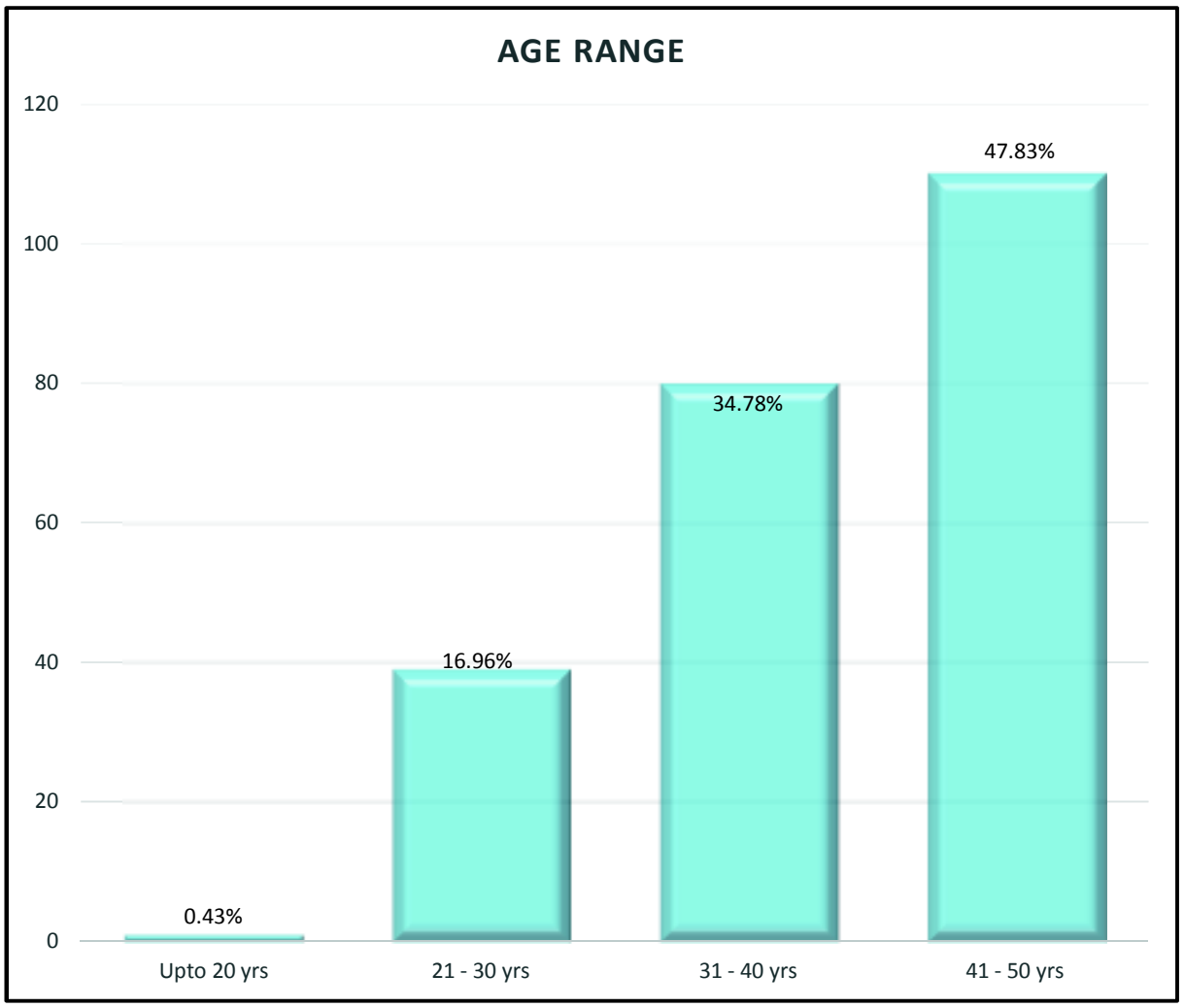
AGE DISTRIBUTION

Age of the patients ranged from 15 years to 50 years. The mean age of the study population is 39.36 years, the standard deviation being 8.046.

TABLE 01: Age distribution of study participants

AGE GROUP	FREQUENCY(n)	PERCENTAGE(%)
0-20	1	0.43
21-30	39	16.96
31-40	80	34.78
41-50	110	47.83
Total	230	100.00

CHART 01-Age distribution



Majority of the patients belonged to the age group of 41-50 (n=110, 47.83%).

GENDER DISTRIBUTION

Female were more in the study group (n=129, 56.1%).

TABLE 02- Gender distribution

SEX	FREQUENCY (n)	PERCENTAGE (%)
Female	129	56
Male	101	44
Total	230	100.0

CHART 02- Gender distribution

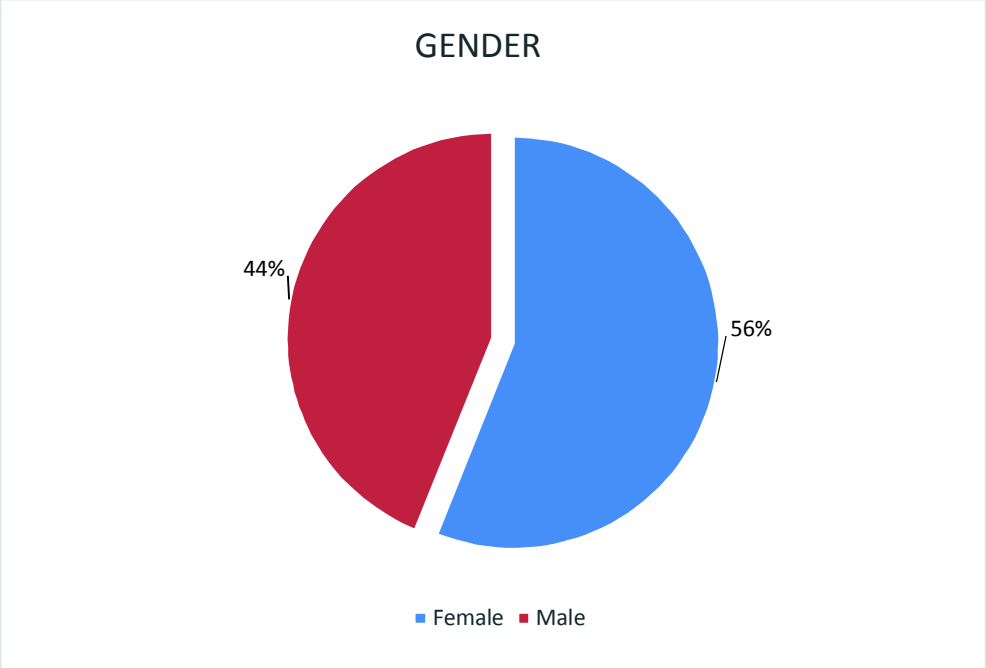
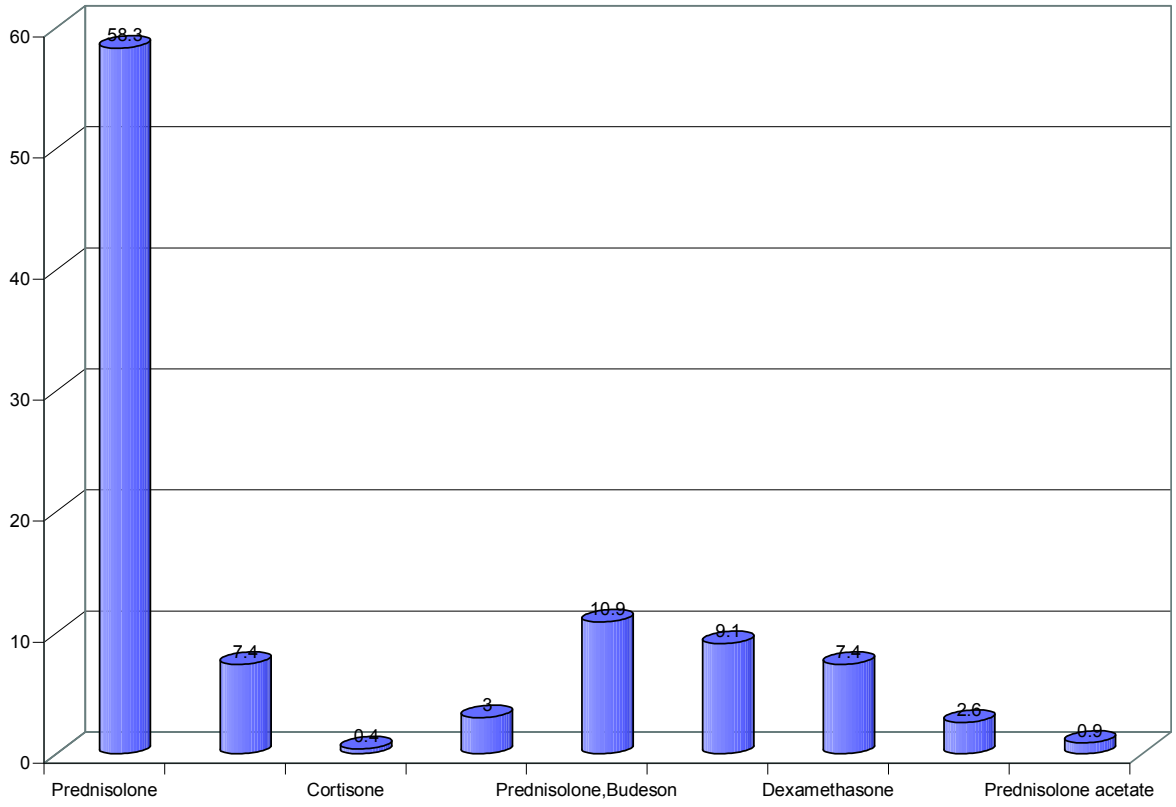


TABLE No 03- Frequency of steroids used

DRUGS	FREQUENCY	PERCENTAGE
Prednisolone	134	58.3
Betamethasone	17	7.4
Cortisone	1	.4
Prednisone	7	3.0
Prednisolone, Budesonide	25	10.9
Budesonide	21	9.1
Dexamethasone	17	7.4
Fluticasone	6	2.6
Prednisolone acetate	2	.9
Total	230	100.0

CHART O3- Distribution of steroids used



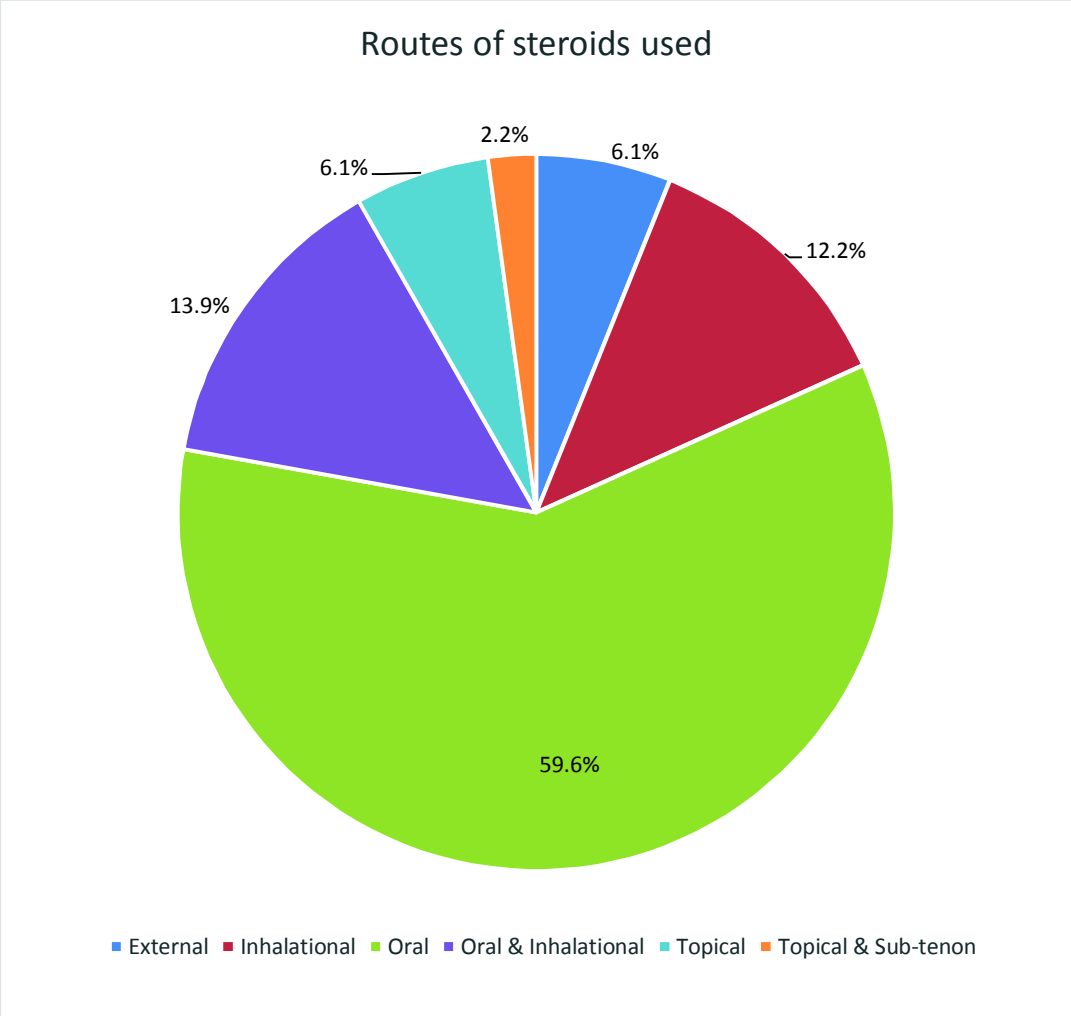
Prednisolone was the oral steroids which was used by most of the patients in our study group (n=134, 58.3%), followed by prednisolone with budesonide (n=25, 10.9%). Cortisone was least the used (n=1,0.4%).

ROUTES OF USE OF STEROIDS

TABLE 04- Various routes of use of steroids

ROUTE OF ADMINISTRATION	FREQUENCY (n)	PERCENTAGE (%)
External	14	6.1
Inhalational	28	12.2
Oral	137	59.6
Oral & Inhalational	32	13.9
Topical	14	6.1
Topical & Sub-tenon	5	2.2
Total	230	100.0

CHART 04- Routes of steroids used

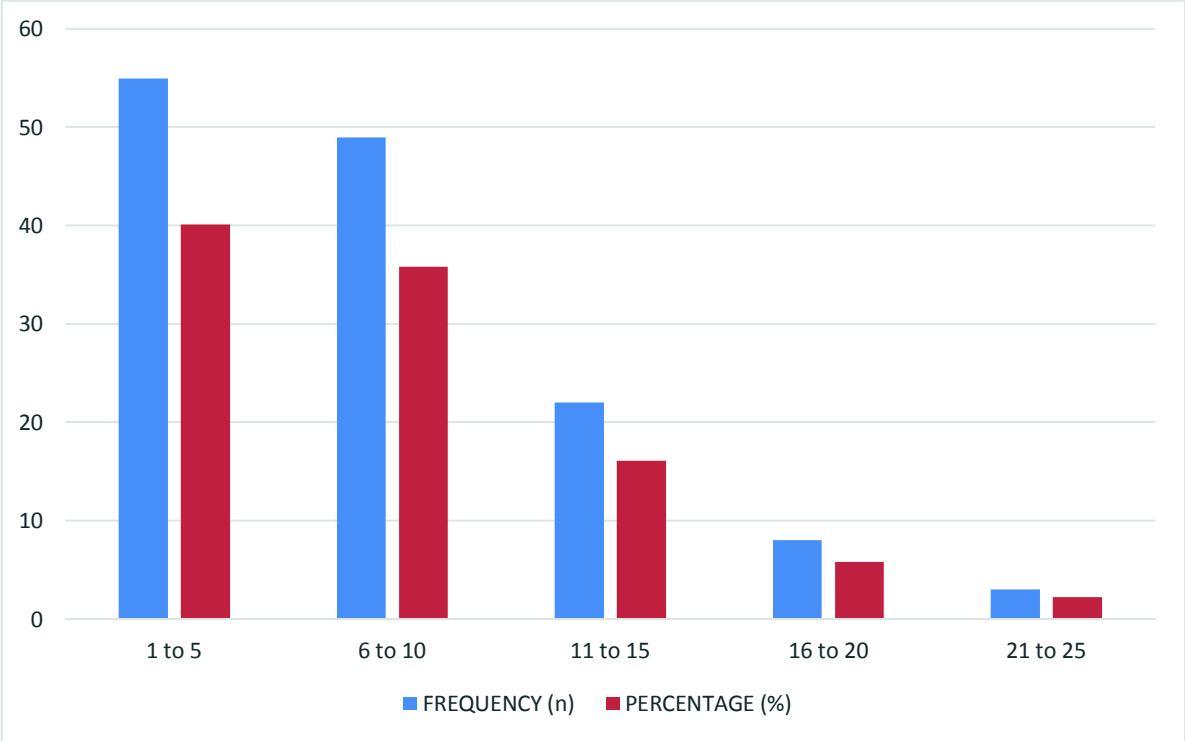


Majority of patients had steroids in oral route (n=137, 59.6%), followed by oral and inhalational steroids (n=32, 13.9%). Topical with sub-tenon steroids were least used (n=5,2.2%)

TABLE 05-Dose distribution of oral steroids

DOSAGE (mg)	FREQUENCY (n)	PERCENTAGE (%)
1 to 5	55	40.1
6 to 10	49	35.8
11 to 15	22	16.1
16 to 20	8	5.8
21 to 25	3	2.2
Total	137	100.0

Chart 05- Dose distribution of oral steroids



Most of the patients had 1 to 5 mg of oral steroids (n=55, 40.1%), followed by 6 to 10 mg (n=49, 35.8%). 21 to 25 mg was least used (n=3, .2%).

TABLE 06- Dose wise distribution of inhalational steroids

DOSAGE (mcg)	FREQUENCY(n)	PERCENTAGE(%)
80	1	3.6
125	6	21.4
250	7	25
360	14	50
Total	28	100.0

Out of 28 patients on inhalational steroids, 50% (n=14) were using 360 mcg.

Chart 06- Dose wise distribution of inhalational steroids

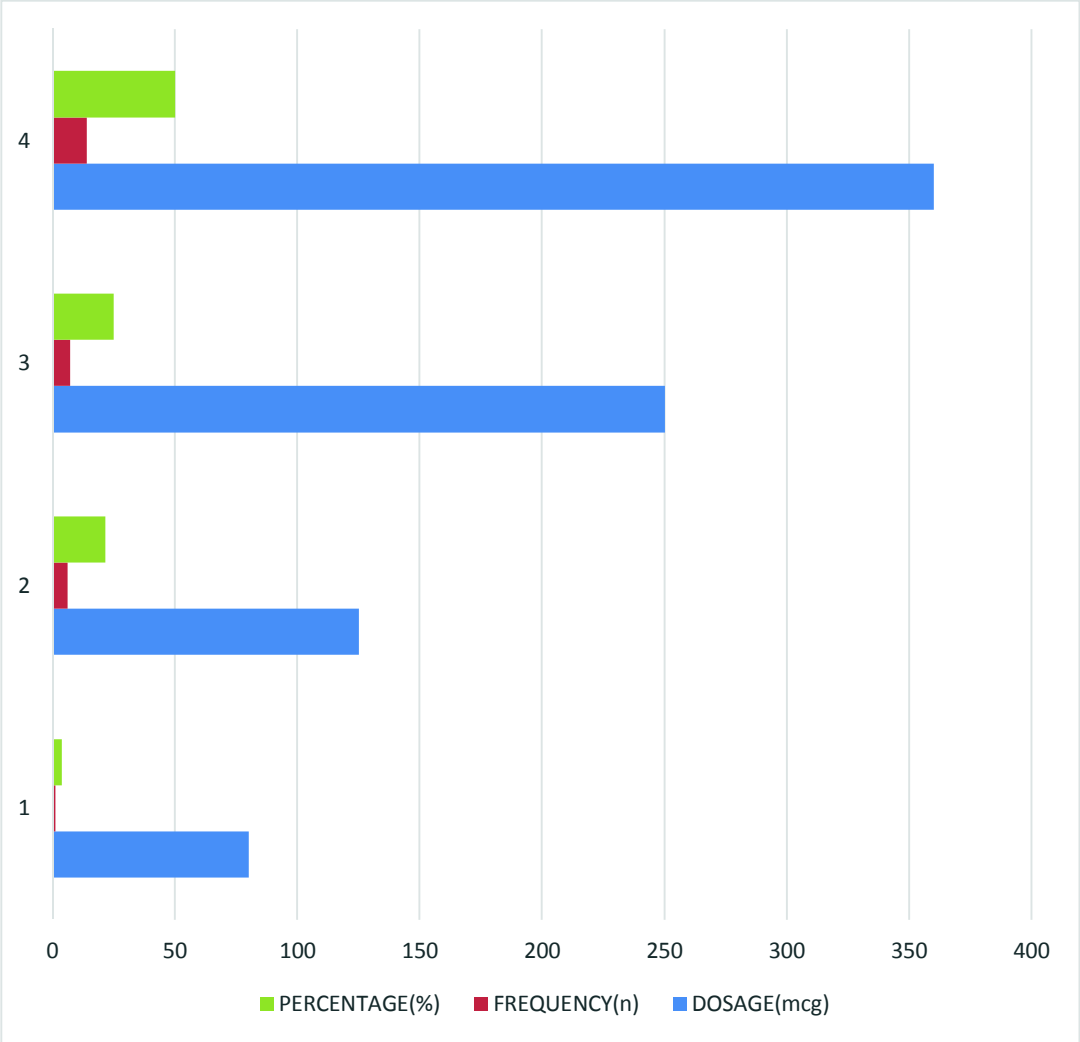


Table 07- Frequency of dose wise distribution of the oral and inhalational steroids.

DOSAGE (mg, mcg)	FREQUENCY	PERCENTAGE
5,250	3	9.4
5,360	7	21.9
7.5,360	4	12.5
10,80	1	3.1
10,125	6	18.7
10,250	6	18.7
10,360	2	6.3
15,250	3	9.4
Total	32	100.0

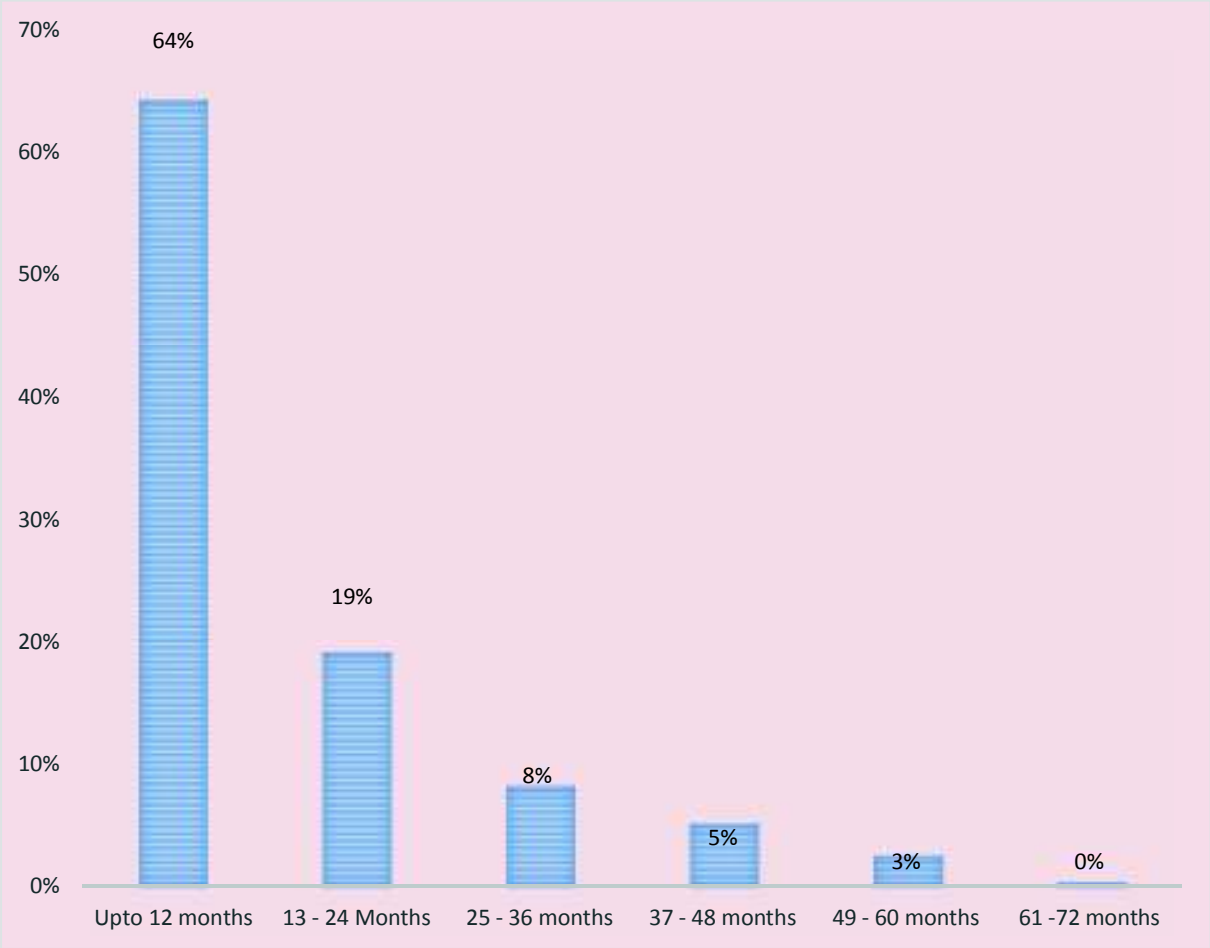
Table 08- Frequency of dose wise distribution of topical and subtenon steroids.

DOSE (%)	FREQUENCY	PERCENTAGE
0	211	91.7
0.1%	13	5.7
1%	1	0.4
0.1%, 0.4cc	5	2.2
Total	230	100

Table 09- Frequency of overall duration of use of steroids.

DURATION (in months)	FREQUENCY (n)	PERCENTAGE (%)
6-12	148	64.35
13-24	44	19.13
25-36	19	8.26
37-48	12	5.22
49-60	6	2.61
61-72	1	0.43
Total	230	100.0

Chart 07- Frequency of overall duration of use of steroids.



Almost 64.35% of the patients (n=148) had taken steroids for 6 to 12 months. Only one patient (0.4%) had taken steroids for >61 months duration.

Table 10- Duration of use of various forms of steroids.

DURATION (m)	MINIMUM	MAXIMUM	MEAN	STANDARD DEVIATION
External	7	16	9.36	2.620
Inhalational	7	48	29.68	12.114
Oral	6	60	14.09	12.568
Oral & Inhalational	8	72	25.88	17.720
Topical	6	16	9.93	3.174
Topical &Sub-tenon	6	9	7.00	1.225
Total	6	72	16.93	14.112

Minimum duration of steroids used was 6 months and the maximum was 72 months. Mean duration of use of steroids was 16.93 months with a standard deviation of 14.112.

Chart 08- Duration of use of various forms of steroids

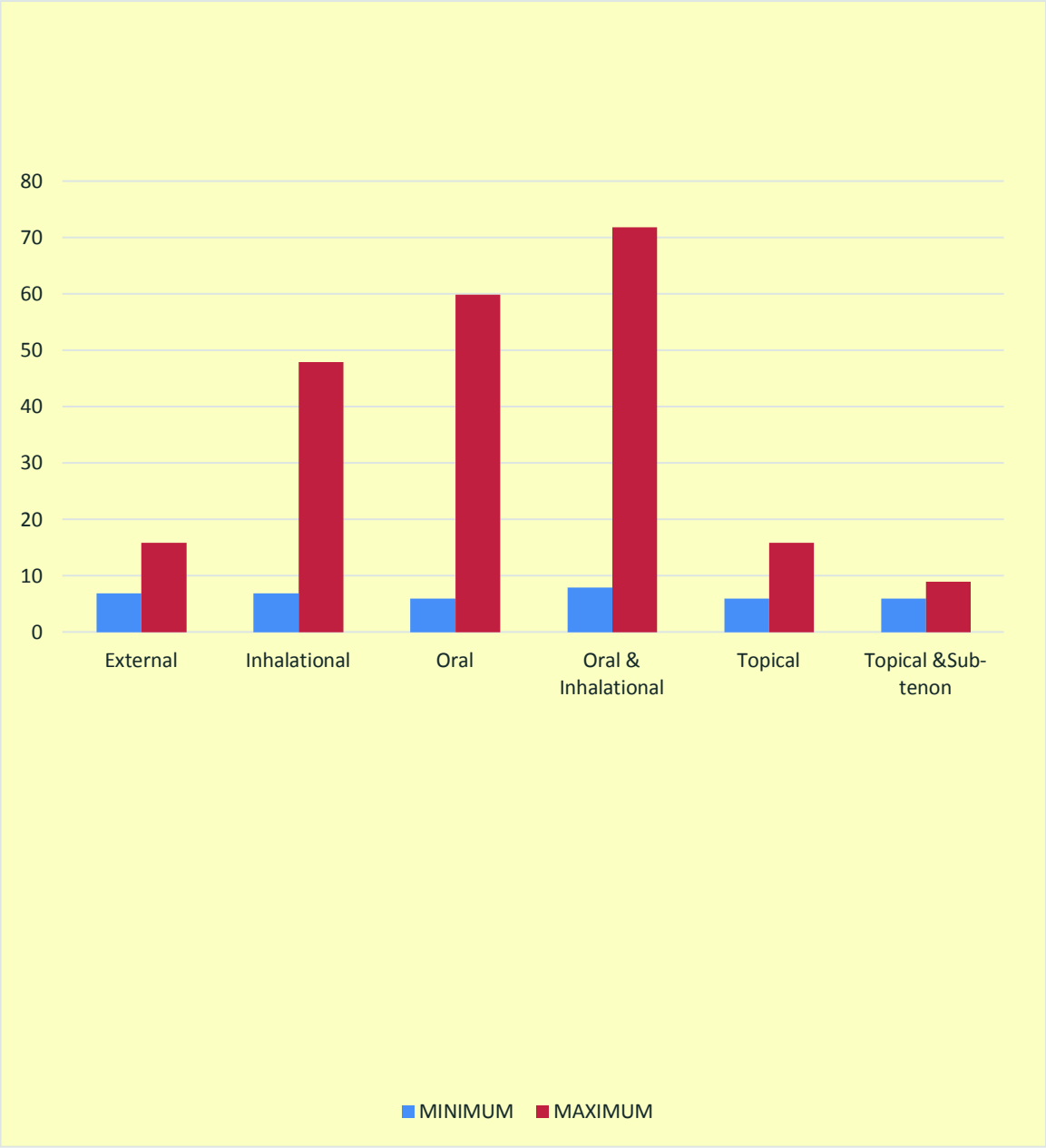


TABLE 11- Prevalence of lens opacities based on LOCS III

CATARACT	FREQUENCY (n)	PERCENTAGE (%)
P1	64	55.2
P2	35	30.2
P3	9	7.8
P4	4	3.4
P5	4	3.4
Total	116	100.0

Number of subjects who got any stage of lens opacities (PSCC) were 116 (50.4%), of which P1 were 55.2% (n=64), P2 30.2% (n=35), least common were P4 and P5 with 3.4% (n=4).

Chart 09- Overall prevalence of lens opacities based on LOCS III

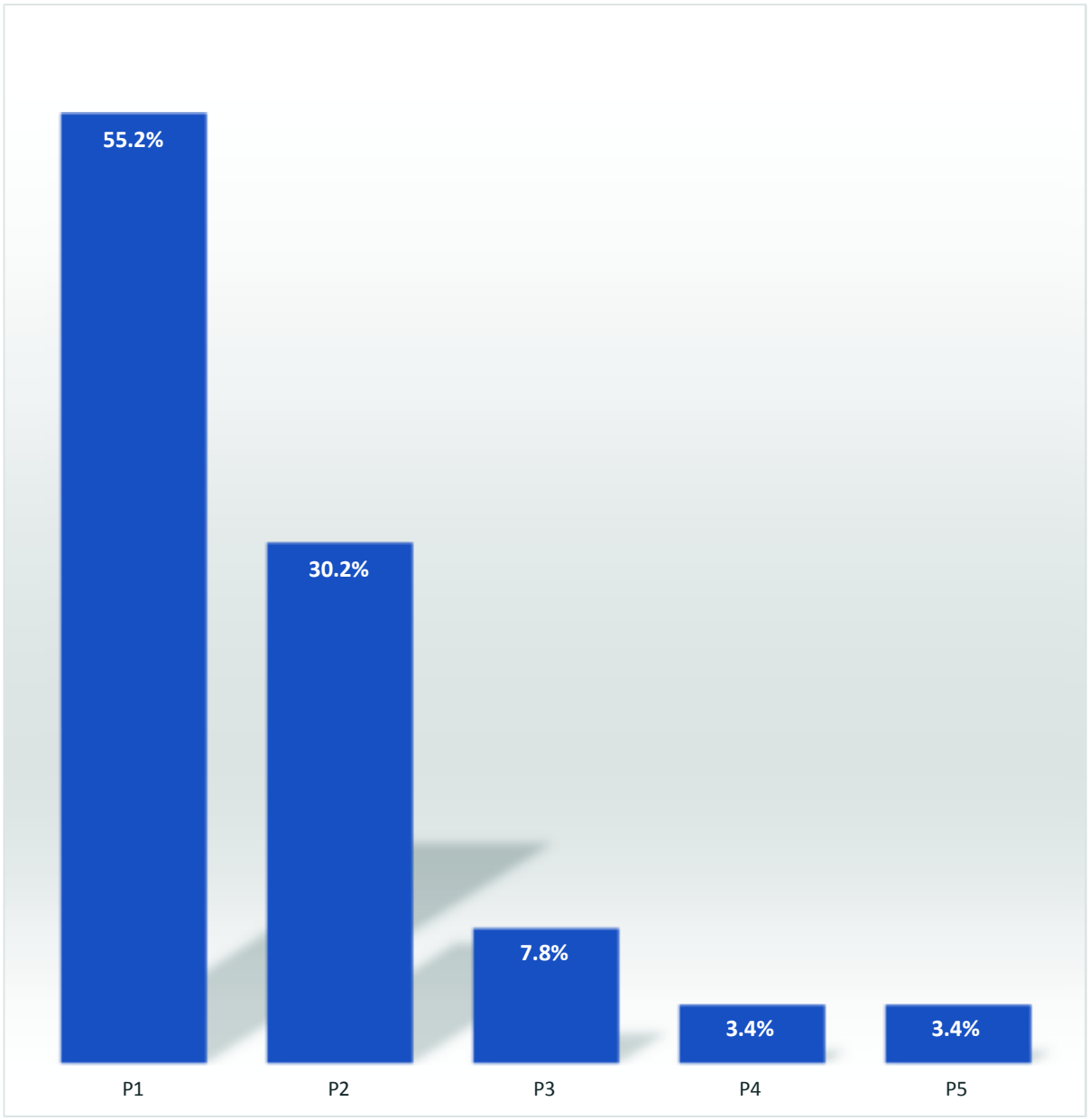


Table 12a - Prevalence of lens opacities in various forms of steroids.

ROUTE OF ADMINISTRATION	FREQUENCY (n)	PERCENTAGE (%)
External	1	0.82
Inhalational	23	16.52
Oral	57	53.72
Oral & Inhalational	30	24.79
Topical	5	4.13
Topical & Sub-tenon	0	0
Total	116	100.0

In 116 patients who developed lens opacities, almost 54% (n=57) were oral steroid users, 25% (n=30) were oral and inhalational steroids users, 17% (n=23) were inhalational users, 4% (n=5) were topical users.

Chart 10- Prevalence of lens opacities in various forms of steroids

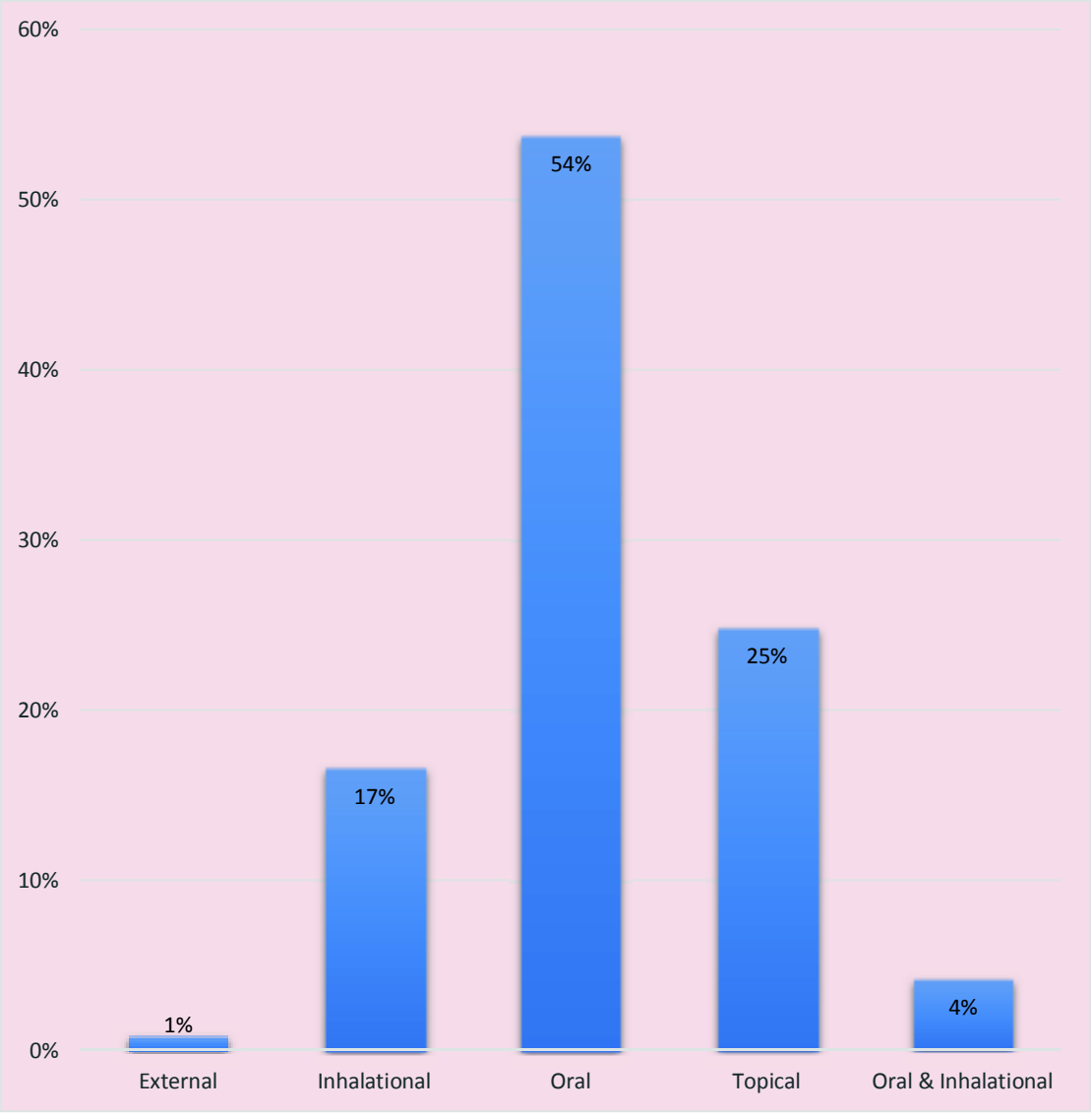


TABLE- 12b-Frequency of prevalence of lens opacities in all forms of steroids

LENS CHANGES	E		I		O		O & I		T		T & ST		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
C	*13*	*92.9 %*	*5*	*17.9 %*	*80*	*58.4 %*	*2*	*6.3 %*	*9*	*64. 3%*	*5*	*100 %*	*114*	49.6%
P1	1	7.1%	13	46.4 %	36	26.3 %	11	34.4 %	3	21. 4%	0	0.0 %	64	27.8%
P2	0	0.0%	7	25.0 %	13	9.5%	13	40.6 %	2	14. 3%	0	0.0 %	35	15.2%
P3	0	0.0%	2	7.1 %	5	3.6%	2	6.3 %	0	0.0 %	0	0.0 %	9	3.9%
P4	0	0.0%	1	3.6 %	2	1.5%	1	3.1 %	0	0.0 %	0	0.0 %	4	1.7%
P5	0	0.0%	0	0.0 %	1	0.7%	3	9.4 %	0	0.0 %	0	0.0 %	4	1.7%
Total	14	100 %	28	100 %	137	100 %	32	100 %	14	100 %	5	100 %	230	100%

93.8% (n=30) of oral and inhalational users developed lens opacities, followed by inhalational users with 82.2% (23), oral users with 41.6% (n=57), topical users 37.7% (n=14) and external users with 7.1% (n=1).

With p value of 0.0001, a statistically significant association was found between steroids used in any form with lens opacities formation.

Table 13-Prevalence of elevated intra-ocular pressure

ELEVATED IOP (mm Hg)	FREQUENCY(n)	PERCENTAGE(%)
22 to 25	73	80.0
26 to 30	12	13.3
31 to 35	4	4.4
36 to 45	1	1.1
Total	90	100

In our study group 39.1% (n=90) got elevated IOP in one or both eyes.

CHART 11-Overall prevalence of elevated IOP

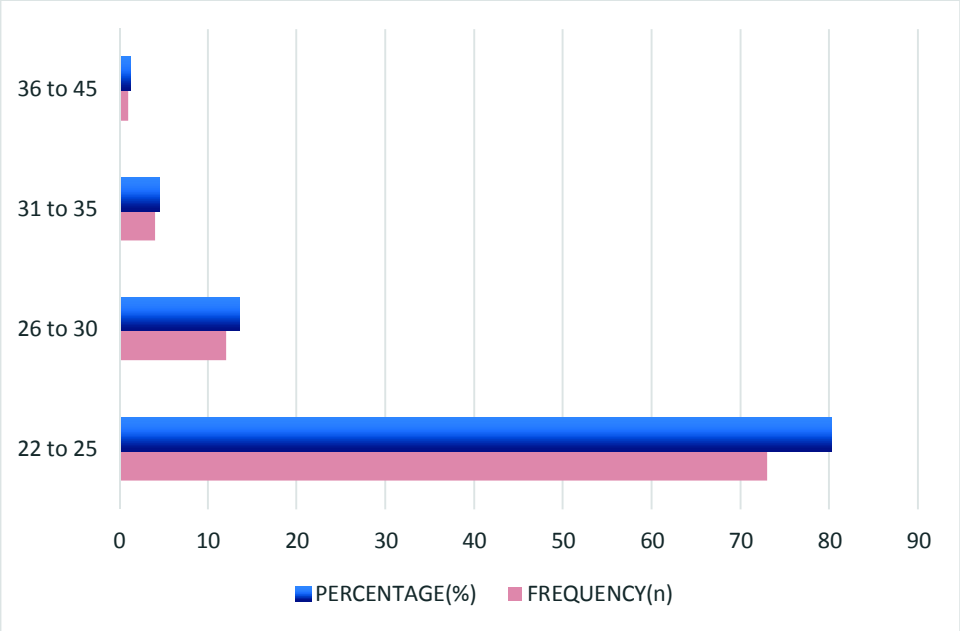


Table 14- Prevalence of elevation of IOP and C:D ratio with visual field defects

ROUTE OF DRUG	FREQUENCY(n)	PERCENTAGE(%)
E	1	6.7
I	4	26.6
O	9	60.0
T	0	0.0
O,T	1	6.7
T,ST	0	0.0
Total	15	100

Chart 12- Prevalence of elevation of IOP and C:D ratio with visual field defects

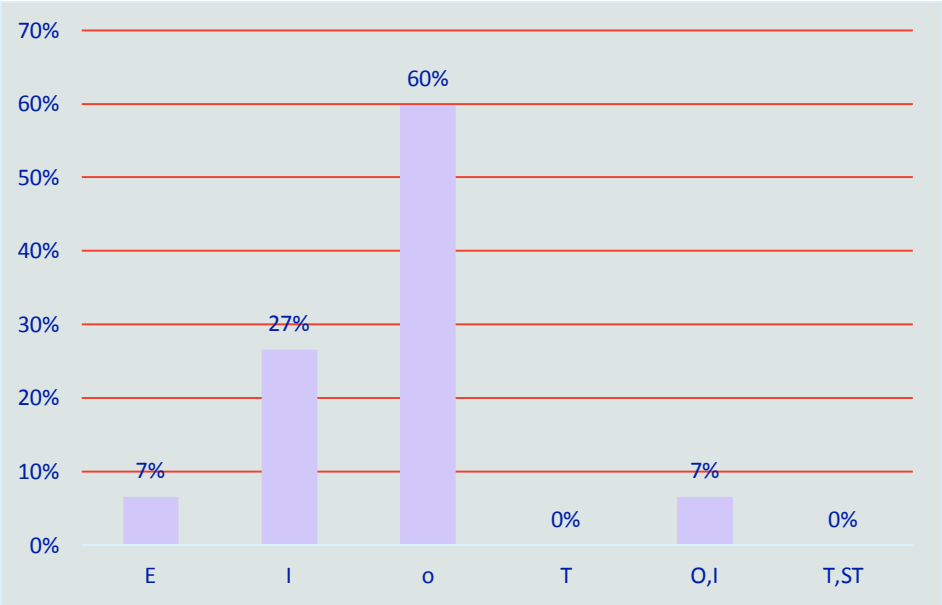


Table 15a- Prevalence of elevated IOP in various form of steroids

ROUTE OF ADMINISTRATION	FREQUENCY (n)	PERCENTAGE (%)
External	2	2.15
Inhalational	12	10.75
Oral	44	51.61
Oral & Inhalational	16	18.28
Topical	11	11.83
Topical & Sub-tenon	5	5.38
Total	90	100.0

Chart 13- Prevalence of elevated IOP in various form of steroids

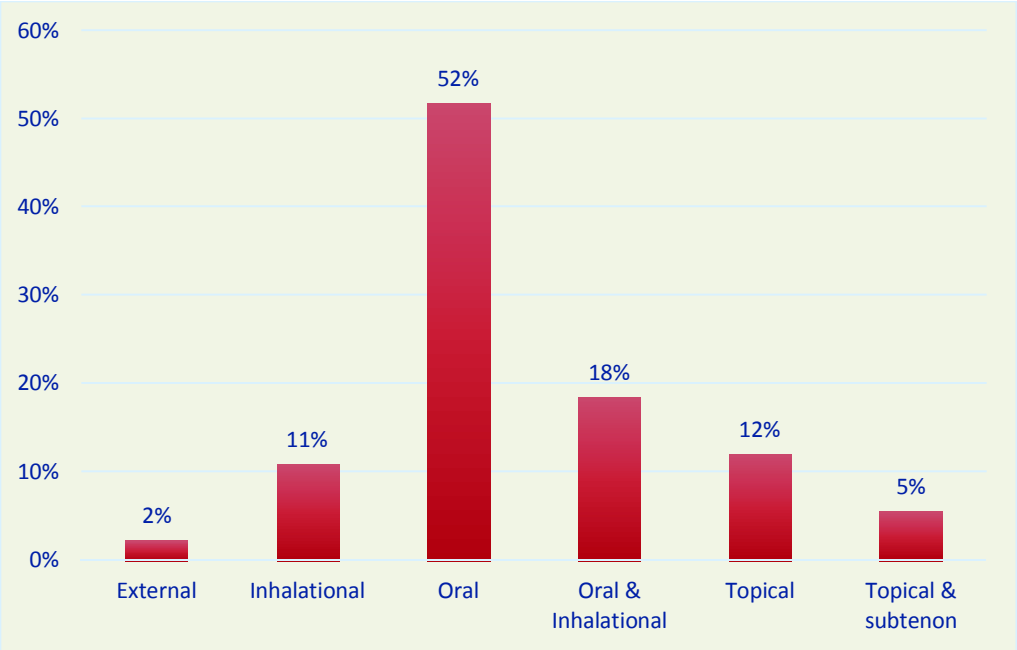


Table 15b- Prevalence of elevated IOP in various routes of steroids

RISE IN IOP	E		I		O		O & I		T		T & ST		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
< 21	12	85.7 %	*16*	*57.1 %*	*93*	67.9 %	*16*	50.0 %	*3*	21.4 %	0	0.0 %	*140*	60.9 %
22-25	2	14.3 %	6	21.4 %	39	28.5 %	15	46.9 %	8	57.1 %	3	60.0 %	73	31.8 %
26-30	0	0.0%	3	10.7 %	3	2.2%	1	3.1 %	3	21.4 %	2	40.0 %	12	5.2%
31-35	0	0.0%	2	7.1 %	2	1.4%	0	0.0 %	0	0.0%	0	0.0 %	4	1.7%
36-45	0	0.0%	1	3.6 %	0	0.0%	0	0.0 %	0	0.0%	0	0.0 %	1	0.4%
Total	14	100 %	28	100 %	137	100 %	32	100 %	14	100 %	5	100 %	230	100 %

100% (n=5) of topical and sub-tenon steroid users developed elevated IOP, followed by 78.5% (n=11) of topical, 50% (n=16) of oral & inhalational steroids, 43% (n=12) of inhalational, 32% (n=44) patients on oral steroids and 14.2% (n=2) of external users. With a p value of 0.0001 statistically significant number of patients developed elevated IOP with steroids use in topical, topical with subtenon and inhalational routes..

Table 16- PREVALENCE OF CENTRAL SEROUS CHORIORETINOPATHY (CSCR)

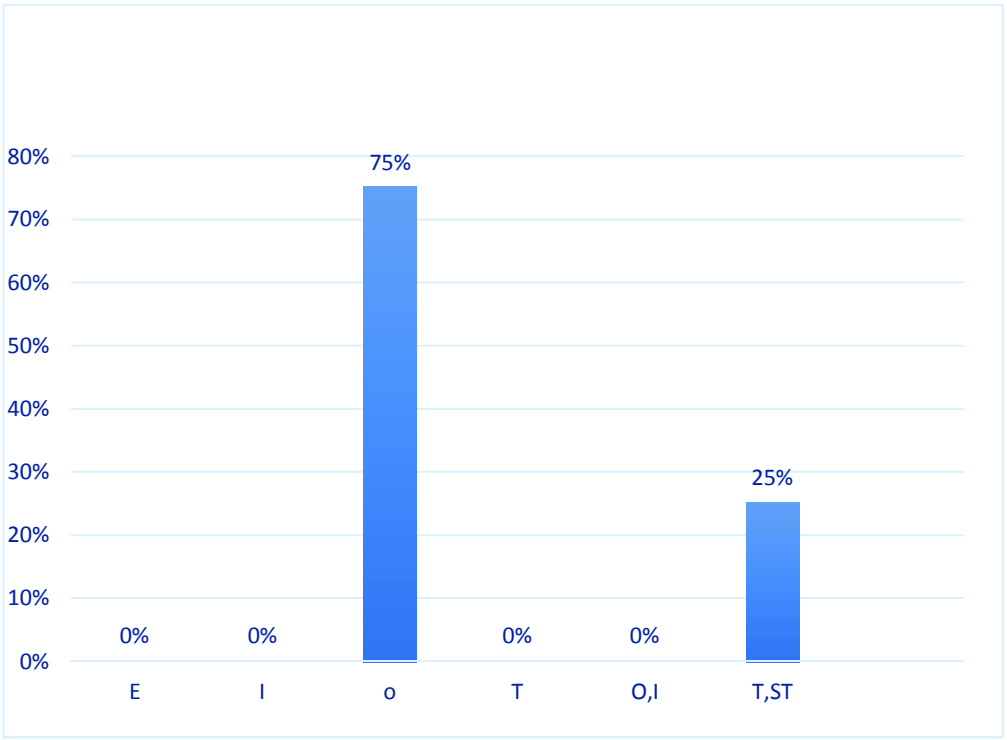
CSCR	FREQUENCY(n)	PERCENTAGE(%)
Present	4	1.74
Absent	216	98.26
Total	230	100.0

Number of patients developed CSCR were 4 (1.74%). 50% developed CSCR in right eye (n=2) and 50% in left eye (n=2).

Table 17- CSCR PREVALENCE WITH VARIOUS ROUTE OF STEROIDS

ROUTE OF ADMINISTRATION	FREQUENCY (n)	PERCENTAGE (%)
External	0	0
Inhalational	0	0
Oral	3	75
Oral & Inhalational	0	0
Topical	0	0
Topical & Sub-tenon	1	25
Total	93	100.0

Chart 14- Prevalence of CSCR in various routes of steroids administration



75% (n=3) developed CSCR were on oral steroids and 25% (n=1) were on topical and subtenon steroids.

Table 18- Frequency of prevalence of lens opacities and elevated IOP based on increase in dose of oral steroids

Dosage (mg)		1-5	6-10	11-15	16-20	21-25	Total
Lens opacities	No (n)	43	30	6	0	1	80
	%	53.7%	37.5%	7.5%	0%	1.3%	100%
	Yes(n)	12	19	16	8	2	57
	%	21.1%	33.3%	28.1%	14.0%	3.5%	100%
Elevated IOP	<21 mm Hg (n)	34	42	13	3	1	93
	%	36.5%	45.2%	14%	3.2%	1.1%	100%
	>21 mm Hg (n)	21	7	9	5	2	44
	%	47.7%	15.9%	20.5%	11.4%	4.5%	100%

p value 0.0001 for dose and lens opacities (significant)

p value 0.98 for dose and elevated IOP (not significant)

Chart 15- Frequency of prevalence of lens opacities and elevated IOP based on increase in dose of oral steroids

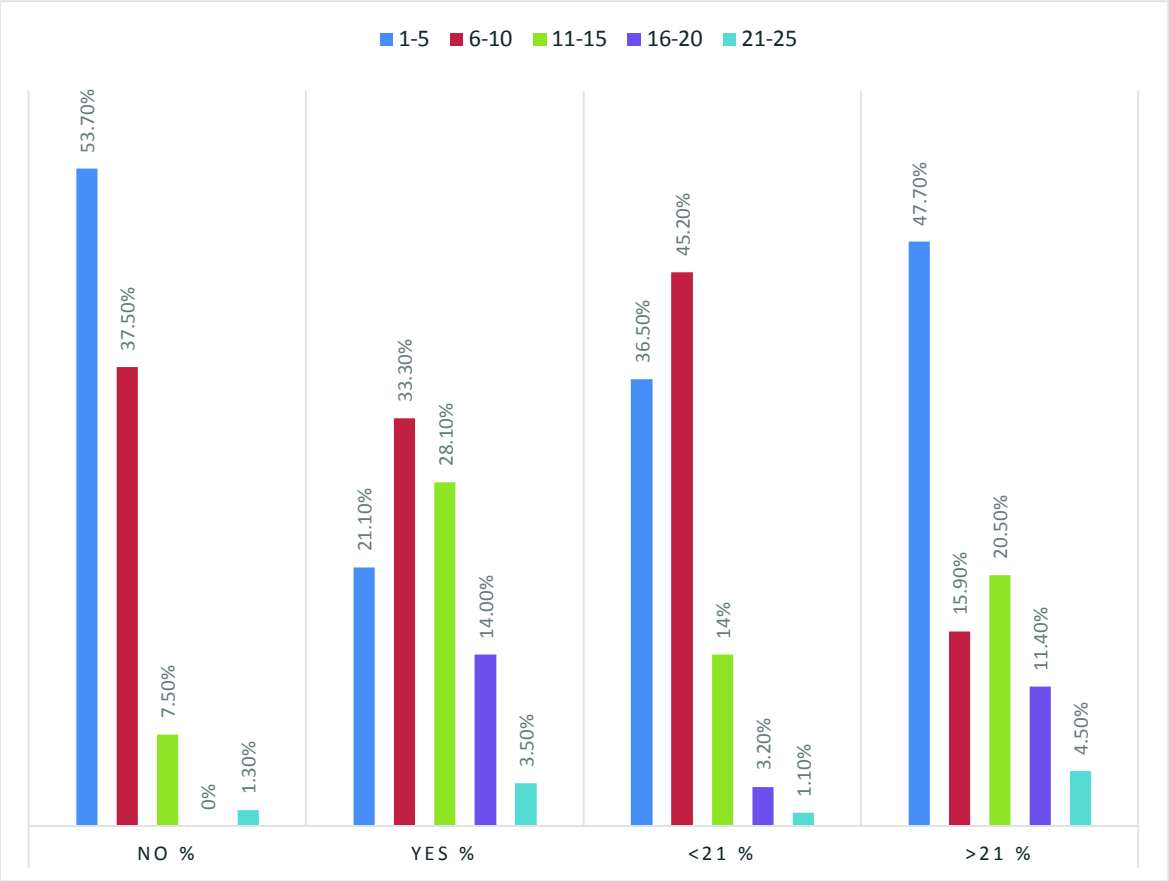


Table 19- Frequency of prevalence of lens opacities and elevated IOP based on increase in dose of inhalational steroids

Dosage (mcg)		80	125	250	360	Total
Lens opacities	No (n)	0	2	2	1	5
	%	0.0	40%	40%	20%	100%
	Yes (n)	1	4	4	13	22
	%	4.5%	18.2%	18.2%	59.1%	100%
Elevated IOP	<21 mm Hg (n)	0	2	3	11	16
	%	0.0%	12.5%	18.8%	68.7%	100%
	>21 mm Hg (n)	1	4	4	3	12
	%	8.4%	33.3%	33.3%	25%	100%

p value 0.0001 for dose and lens opacities (significant)

p value 0.0001 for dose and elevated IOP (significant)

Chart 16- Frequency of prevalence of lens opacities and elevated IOP based on increase in dose of inhalational steroids

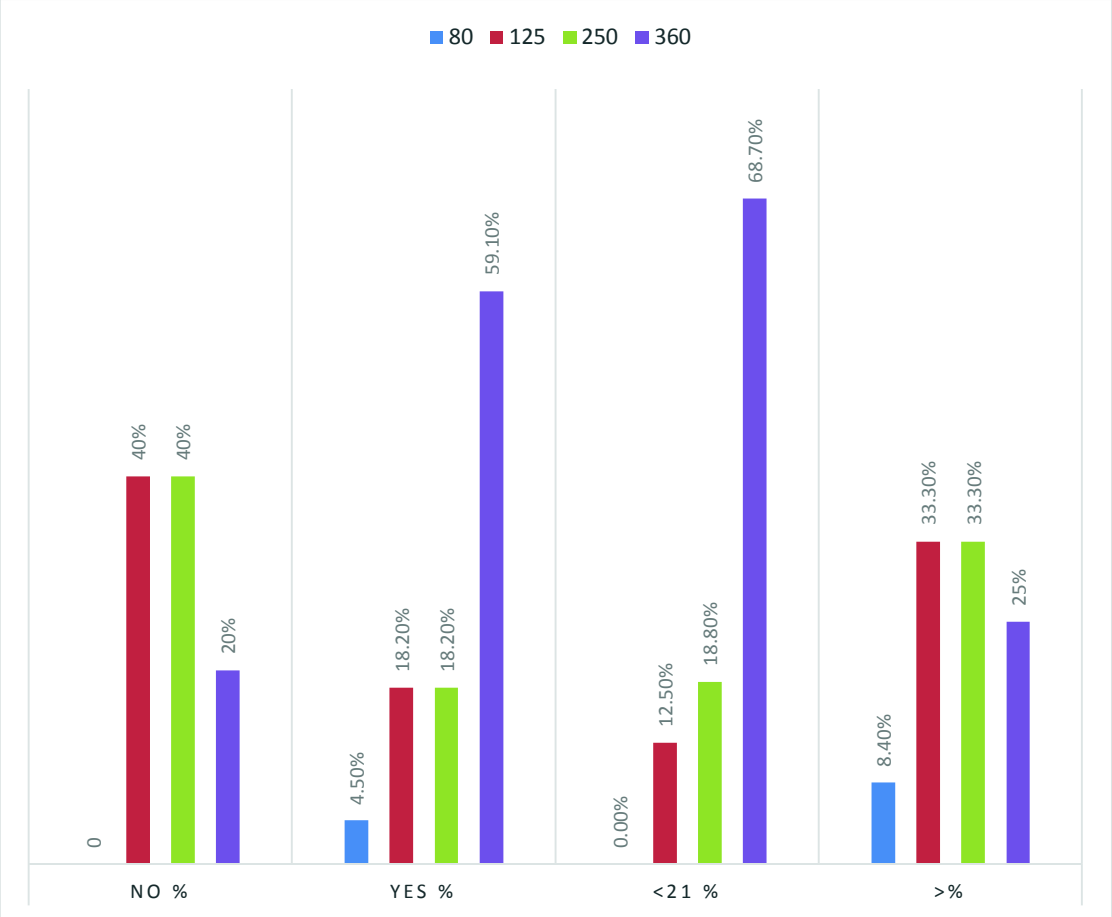


Table 20- Frequency of prevalence of lens opacities and elevated IOP based on increase dose of both oral and inhalational steroids

Dosage (mg, mcg)	Lens opacities				Elevated IOP			
	No (n)	%	Yes (n)	%	<21 (n)	%	>21 (n)	%
5,250	0	0.0%	3	10%	1	6.3%	2	12.5%
5,360	0	0.0%	7	23.3%	1	6.3%	6	37.5%
7.5,360	0	0.0%	4	13.3%	4	25%	0	0.0%
10,80	0	00%	1	3.3%	0	0.0%	1	6.3%
10,125	1	50%	5	16.7%	3	18.7 %	3	18.7%
10,250	1	50%	5	16.7%	3	18.7 %	3	18.7%
10,360	0	0.0%	2	6.7%	2	12.5 %	0	0.0%
15,250	0	0.0%	3	10%	2	12.5 %	1	6.3%
Total	2	100 %	30	100%	16	100%	16	100%

p value 0.0001 for dose and lens opacities (significant)

p value 0.648 for dose and elevated IOP (not significant)

Chart 17- Frequency of prevalence of lens opacities and elevated IOP based on increase dose of both oral and inhalational steroids

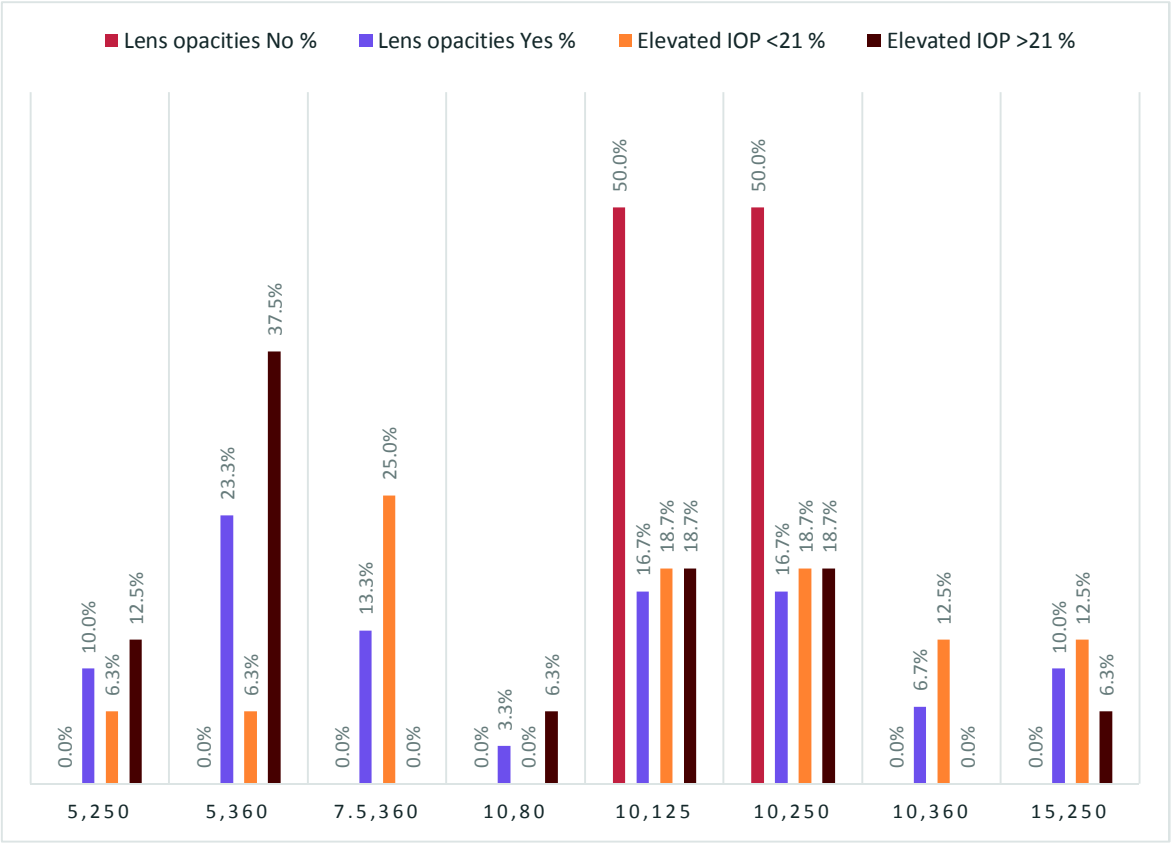


Table 21- Frequency of prevalence of lens opacities and elevated IOP based on duration

DURATION (m)	Lens opacities				Elevated IOP			
	No (n)	%	Yes (n)	%	<21 (n)	%	>21 (n)	%
6-12	91	79.8%	56	48.3%	110	78.6 %	37	41.1%
13-24	14	12.3%	31	26.7%	20	14.3 %	25	27.8%
25-36	6	5.3%	13	11.2%	6	4.3%	13	14.4%
37-48	1	0.9%	11	9.5%	2	1.4%	10	11.1%
49-60	2	1.7%	4	3.4%	2	1.4%	4	4.5%
61-72	0	0.0%	1	0.9%	0	0.0%	1	1.1%
Total	114	100%	116	100%	140	100%	90	100%

p value was 0.0001 for lens opacities and duration (significant)

p value was 0.0001 for elevated IOP and duration (significant)

Chart 18- Frequency of prevalence of lens opacities and elevated IOP based on duration

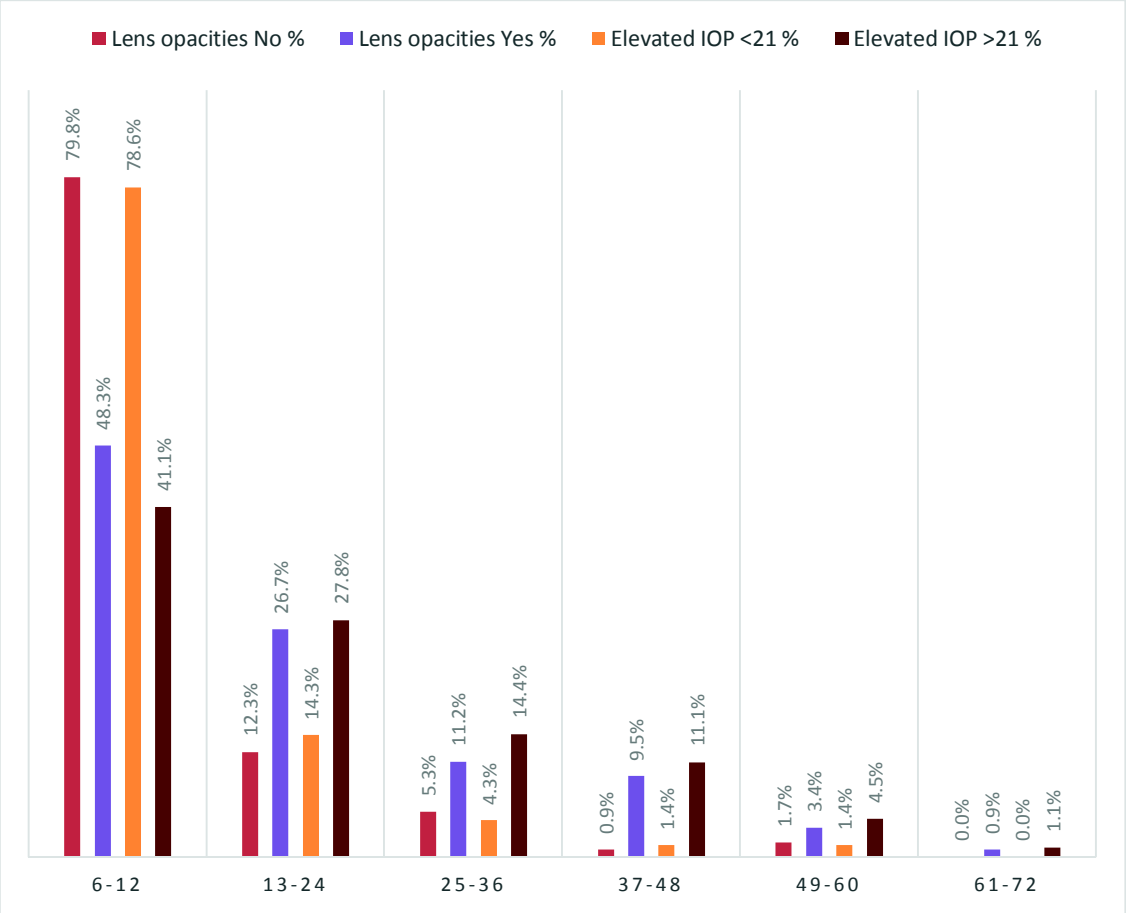


Table 22- Prevalence of lens opacities and elevated IOP based on age

Age (years)	Lens opacities				Elevated IOP			
	No (n)	%	Yes (n)	%	<21 (n)	%	>21 (n)	%
18	1	0.9%	0	0.0%	1	0.7%	0	0.0%
21-30	34	29.9%	5	4.3%	31	22.1 %	8	8.9%
31-40	41	35.9%	39	33.6%	53	37.9 %	27	30%
41-50	38	33.3%	72	62.1%	55	39.3 %	55	61.1%
Total	114	100%	116	100%	140	100%	90	100%

p value was 0.0001 for lens opacities and age (significant)

p value was 0.149 for elevated IOP and age (not significant)

Chart 19- Prevalence of lens opacities and elevated IOP based on age

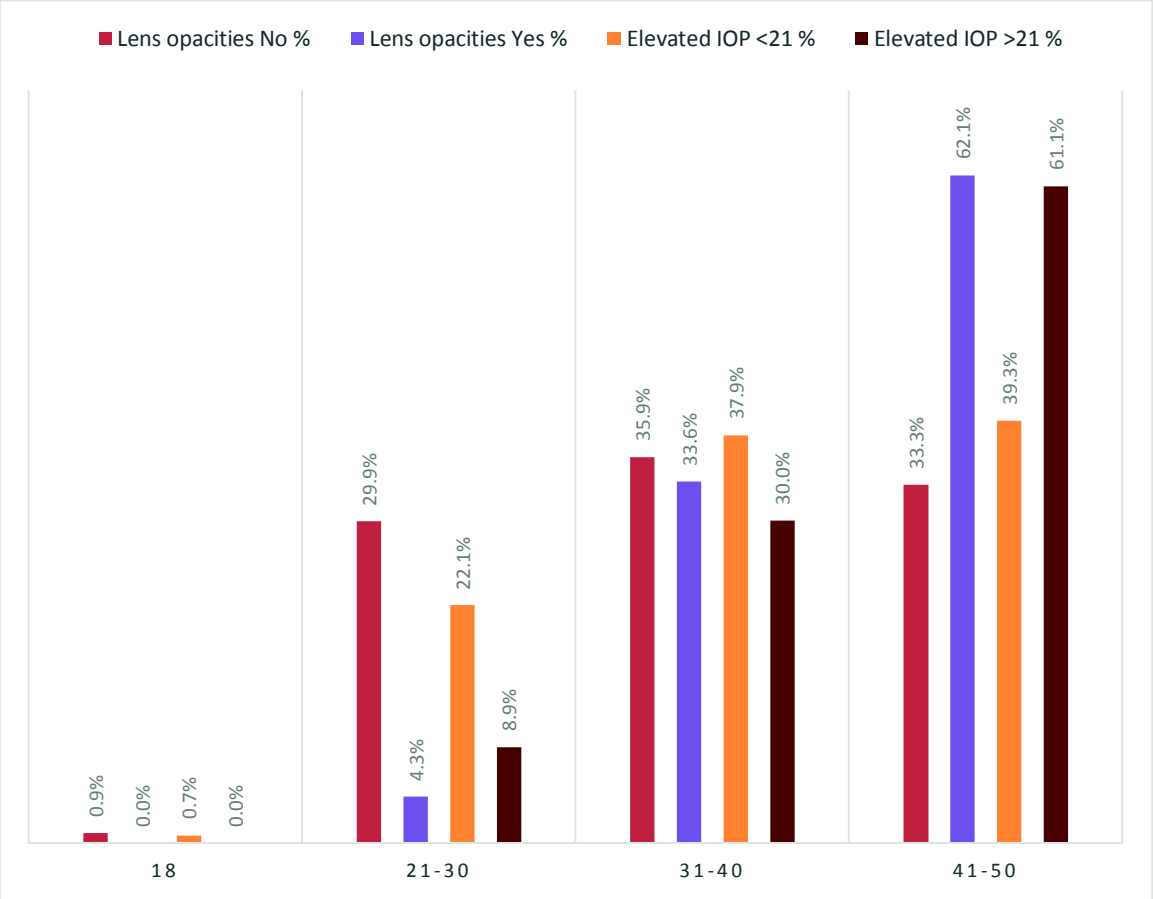


Table 23- Prevalence of lens opacities and elevated IOP based on sex

Sex	Lens opacities				Elevated IOP			
	No (n)	%	Yes (n)	%	<21 (n)	%	>21 (n)	%
Male	48	42.1%	53	45.7%	66	47.1%	35	38.9%
Female	66	57.9%	63	54.3%	74	52.9%	55	61.1%
Total	114	100%	116	100%	140	100%	90	100%

p value was 0.660 for lens opacities and sex (not significant)

p value was 0.668 for elevated IOP and sex (not significant)

Chart 20- Prevalence of lens opacities and elevated IOP based on sex

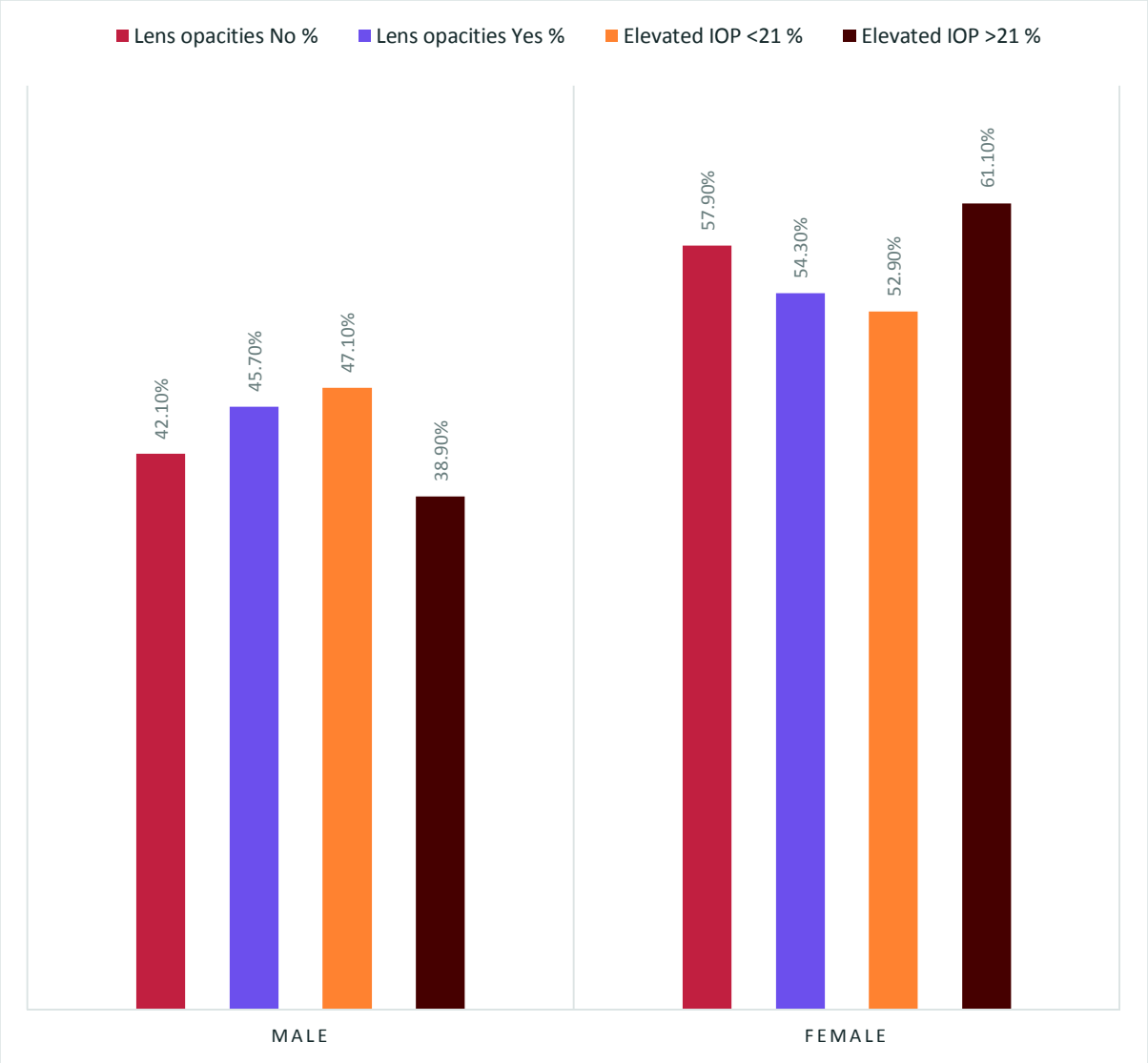
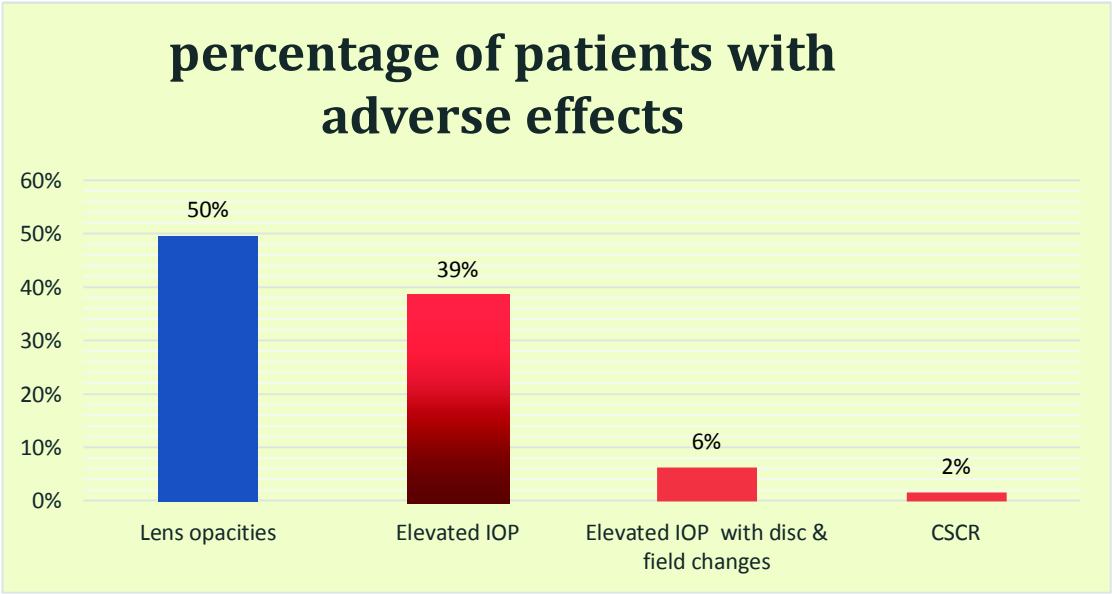


Table 24- Overall prevalence of ocular effects of long term steroids

Ocular effect	Frequency (n)	Percentage (%)
Lens opacities	116	50.4%
Elevated IOP	90	39.1%
Elevated IOP with disc & field changes	15	6.5%
CSCR	4	1.7%

Chart 15- Overall prevalence of ocular manifestations of long term steroids



DISCUSSION

Our study was conducted on 230 patients who were taking corticosteroids in various forms like oral, inhalational, external application and topical eye application for more than 6 months duration.

The mean age of the patients in our study was 39.36 years with a standard deviation of 8.046 years. The youngest patient was 18 years and the oldest was 50 years.

One patient was 18 years old (0.4%), 39 (17.0%) were in the age group of 21-30 years, 80 (34.8%) were in the age group of 31-40 years and 110 (47.8%) were in the age group of 41-50 years, in our study.

Females were predominant in our study population (56.1%, n=129) and males comprised 43.9% (n=101).

Patients in our study were on treatment with corticosteroids for various disease conditions in different routes of administration in rheumatology, thoracic medicine, dermatology and ophthalmology departments.

Patients using external form of steroids were 14 (6.1%), inhalational steroids were 28 (12.2%), only oral were 137 (59.6%), both oral and inhalational steroids were 32 (13.9), topical steroids were 14 (6.1%) and

in both topical and sub-tenon injection steroids were 5 (2.2%). Our study group comprise a large subgroup of patients on oral steroids alone. Prednisolone was the most commonly used oral drug in our study group. In which patient taking < 5mg were 55, 6-10 mg were 49, 11-15 mg were 22, 16-25 mg were 11. Mean dosage used in our study group is 8.97 mg with a standard deviation of

Mean duration for which various forms of steroids used were 16.93 months with a standard deviation of 14.112.

The prevalence of lens opacities graded by LOCS III among the total study population 230 was 50.4% (n=116). Among them almost 89.7% (n=104) had only PSCC type of lens opacities. 12 patients (10.3%) had both PSCC and non-PSCC type of lens opacities.

Prevalence of lens opacities among various route of steroid administration is given in the table 12a, comprise the external users 0.9% (n=1), inhalational users 19.8% (n=23), only oral users 49.1% (n=57), both oral and inhalational users 25.9% (n=30), and topical users 4.3% (n=5) had lens opacities.

93.8% (n=30) of combined oral and inhalational users developed lens opacities, followed by inhalational users with 82.2% (23), oral users with 41.6% (n=57), topical users 37.7% (n=14) and external users with

7.1% (n=1). A statistically significant association was found between steroids used in any form with lens opacities formation with a p value of <0.001.

Based upon the dosage of various forms of steroids, oral form, inhalational and oral and inhalational form showed significant association between development of lens opacities with increase in the dose with a p value < 0.001.

Based upon the duration, a strong association was found between the development of lens opacities with increase in the duration irrespective of the route of administration of steroids with a p value <0.001.

Prevalence of elevated IOP (>22 mm Hg) in our study group was 39.1% (n=90), of which patients with IOP ranging from 22 to 25 mm Hg were 80% (n=73), 26 to 30 mm Hg were 13.3% (n=12), 31 to 35 mm Hg were 4.4% (n=4) and 36 to 45 mm Hg were 1.1% (n=1).

Mean IOP was 19.96 mm Hg with a standard deviation of 4.272. The prevalence of elevated IOP with increase in C:D ratio and visual field defects were 15 (16.7%) with a p value of 0.001 with statistically higher significance.

Out of the 90 patients with elevated IOP, 2.2% (n=2) were on external steroids, 13.3% (n=12) were inhalational, 48.9% (n=44) were

oral, 17.8% (n=16) were both oral and inhalational, 12.2% (n=11) were topical and 5.6% (n=5) were topical and subtenon injection users.

100% (n=5) of topical and sub-tenon steroid users developed elevated IOP, followed by 78.5% (n=11) of topical, 50% (n=16) of oral & inhalational steroids, 43% (n=12) of inhalational, 32% (n=44) patients on oral steroids and 14.2% (n=2) of external users. With a p value of 0.001 statistically significant number of patients developed elevated IOP with steroids use in any form.

Based upon the dosage of various forms of steroids, topical form and inhalational form showed significant association between elevation of IOP with increase in the dose with p value <0.001. No significant association seen between oral and combined oral with inhalational steroids dose with the prevalence of elevated IOP with a p value 0.9 and 0.6 respectively.

Based upon the duration, a strong association was found between the elevation of IOP with increase in the duration irrespective of the route of administration of steroids with a p value <0.001.

Most of them were treated with topical anti-glaucoma medications with single or double drug regimen with tapering the dose of steroid to

minimal therapeutic dose or by stopping them in some patients with uncontrolled IOP. One patient needed trabeculectomy to control the IOP.

In our study group, 4 patients developed CSCR (1.7%). Of which 3 patients used oral steroids and 1 patient had both topical and sub-tenon steroids. The mean duration of manifestation of CSCR was 32.4 months in patients on oral steroids and 28 months in patients on topical steroids. 50% (n=2) developed CSCR in right eye and 50% (n=2) in left eye.

Overall 50.4% (n=116) of the study group developed lens opacities, 39.1% (n=90) developed elevated IOP, 6.5% (n=15) developed elevated IOP with disc and visual field defects and 1.7% (n=4) developed CSCR.

Drawback of the study were 1. all patients <50 years of age were presumed to have clear lens. Hence, any grade of lens opacities was taken as significant and assumed to be due to steroid therapy. 2. 21 mm Hg was the maximum physiological IOP in normal population. Hence, IOP more than 21 mm Hg was taken as elevated IOP in our study. Some patients may have had POAG or some may have had high baseline IOP. All the above conditions could not be ruled out since this was a cross-sectional study. Hence it could not be stated that elevated IOP was really due to steroids therapy in each and every case. Hence as further scope in similar future studies, it is recommended to record baseline IOP before starting steroid therapy to improve the value of the study.

SUMMARY

Our study **titled "AN ANALYTICAL STUDY OF THE OCULAR EFFECTS IN PATIENTS ON LONG TERM CORTICOSTEROIDS"** was a hospital based cross-sectional study.

The aim of the study was to analyse the ocular effects of long term use of corticosteroids by various routes of administration for various disorders treated in a tertiary care hospital.

The objective was to study the prevalence of ocular manifestations of chronic use of corticosteroids in various diseases and to emphasise the importance of regular ocular examination for the patients on long term steroid therapy in any form.

Almost 50% of our study group developed lens opacites, 39% developed elevated IOP, of which 15 patients developed elevated IOP with significant disc and visual field changes. 1.7% of our study group developed CSCR.

The prevalence of lens opacities showed significant association with all routes of steroid intake, duration of the therapy and dose of the drug.

The prevalence of elevated IOP showed significant association with topical, topical with subtenon and inhalational drugs and not significant with oral and external steroids.

Age of the study group who showed significant association with lens opacities were 41-50 years (74 patients). But there was no significant correlation between the elevated IOP and CSCR with the age. Sex showed no significant association for the development of lens opacities, elevated IOP or CSCR.

CONCLUSION

Corticosteroids are most widely used anti-inflammatory drug in various specialities. Steroids are used in different doses, frequency, duration and different routes. Though most of their adverse effects are well documented, the pathogenesis behind them is very poorly understood so far. There are many studies documenting the benefits, adverse effects and safety measures to be taken while prescribing steroids, but still we are lacking in pre-treatment documentation of various parameters especially ophthalmological examination, screening for adverse effects and timely management of the adverse effects.

The main objective of our study is to document the prevalence of common ocular manifestations like lens opacities, steroids-induced elevated IOP, and CSCR in the patients taking long-term steroids (> 6months) and to sensitize the treating physicians who are using steroids on long term to use them judicially and refer the patients for pre-treatment evaluation and intermittent re-evaluation since the prevalence of adverse effects are found to be in significant numbers in our study.

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PROFORMA

NAME :

AGE :

SEX :

OP / PIN NO :

History :

1. Presenting Complaint -

2. Associated symptoms -

3. Blurring of vision -

4. Glare -

5. Uniocular polyopia -

6. Coloured haloes -

7. Black spots in front of eyes -

8. Day blindness -

9. Headache and eye ache -

10. Scotoma -

11. Metamorphopsia/micropsia -

Past history : DM/ SHT/ Ocular traumas, Similar complaints in the past

Medical history: systemic disease :

Form and dose of steroid use :

Duration of use :

Ocular Examination :

RE LE

Uncorrected Visual acuity (UCVA) :

Refraction : SPH

CYL

AXIS

Best corrected visual acuity(BCVA):

Near vision :

Intra-ocular pressure :

(with Goldmann Applanation Tonometer)

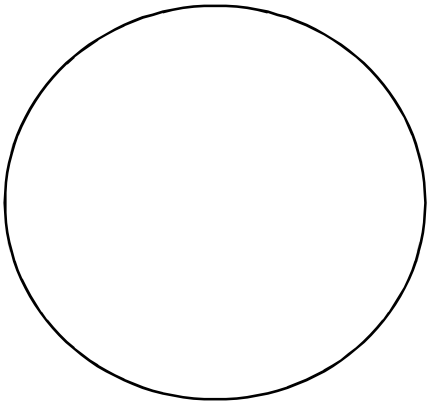
Slit lamp examination:

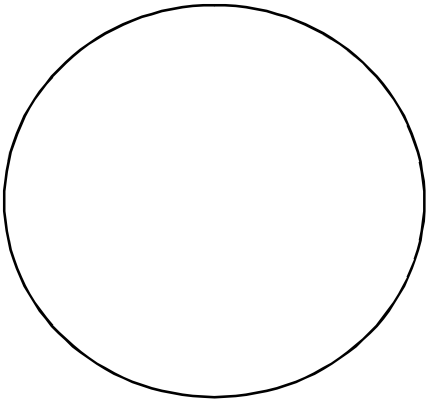
	RE	LE
Lids	:	
Conjunctiva	:	
Cornea	:	
Anterior chamber	:	
Iris	:	
Pupil	:	
Lens	:	
Extra ocular movements	:	

Fundus examination :

Direct Ophthalmoscopy, +90D and Indirect Ophthalmoscopy.

RIGHT EYE LEFT EYE





Visual fields :

Colour vision :

Blood pressure :

Biochemical investigations:

Random blood sugar -

FBS/PPBS (if required) -

OCT: (if required)

CONSENT FORM

Here by I volunteer and consent to participate in this study "**ANALYTICAL STUDY OF THE OCULAR EFFECTS IN PATIENTS ON LONG TERM CORTICOSTEROIDS**". I was fully explained about the nature of this study by the doctor; knowing which I Mr / Ms…….. fully consent to volunteer in this study.

Signature of the volunteer

Date:

Place: Signature of the witness

CONSENT FORM

I Dr. SHALINI. G is carrying out a study on the topic, "AN ANALYTICAL STUDY OF THE OCULAR EFFECTS IN PATIENTS ON LONG TERM CORTICOSTEROIDS"

My research project guide is **Dr.S.PADMANABAN M.S.,D.O**.

My research project is being carried out in the Department of Ophthalmology, Coimbatore Medical College Hospital, Coimbatore.

RESEARCH BEING DONE:

AN ANALYTICAL STUDY OF THE OCULAR EFFECTS IN PATIENTS ON LONG TERM CORTICOSTEROIDS.

PURPOSE OF RESEARCH

To study the prevalence of various ocular effects of long term use of corticosteroids in various diseases.

To emphasis the importance of regular ocular examination for the patients on long term steroid therapy.

PROCEDURES INVOLVED:

Detailed history including the past medical history and treatment history, form, frequency and duration of usage of corticosteroids is recorded. Blood pressure and blood sugar are recorded.

A comprehensive ophthalmological examination was done including visual acuity, intra-ocular pressure measurement, colour vision, visual fields, slit lamp biomicroscopy and ophthalmoscopic examination.

You, Shri./ Smt./ Kum._____,

aged …… years, S/o / D/o / W/o_____,

residing at……. are requested to be a participant in the research study titled **'AN ANALYTICAL STUDY OF THE OCULAR EFFECTS IN PATIENTS ON LONG TERM CORTICOSTEROIDS'** in Government Medical College Hospital, Coimbatore. You satisfy eligibility criteria as per the inclusion criteria. You can ask any questions or seek any clarifications on the study that you may have before agreeing to participate.

DECLINE FROM PARTICIPATION

You are hereby made aware that participation in this study is purely voluntary and honorary and that you have the option and the right to decline from participation in the study.

PRIVACY AND CONFIDENTIALITY

You are hereby assured about your privacy. Privacy of subject will be respected and any information about you or provided by you during the study will be kept strictly confidential.

AUTHORIZATION TO PUBLISH RESULTS

Results of the study may be published for scientific purposes and/or presented to scientific groups, however you will not be identified; neither will your privacy be breached.

STATEMENT OF CONSENT

I,_____, do hereby volunteer and consent to participate in this study being conducted by **Dr.Shalini. G** I have read and understood the consent form / or it has been read and explained to me in my own language. The study has been fully explained to me, and whenever I ask questions at any time.

Signature / Left Thumb Impression of the Volunteer

Date:

Signature and Name of witness

Date:

ஒப்புதல் படிவம்

பெயர் :

வயது :

பாலினம் :

முகவரி :

கோவை அரசு மருத்துவக் கல்லூரி மருத்துவமனையில் மரு.**கு.ஷாலினி** தலைமையில் நடைபெறும் இந்த ஆய்வில் எனது முழுஉடல் மற்றும் **வெகுநாள் கார்ட்டிகோஸ்டிராய்ட்ஸ் உபயோகிப்பதால் கண்ணில் ஏற்படும் பின்விளைவுகளின் ஆய்வு** செய்து கொள்ள முழு மனதுடன் சம்மதிக்கிறேன். என்னைப் பற்றிய விவரங்களை பாதுகாப்புடன் இந்த ஆய்வில் வெளியிட ஆட்சேபணை இல்லை என்று தெரிவித்துக் கொள்கிறேன். நான் எந்த நேரத்திலும் ஆய்வில் இருந்து விலக்கிக் கொள்ளும் உரிமை உண்டு என்று அறிவேன்.

இடம் கையொப்பம்/கைரேகை

தேதி

KEY TO MASTER CHART

M	-	Male
F	-	Female
mg	-	milligram
mcg	-	microgram
BA	-	Bronchial Asthma
RA	-	Rheumatoid Arthritis
SLE	-	Systemic Lupus Erythematosis
ILD	-	Interstitial Lung Disease
O	-	Oral
COPD	-	Chronic Obstructive Pulmonary Disease
I	-	Inhalational
ENL	-	Erythema Nodosu Leprosum
E	-	External
UCTD	-	Undifferentiated connective tissue disorder
T	-	Topical
SS	-	Systemic sclerosis
ST	-	Subtenon
TB	-	Tuberculosis
RE	-	Right eye
CAU	-	Chronic Anterior Uveitis
LE	-	Left Eye

IU	-	Intermediate Uveitis
m	-	Months
PU	-	Posterior Uveitis
BP	-	Blood Pressure
VKH	-	Vogt-Koyanaki-Harada
RBS	-	Random blood sugar
PV	-	Pempigus vulgaris
mg/dl	-	milligram/deciliter
PN	-	Polyarthritis nodosa
C	-	Clear
LR	-	Lepra Reaction
N	-	Normal
SD	-	Scleroderma
C:D	-	Cup, disc ratio
VIT	-	Vitiligo
PU	-	Posterior Uveitis
PR	-	Polymayalgia Rheumatica
DM	-	Dermatomyositis
NS	-	Nephrotic Syndrome
CSCR	-	Central Serous Chorioretinopathy

MASTER CHART

SN	NAME	AGE	SEX	DRUG	MEAN DOSE	FORM	DURATION OF TREATMENT	DISEASE FOR WHICH STEROIDS USED	RISK FACTORS	BP in mm hg		RBS	DISTANT VISION		NEAR VISION		TENSION in mm Hg		LENS CHANGES(LOCS III)		FUNDUS	
		years			in mg		in months			SYSTOL	DIASTOLE	mg/dl	RE	LE	RE	LE	RE	LE	RE	LE	RE	LE
1	Sakkarammal	38	F	Prednisolone	10	O	9	RA	1	110	80	102	6/60	6/36	N18	N12	14	15	P3	P2	N	N
2	Amudha	50	F	Prednisolone	15	O	60	RA	1	120	80	88	4/60	4/60	N36	N36	24	25	P4	P4	N	N
3	Shanthamani	50	F	Prednisolone, Budesonide	5,360 mcg	O,I	72	BA	2	110	70	96	6/60	6/18	N12	N10	22	22	P3	P2	N	N
4	Papammal	30	F	Prednisolone	5	O	60	SLE, NS	1	100	60	112	6/6	6/9	N.6	N.6	14	15	p1	P1	N	N
5	Saraswathi	49	F	Prednisolone, Budesonide	15,100 mcg	O,I	48	BA	2	120	80	132	6/18	6/60	N.8	N.12	13	11	P1	P3	N	N
6	Malliga	40	F	Prednisolone	25	O	8	ENL	2	110	80	128	6/60	6/36	N.12	N.10	24	22	P3	P2	N	N
7	Padma	47	F	Prednisolone	7.5	O	24	RA	1	90	60	94	3/60	6/60	N.36	N.18	11	10	P4	P3	N	N
8	Bagya	40	F	Betamethasone	80 mcg	I	48	BA	2	110	70	86	4/60	1/60	N.36	N.36	33	43	P3	P3	C:D-0.5	C:D-0.7
9	Lakshmi	50	F	Prednisolone	10	O	24	RA	1	130	80	108	6/18p	6/24	N.8	N.8	18	18	P2	P2	N	N
10	Shyni	43	F	Prednisolone	20	O	8	UCTD	1	120	80	112	6/36	6/24	N.10	N.10	19	18	P2	P2	N	N
11	Zamid Abid	28	M	Prednisolone	25	O	7	PV	1	90	60	78	6/6	6/6	N.6	N.6	18	17	C	C	N	N
12	Muthammal	46	F	Prednisolone, Betamethasone	10,80 mcg	O,I	60	BA	2	120	70	88	HM+	HM+	-	-	24	25	P5	P5	N	N

13	Ambika	49	F	Prednisolone, Budesonide	5, 360 mcg	O,I	60	BA	2	130	80	94	6/24	6/24	N.8	N.8	14	14	P2	P2	N	N
14	Muthulakshmi	50	F	Prednisolone	25	O	7	DCSS	1	110	68	126	6/12	6/9	N.8	N.8	25	24	P2	P1	N	N
15	Gajenderan	48	M	Prednisolone, Budesonide	7.5, 360 mcg	O, I	24	BA	2	118	80	118	1/60	6/24	N.36	N.12	18	15	P5	P2	N	N
16	Baby	23	F	Prednisolone	20	O	7	SLE	1	90	60	132	6/24	6/18	N.10	N.10	18	16	P2	P2	N	N
17	Abinesh	21	M	Prednisolone	5	O	8	VIT	2	110	70	106	6/6	6/6	N.6	N.6	22	24	C	C	N	N
18	Senni	45	F	Budesonide	250 mcg	I	24	BA	2	112	72	96	6/6	6/9	N.6	N.6	28	24	P1	P1	C:D-0.5	C:D-0.3
19	Prema	50	F	Budesonide	360 mcg	I	36	BA	2	122	80	88	6/9	6/9	N.6	N.6	19	17	P1	P1	N	N
20	Ganesan	49	M	Budesonide	250 mcg	I	36	BA	2	110	80	116	6/60	6/36	N.18	N.12	19	19	P3	P2	N	N
21	Palanisamy	46	M	Prednisolone	10	O	8	BA	2	80	60	124	6/6	6/6	N.6	N.6	23	24	C	C	N	N
22	Selvaraj	50	M	Prednisolone	5	O	6	ILD	2	124	82	128	6/6	6/6	N.6	N.6	18	18	C	C	N	N
23	Rukmani	48	M	Prednisolone	15	O	8	RA	1	120	80	86	6/12	6/18	N.8	N.8	15	16	P1	P1	N	N
24	Ramasamy	36	F	Prednisolone	10	O	6	SLE, NS	1	100	60	92	6/6	6/6	N.6	N.6	18	18	C	C	N	N
25	Arumugam	38	M	Prednisolone	10	O	7	BA	2	90	60	126	6/6	6/6	N.6	N.6	20	20	C	C	N	N
26	Paapathy	44	F	Betamethasone	0 . 1 %	E	7	VIT	2	120	80	32	6/6	6/6	N.6	N.6	18	20	C	C	N	N
27	Rajammal	42	F	Prednisolone	5	O	24	RA	1	126	76	110	6/9	6/9	N.6	N.6	28	26	P1	P1	C:D-0.4	NC:D-0.5
28	Marudhappan	50	M	Prednisolone	10	O	9	COPD	2	92	70	86	6/9	6/12	N.8	N.8	14	15	P1	P1	N	N
29	Subbulakshmi	40	F	Prednisolone	5	O	7	PV	1	124	80	98	6/6	6/6	N.6	N.6	25	24	C	C	N	N
30	Sulokshana	46	F	Prednisolone	10	O	12	RA	1	116	76	106	6/18	6/24	N.8	N.8	17	16	P1	P2	N	N
31	Baiyammal	32	F	Budesonide	360 mcg	I	24	BA	2	110	72	82	6/9	6/9	N.6	N.6	16	16	P1	P1	N	N
32	Kittathaal	41	F	Prednisolone	7.5	O	10	RA	1	122	76	104	6/12	6/12	N.8	N.8	18	17	P1	P1	N	N

33	Ramathal	49	F	Fluticasone	125 mcg	I	12	BA	2	118	78	116	6/9	6/9	N.6	N.6	26	24	P1	P1	N	N
34	Nalammal	33	F	Cortisone	1	O	7	SS	1	110	70	128	6/6	6/6	N.6	N.6	18	18	C	C	N	N
35	Rebiya	28	F	Prednisolone	10	O	8	SLE	1	94	62	138	6/6	6/6	N.6	N.6	18	19	C	C	N	N
36	Perumal	50	M	Prednisolone	5	O	24	RA	1	126	78	126	6/18	6/24	N.10	N.10	26	24	P1	P2	N	N
37	Sagadevan	44	M	Prednisolone	2.5	O	9	ILD	2	120	82	92	6/6	6/6	N.6	N.6	20	20	C	C	N	N
38	Chinniyappan	32	M	Prednisolone, Budesonide	5, 250 mcg	O, I	12	BA	2	118	80	98	6/36	6/36	N.12	N.12	22	21	P2	P2	N	N
39	Kuppathal	36	F	Betamethasone	0 . 1 %	E	7	VIT	2	124	78	86	6/9	6/9	N.6	N.6	24	23	P1	P1	N	N
40	Neelaveni	33	F	Budesonide	360 mcg	I	24	BA	2	110	70	104	6/9	6/9	N.6	N.6	17	17	P1	P1	N	N
41	Daavuth	38	M	Prednisolone	15	O	11	RA	1	122	80	128	6/6	6/6	N.6	N.6	18	19	C	C	N	N
4	Kamala	39	F	Prednisolone	5	O	36	RA	1	116	76	122	6/6	6/6	N.6	N.6	24	25	C	C	N	N
43	Pushparani	38	F	Prednisolone, Budesonide	7.5, 360 mcg	O, I	12	BA	2	110	70	138	6/36	6/60	N.18	N.18	16	15	P2	P3	N	N
44	Raju	47	M	Prednisolone	12.5	O	8	RA	1	100	72	130	6/18p	6/24	N.10	N.10	17	17	P2	P2	N	N
45	Bakiya	36	F	Prednisolone	7.5	O	10	SD	1	108	76	126	6/6	6/6	N.6	N.6	19	18	C	C	N	N
46	Vijayalakshmi	42	F	Prednisolone	20	O	7	RA	1	122	80	110	6/60	6/36	N.36	N.18	23	24	P3	P2	N	N
47	Nirmala	34	F	Prednisolone	2.5	O	6	ILD	2	120	78	124	6/9	6/9	N.6	N.6	16	16	P1	P1	N	N
48	Jothimani	38	F	Budesonide	360 mcg	I	12	BA	2	120	70	88	6/9	6/9	N.6	N.6	17	18	P1	P1	N	N
49	Divya	21	F	Prednisolone	10	O	7	SLE	1	128	82	92	6/6	6/6	N.6	N.6	17	17	C	C	N	N
50	Venugopal	42	M	Betamethasone	1	O	7	BA	2	120	80	120	6/60	6/60	N.36	N.36	20	21	P3	P3	N	N
51	Bathral	34	F	Betamethasone	0 . 1 %	E	8	VIT	2	110	72	86	6/6	6/6	N.6	N.6	15	16	C	C	N	N
52	Apsana Begum	44	F	Prednisolone	5	O	36	RA	1	116	74	120	6/6	6/6	N.6	N.6	27	30	C	C	C:D-0.5	C:D-0.6
53	Balamurugan	40	M	Prednisolone	7.5	O	9	Post-TB	2	120	70	118	6/18	6/18	N.8	N.8	15	14	P1	P1	N	N

54	Ganesan	38	M	Prednisolone, Budesonide	7.5, 250 mcg	O, I	12	BA	2	126	76	110	6/9	6/9	N.6	N.6	16	16	P1	P1	N	N
55	Poongothai	42	F	Prednisolone	10	O	9	RA	1	92	70	136	6/6	6/6	N.6	N.6	15	16	C	C	N	N
56	Suriya	18	M	Prednisolone	10	O	6	DM	2	124	80	120	6/6	6/6	N.6	N.6	17	17	C	C	N	N
57	Sakthivel	36	M	Budesonide	360 mcg	I	48	BA	2	126	78	88	4/60	6/60	N.36	N.18	24	26	P4	P5	N	N
58	Reji	43	F	Prednisolone	12.5	O	10	RA	1	120	82	82	6/24	6/36	N.10	N.10	22	21	P2	P2	N	N
59	Dhilip	35	M	Prednisolone	7.5	O	6	LR	2	118	80	128	6/6	6/6	N.6	N.6	17	18	C	C	N	N
60	Gopal	50	M	Prednisolone	5	O	7	COPD	2	124	78	114	6/9	6/9	N.6	N.6	18	17	P1	P1	N	N
61	Rajendran	41	M	Fluticasone	125 mcg	I	36	BA	2	110	70	132	6/36	6/60	N.18	N.18	24	25	P2	P3	N	N
62	Leela	29	F	Prednisolone	5	O	7	ILD	2	122	80	78	6/6	6/6	N.6	N.6	15	17	C	C	N	N
63	Velumani	48	M	Betamethasone	0 . 1 %	E	13	VIT	2	116	76	138	6/6	6/6	N.6	N.6	16	16	C	C	N	N
64	Sujitha	26	F	Prednisolone	12.5	O	8	UCTD	1	120	80	126	6/6	6/6	N.6	N.6	20	20	C	C	N	N
65	Rajkumar	42	M	Budesonide	250 mcg	I	24	BA	2	126	76	82	6/6	6/6	N.6	N.6	32	29	C	C	C:D-0.5	C:D-0.4
66	Rathinam	44	M	Prednisolone	20	O	12	RA	1	92	70	88	6/36	6/60	N.18	N.18	22	23	P2	P3	N	N
67	Akilandeshwari	47	F	Prednisolone, Budesonide	5, 250 mcg	O, I	48	BA	2	124	80	98	5/60	6/60	N.36	N.36	20	22	P4	P3	N	N
68	Arumugam	38	M	Budesonide	360 mcg	I	36	BA	2	116	76	106	6/36	6/24	N.12	N.12	22	23	P2	P2	N	N
69	Palani	49	M	Prednisolone	10	O	9	RA	1	110	72	114	6/6	6/6	N.6	N.6	19	21	C	C	N	N
70	Ganesan	36	M	Betamethasone	0 . 1 %	E	7	VIT	2	122	76	108	6/6	6/6	N.6	N.6	17	15	C	C	N	N
71	Uma	30	F	Prednisolone	2.5	O	6	DCSS	1	118	78	110	6/6	6/6	N.6	N.6	16	16	C	C	N	N
72	Parvathi	50	F	Prednisone	20	O	6	PR	2	110	70	94	6/12	6/12	N.8	N.8	21	20	P1	P1	N	N
73	Antoniraj	44	M	Prednisolone, Budeonide	10, 360 mcg	O, I	14	BA	2	94	62	86	6/12	6/9	N.8	N.8	12	10	P1	P1	N	N
74	Sundari	34	F	Prednisolone	5	O	14	SLE	1	126	78	132	6/6	6/6	N.6	N.6	22	22	P1	P1	N	N

75	Gayathri	22	F	Prednisolone	12.5	O	7	SLE, NS	1	120	82	126	6/6	6/6	N.6	N.6	21	20	C	C	N	N
76	Muthulakshmi	40	F	Prednisolone	7.5	O	24	RA	1	90	62	122	6/18	6/24	N.10	N.10	24	22	P1	P2	N	N
77	Vignesh	27	M	Prednisolone	2.5	O	6	ILD	2	116	72	130	6/6	6/6	N.6	N.6	19	19	C	C	N	N
78	Radha	48	F	Prednisolone	20	O	60	RA	1	122	70	126	6/60	6/36	N.18	N.18	24	23	P3	P2	C:D-0.4	C:D-0.4
79	Thenmozhi	44	F	Prednisolone	5	O	24	RA	1	110	70	88	6/6	6/6	N.6	N.6	22	23	C	C	N	N
80	Bhavani	38	F	Prednisolone	5	O	7	ILD	2	112	80	94	6/6	6/6	N.6	N.6	16	18	C	C	N	N
81	Muthulakshmi	48	F	Prednisolone	15	O	8	RA	1	120	82	120	6/12	6/24	N.8	N.8	14	14	P1	P2	N	N
82	Panchavarnam	49	F	Prednisolone, Budesonide	5, 250 mcg	O, I	24	BA	2	130	80	122	6/9	6/12	N.8	N.8	22	23	P1	P1	N	N
83	Lakshmi	44	F	Prednisolone	7.5	O	8	DM	1	110	80	118	6/6	6/6	N.6	N.6	17	17	C	C	N	N
84	Mohammed yusuf	48	M	Prednisolone	15	O	10	RA	1	122	78	86	6/9	6/9	N.6	N.6	19	19	P1	P1	N	N
85	Krishnaveni	45	F	Budesonide	360 mcg	I	48	BA	2	124	82	94	6/9	6/12	N.8	N.8	29	30	P1	P1	C:D-0.5	C:D-0.7
86	Samshad	37	M	Prednisolone	5	O	10	Post-TB	2	120	80	106	6/18	6/18	N.10	N.10	19	20	P1	P1	N	N
87	Ethrick	43	M	Prednisolone, Fluticasone	10, 125 mcg	O, I	12	BA	2	100	60	126	6/6	6/6	N.6	N.6	21	21	C	C	N	N
88	Vijayakumari	50	F	Prednisolone	7.5	O	24	RA	1	90	60	110	6/6	6/6	N.6	N.6	22	23	C	C	N	N
89	Sumathi	36	F	Prednisolone	2.5	O	14	Post-TB	2	120	80	132	6/6	6/6	N.6	N.6	19	18	C	C	N	N
90	Powjiya	34	F	Prednisolone	15	O	12	RA	1	126	76	88	6/12	6/18	N.8	N.8	16	16	P1	P1	N	N
91	Gowrysanker	30	M	Prednisolone	10	O	12	LR	2	92	70	94	6/9	6/12	N.8	N.8	18	18	P1	P1	N	CSCR
92	Selvakumar	28	M	Betamethasone	0.1%	E	16	VIT	2	124	80	106	6/6	6/6	N.6	N.6	26	25	C	C	C:D-O.5	C:D-0.6
93	Prabakaran	45	M	Prednisolone, Budesonide	10, 250 mcg	O, I	24	BA	2	116	76	136	6/9	6/9	N.6	N.6	24	23	P1	P1	N	N

94	Sneha	23	F	Betamethasone	0 . 1 %	E	11	VIT	2	120	80	128	6/6	6/6	N.6	N.6	18	18	C	C	N	N
95	Eshwari	37	F	Prednisolone	10	O	7	SS	1	90	60	110	6/6	6/6	N.6	N.6	20	19	C	C	N	N
96	Kumar	45	M	Prednisolone	7.5	O	6	PV	2	96	68	94	6/6	6/6	N.6	N.6	21	21	C	C	N	N
97	Jayanthi	50	F	Prednisolone, Budesonide	10, 250 mcg	O, I	12	BA	2	110	70	88	6/24	6/18	N.10	N.10	22	22	P2	P1	N	N
98	Suguna	44	F	Prednisolone	5	O	12	DM	2	100	72	82	6/6	6/6	N.6	N.6	17	17	C	C	N	N
99	Thangamani	48	F	Prednisolone	5	O	24	RA	1	108	76	116	6/6	6/6	N.6	N.6	22	22	C	C	N	N
100	Jayanthi	46	F	Prednisolone	10	O	12	RA	1	122	80	124	6/36	6/24	N.10	N.10	17	17	P2	P2	N	N
101	Umamaheshwari	35	F	Budesonide	360 mcg	I	36	BA	2	120	78	132	6/18p	6/24	N.12	N.12	16	16	P2	P2	N	N
102	Prema	49	F	Prednisolone	20	O	24	RA	1	120	70	94	6/36	6/24	N.12	N.12	32	30	P2	P2	C:D-0.6	C:D-0.7
103	Radha	44	F	Prednisolone	10	O	11	RA	1	128	82	108	6/9	6/6	N.6	N.6	19	19	P1	C	N	N
104	Kuppusamy	46	M	Prednisolone, Budesonide	5, 360 mcg	O, I	48	BA	2	120	80	104	6/24	6/36	N.12	N.12	23	24	P1	P2	N	N
105	Murthy	48	M	Prednisolone	7.5	O	12	RA	1	110	72	118	6/9	6/9	N.8	N.8	21	21	P1	P1	N	N
106	Shanmugam	34	M	Prednisolone	20	O	12	LR	2	116	74	124	6/9	6/9	N.6	N.6	22	22	P1	P1	N	N
107	Krishnan	29	M	Budesonide	360 mcg	I	24	BA	2	120	70	92	6/12	6/12	N.8	N.8	18	19	P1	P1	N	N
108	Muthusamy	37	M	Fluticasone	125 mcg	I	8	BA	2	126	76	118	6/6	6/6	N.6	N.6	16	16	C	C	N	N
109	Chandran	48	M	Prednisolone, Fluticasone	10, 125 mcg	O, I	24	COPD	2	92	70	136	6/12	6/24	N.8	N.8	14	15	P1	P2	N	N
110	Subbathal	49	F	Prednisolone	15	O	12	RA	1	124	80	132	6/12	6/9	N.8	N.8	21	21	P1	P1	N	N
111	Sakunthala	42	F	Fluticasone	125 mcg	I	36	BA	2	116	76	128	6/9	6/9	N.8	N.8	14	14	P1	P1	N	N
112	Joseph	48	M	Prednisolone	2.5	O	6	PV	1	110	72	122	6/6	6/6	N.6	N.6	19	19	C	C	N	N
113	Murugan	30	M	Prednisolone	5	O	6	ILD	2	122	76	106	6/12	6/18	N.8	N.8	19	20	P1	P1	N	N

114	Rajalakshmi	37	F	Prednisolone	10	O	7	Post-TB	2	118	78	120	6/9	6/9	N.6	N.6	21	21	P1	P1	N	N
115	Muniyammal	50	F	Prednisolone, Budesonide	10	O,I	48	BA	2	110	70	88	6/24	6/36	N.10	N.10	25	23	P2	P2	C:D-O.5	C:D-0.3
116	Sundari	46	F	Budesonide	360 mcg	I	36	BA	2	94	62	82	6/12	6/12	N.10	N.10	18	19	P1	P1	N	N
117	Chinnasamy	32	M	Betamethasone	0 . 1 %	E	9	VIT	2	126	78	128	6/6	6/6	N.6	N.6	16	17	C	C	N	N
118	Vijiya	25	F	Prednisolone	10	O	6	PR	1	120	82	110	6/6	6/6	N.6	N.6	14	14	C	C	N	N
119	Sampath	28	M	Prednisolone	5	O	36	RA	1	118	80	116	6/18p	6/6	N.10	N.6	22	24	C	C	CSCR	N
120	Mani	43	M	Prednisolone	5	O	6	ILD	2	124	78	84	6/6	6/6	N.6	N.6	19	18	C	C	N	N
121	Nalapathy	50	M	Prednisolone, Budesonide	15	O,I	24	BA	2	110	70	132	6/60	6/36	N.18	N.18	23	24	P3	P2	N	N
122	Subburayan	48	M	Budesonide	250 mcg	I	48	BA	2	100	72	128	6/12	6/24	N.8	N.8	23	26	P1	P2	C:D-0.3	C:D-0.6
123	Rani	36	F	Prednisolone	12.5	O	9	RA	1	108	76	110	6/6	6/9	N.6	N.6	21	21	C	P1	N	N
124	Kannamaal	28	F	Prednisolone	10	O	10	SLE	1	122	80	98	6/6	6/6	N.6	N.6	17	17	C	C	N	N
125	Sunil	22	M	Betamethasone	0 . 1 %	E	11	VIT	1	120	78	122	6/6	6/6	N.6	N.6	18	19	C	C	N	N
126	Kathirvel	38	M	Prednisolone	10	O	7	LR	2	120	70	104	6/9	6/9	N.6	N.6	21	21	P1	P1	N	N
127	Palanal	49	F	Prednisolone	5	O	36	RA	1	128	82	92	6/6	6/6	N.6	N.6	23	25	C	C	N	N
128	Ibrahim	32	M	Prednisolone	10	O	8	BA	2	120	80	116	6/6	6/6	N.6	N.6	16	16	C	C	N	N
129	Poovathal	38	F	Prednisolone	15	O	11	RA	1	110	72	124	6/9	6/9	N.6	N.6	18	18	P1	P1	N	N
130	Sekar	40	M	Prednisolone, Budesonide	10, 250 mcg	O, I	24	BA	2	116	74	136	6/36	6/24	N.10	N.10	21	22	P2	P2	N	N
131	Thangam	37	F	Prednisolone	7.5	O	10	RA	1	120	70	120	6/6	6/6	N.6	N.6	17	19	C	C	N	N
132	Mariyambeevi	43	F	Prednisolone	15	O	24	RA	1	126	76	88	6/18	6/24	N.8	N.8	22	23	P1	P2	N	N
133	Anitha	28	F	Prednisolone	12.5	O	13	UCTD	1	92	70	92	6/6	6/6	N.6	N.6	15	16	C	C	N	N
134	Thendral	36	F	Prednisolone, Budesonide	5, 360 mcg	O, I	24	BA	2	114	72	116	6/36	6/60	N.18	N.18	23	24	P2	P3	N	N

135	Neelambiga	50	F	Prednisolone	5	O	36	RA	1	122	80	124	6/24	6/36	N.12	N.12	22	22	P2	P2	N	N
136	Shankar	46	M	Prednisolone	2.5	O	7	ILD	2	90	62	130	6/9	6/9	N.6	N.6	19	18	P1	P1	N	N
137	Selvi	28	F	Prednisolone	7.5	O	9	SLE	1	128	80	122	6/6	6/6	N.6	N.6	21	20	C	C	N	N
138	Boopathi	36	M	Fluticasone	125 mcg	I	48	BA	2	110	74	136	6/18p	6/24	N.10	N.12	32	30	P2	P2	C:D-0.6	C:D-0.4
139	Deivathal	33	F	Budesonide	360 mcg	I	24	BA	2	120	70	104	6/12	6/12	N.8	N.8	19	18	P1	P1	N	N
140	Sathish	45	M	Prednisolone, Budesonide	10, 360 mcg	O, I	12	COPD	2	128	82	96	6/12	6/18	N.8	N.8	21	21	P1	P1	N	N
141	Kanaga	47	F	Prednisolone	15	O	48	RA	1	120	80	88	6/24	6/36	N.10	N.12	24	24	P2	P2	N	N
142	Velmmal	48	F	Prednisolone	10	O	7	DM	1	110	72	136	6/6	6/6	N.6	N.6	21	21	C	C	N	N
143	Karthikeyan	28	M	Betamethasone	0 . 1 %	E	9	VIT	1	116	74	110	6/6	6/9	N.6	N.6	19	18	C	P1	N	N
144	Mohana	36	F	Prednisolone	10	O	6	PV	1	120	70	126	6/6	6/6	N.6	N.6	16	16	C	C	N	N
145	Durai	43	M	Prednisolone, Budesonide	5,360 mcg	O,I	36	BA	2	126	76	130	6/36	6/60	N.18	N.36	24	24	P2	P3	N	N
146	Murali	28	M	Budesonide	360 mcg	I	7	BA	2	92	70	106	6/6	6/6	N.6	N.6	18	18	C	C	N	N
147	Priya	22	F	Prednisolone	5	O	12	SLE	1	124	80	100	6/6	6/6	N.6	N.6	22	23	C	C	N	N
148	Deepa	28	F	Prednisolone	7.5	O	7	DCSS	1	110	70	88	6/6	6/6	N.6	N.6	17	18	P1	P1	N	N
149	Sundar	36	M	Prednisolone	15	O	36	BA	2	122	80	96	6/12	6/9	N.8	N.8	23	22	P1	P1	CSCR	N
150	Prakash	40	M	Prednisolone	5	O	4	RA	1	116	76	132	6/6	6/6	N.6	N.6	19	19	C	C	N	N
151	Masilamani	48	M	Prednisolone, Fluticasone	10, 125 mcg	O, I	10	Post-TB	2	110	78	104	6/24	6/36	N.10	N.10	23	22	P2	P2	N	N
152	Arumugan	44	M	Prednisolone, Budesonide	5, 360 mcg	O, I	36	BA	2	122	80	76	6/9	6/24	N.8	N.8	24	26	P1	P2	N	N
153	Rajathi	49	F	Prednisolone	10	O	12	RA	1	120	78	84	6/6	6/6	N.6	N.6	22	22	C	C	N	N
154	Rathina	37	F	Budesonide	250mcg	I	24	BA	2	110	70	136	6/12	6/24	N.8	N.8	17	16	P1	P1	N	N
155	Eshwariammal	50	F	Prednisolone	5	O	36	RA	1	126	82	106	6/6	6/6	N.6	N.6	24	24	C	C	N	N

156	Nagamma	44	F	Prednisolone	5	O	24	RA	1	130	70	128	6/6	6/6	N.6	N.6	21	22	C	C	N	N
157	Suryakala	48	F	Prednisolone, Fluticasone	10, 125 mcg	O, I	8	Post-TB	2	122	80	122	6/12	6/9	N.8	N.8	22	23	P1	P1	N	N
158	Vanitha	38	F	Prednisolone	5	O	10	SD	1	110	80	110	6/6	6/6	N.6	N.6	25	26	C	C	N	N
159	Rajan	42	M	Prednisolone	10	O	10	BA	2	120	80	128	6/9	6/6	N.6	N.6	18	19	P1	C	N	N
160	Anandhi	49	F	Prednisolone	15	O	36	RA	1	110	70	122	6/6	6/6	N.6	N.6	26	24	C	C	C:D-0.6	C:D-O.5
161	Annammal	35	F	Betamethasone	0 . 1 %	E	9	VIT	1	100	60	88	6/6	6/6	N.6	N.6	16	17	C	C	N	N
162	Ranganayagi	50	F	Prednisolone, Budesonide	7.5, 360 mcg	O, I	9	COPD	2	120	80	82	6/9	6/9	N.6	N.6	17	18	P1	P1	N	N
163	Annakili	44	F	Fluticasone	125 mcg	I	24	BA	2	110	80	96	6/6	6/6	N.6	N.6	24	24	C	C	N	N
164	Mariyammal	38	F	Prednisolone	10	O	48	RA	1	90	60	108	6/18	6/12	N.8	N.8	22	23	P1	P1	N	N
165	Vasugi	26	F	Prednisolone	5	O	7	DCSS	1	110	70	128	6/6	6/6	N.6	N.6	17	16	C	C	N	N
166	Manigandan	36	M	Prednisolone	7.5	O	8	LR	2	130	80	134	6/6	6/9	N.6	N.6	16	17	C	P1	N	N
167	Muthugoundar	49	M	Betamethasone	15	O	24	BA	2	120	80	88	4/60	6/60	N.36	N.18	22	23	P5	P4	N	N
168	Manoj	26	M	Betamethasone	0 . 1 %	E	7	VIT	1	90	60	122	6/6	6/6	N.6	N.6	14	14	C	C	N	N
169	Geetha	44	F	Prednisolone	5	O	24	RA	1	120	70	106	6/6	6/6	N.6	N.6	23	24	C	C	N	N
170	Thenmalar	38	F	Prednisolone	5	O	12	SLE	1	130	80	104	6/6	6/6	N.6	N.6	22	23	C	C	N	N
171	Saravanan	35	M	Budesonide	250mcg	I	24	BA	2	110	68	98	6/9	6/12	N.8	N.8	17	17	P1	P1	N	N
172	Subramani	45	M	Prednisolone, Budesonide	15, 250 mcg	O, I	12	BA	2	118	80	92	6/36	6/36	N.12	N.12	13	14	P2	P2	N	N
173	Kasinadhan	49	M	Prednisolone, Budesonide	10, 250 mcg	O, I	10	COPD	2	90	60	78	6/6	6/6	N.6	N.6	14	14	C	C	N	N
174	Lalitha	36	F	Betamethasone	0 . 1 %	E	8	VIT	2	110	70	110	6/6	6/6	N.6	N.6	15	16	C	C	N	N
175	Gowry	28	F	Prednisolone	5	O	7	UCTD	1	112	72	104	6/6	6/6	N.6	N.6	16	16	C	C	N	N

176	Parvathy	21	F	Prednisolone	10	O	8	SLE	1	122	80	134	6/6	6/6	N.6	N.6	18	18	C	C	N	N
177	Ponnamal	46	F	Prednisolone	10	O	48	RA	1	110	80	128	6/6	6/6	N.6	N.6	24	24	C	C	C:D-0.3	C:D-0.3
178	Rajeshwary	41	F	Budesonide	360 mcg	I	24	BA	2	80	60	106	6/18p	6/24	N.10	N.10	17	16	P2	P2	N	N
179	Pandiyan	39	M	Budesonide	250 mcg	I	24	BA	2	124	82	94	6/36	6/24	N.12	N.12	23	25	P2	P2	N	N
180	Annamalai	47	M	Prednisolone	2.5	O	6	ILD	2	120	80	88	6/9	6/9	N.8	N.8	15	16	P1	P1	N	N
181	Narayanasamy	49	M	Prednisolone, Fluticasone	10, 125 mcg	O, I	24	BA	2	100	60	126	5/60	6/60	N.36	N.36	23	22	P5	P3	N	N
182	Manivel	42	M	Prednisolone	15	O	8	RA	1	90	60	104	6/12	6/24	N.8	N.8	15	16	P1	P1	N	N
183	Soundammal	37	F	Prednisolone	7.5	O	9	SD	1	120	80	122	6/6	6/6	N.6	N.6	21	21	C	C	N	N
184	Veeramuthu	32	M	Prednisolone	5	O	7	Post-TB	2	126	76	116	6/9	6/9	N.6	N.6	16	15	P1	P1	N	N
185	Annakodi	39	F	Budesonide	360 mcg	I	36	BA	2	92	70	84	6/36	6/60	N.18	N.18	14	16	P2	P3	N	N
186	Janaki	48	F	Prednisolone	5	O	60	RA	1	124	80	96	6/6	6/6	N.6	N.6	32	28	C	C	C:D-0.6	C:D-0.4
187	Kalyani	24	F	Prednisolone	5	O	14	SLE, NS	1	116	76	116	6/6	6/6	N.6	N.6	15	16	C	C	N	N
188	Maral	47	F	Prednisolone	15	O	10	RA	1	110	72	134	6/12	6/9	N.8	N.8	23	24	P1	P1	N	N
189	Devar	46	M	Betamethasone	0 . 1 %	E	9	VIT	2	122	76	128	6/6	6/6	N.6	N.6	18	19	C	C	N	N
190	Prem	23	M	Prednisolone	5	O	12	ILD	2	118	78	106	6/6	6/6	N.6	N.6	17	16	C	C	N	N
191	Subbaiyan	48	M	Prednisolone, Fluticasone	10, 125 mcg	O, I	13	BA	2	110	70	82	6/24	6/36	N.10	N.10	15	14	P2	P2	N	N
192	Badhran	45	M	Prednisolone	5 mg	O	8	PV	1	94	62	98	6/6	6/6	N.6	N.6	12	13	C	C	N	N
193	Lakshmanam	36	M	Prednisolone	7.5	O	7	LR	2	126	78	136	6/36	6/36	N.12	N.12	15	16	P2	P2	N	N
194	Rajagopal	31	M	Prednisolone	5	O	8	ILD	2	120	82	128	6/6	6/6	N.6	N.6	18	17	C	C	N	N
195	Shanthi	39	F	Prednisolone	10	O	10	PN	2	118	80	96	6/6	6/6	N.6	N.6	17	16	C	C	N	N
196	Rangammal	48	F	Prednisolone	10	O	36	RA	1	124	78	108	6/9	6/6	N.6	N.6	25	24	P1	C	N	N

197	Geetha	33	F	Prednisolone	5	O	12	SLE	1	110	70	128	6/6	6/6	N.6	N.6	15	16	C	C	N	N
198	Rajavel	48	M	Prednisolone, Budesonide	5, 360 mcg	O, I	24	BA	2	122	80	136	6/36	6/24	N.12	N.12	23	24	P2	P2	N	N
199	Loganayagi	45	F	Prednisolone, Budesonide	10, 250 mcg	O, I	8	BA	2	116	76	118	6/9	6/12	N.8	N.8	19	20	P1	P1	N	N
200	Chellamma	50	F	Prednisolone	15	O	7	RA	1	110	78	106	6/24	6/18	N.10	N.10	22	23	P2	P1	N	N
201	Rajammal	42	F	Prednisolone acetate, Dexamethasone	1%	T, ST	7	CAU	2	122	80	132	6/24	6/18	N.10	N.10	22	22	C	C	N	N
202	Mohammed farook	48	M	Dexamethasone	0 . 1 %	T	12	CAU	2	126	76	108	6/12	6/9	N.8	N.8	29	28	P1	PI	N	N
203	Parvathy	36	F	Prednisolone	5	O	7	PU	2	92	70	112	6/60	6/6	N.36	N.6	19	18	C	C	PU	N
204	Nanjan	44	M	Dexamethasone	0 . 1 %	T	8	CAU	2	124	80	78	6/18	6/24	N.10	N.10	23	22	C	C	N	N
205	Muthu	29	M	Dexamethasone	0 . 1 %	T,ST	6	IU	2	126	78	88	6/9	6/36	N.8	N.10	24	24	C	C	VITRITIS	VITRITIS
206	Velliyamal	31	F	Dexamethasone	0 . 1 %	T	14	CAU	2	120	82	94	6/36	6/24	N.12	N.12	25	23	P2	P1	N	N
207	Muniyal	34	F	Prednisolone	7.5	O	6	VKH	2	118	80	126	4/60	6/60	N.36	N.36	16	16	C	C	PU	PU
208	Sakthiram	38	M	Dexamethasone	0 . 1 %	T	16	CAU	2	124	78	118	6/24	6/18	N.10	N.10	23	24	P2	P1	N	N
209	Babulal	45	M	Dexamethasone	0 . 1 %	T	9	CAU	2	110	70	132	6/9	6/9	N.8	N.8	18	19	C	C	N	N
210	Bhuvaneshwari	39	F	Prednisolone	5	O	7	VKH	2	122	80	106	6/18	6/24	N.10	N.10	16	14	C	C	PU	PU
211	Manjula	32	F	Dexamethasone	0 . 1 %	T,ST	7	IU	1	116	76	96	6/36	6/9	N.12	N.8	27	26	C	C	VITRITIS	VITRITIS
212	Gangadharan	40	M	Prednisolone	2.5	O	7	PU	2	120	80	88	6/36	6/24	N.10	N.10	17	16	C	C	PU	PU
213	Neem Ahmed	33	M	Dexamethasone	0 . 1 %	T	6	CAU	2	126	76	116	6/9	6/12	N.8	N.8	14	17	C	C	N	N
214	Thangavel	31	M	Dexamethasone	0 . 1 %	T	10	CAU	1	92	70	124	6/24	6/18	N.10	N.10	28	26	C	C	N	N

215	Chinnaponnu	40	F	Prednisolone	5	O	6	PU	2	124	80	128	6/60	6/6	N.18	N.6	22	22	C	C	PU	N
216	Kumaresan	29	M	Dexamethasone	0.1%	T	8	CAU	1	116	76	86	6/12	6/9	N.8	N.8	25	24	C	C	N	N
217	Gunasekaran	26	M	Prednisolone	2.5	O	7	PU	2	110	72	92	6/36	6/9	N.10	N.8	16	15	C	C	PU	PU
218	Marimuthu	30	M	Dexamethasone	0.1%	T	9	CAU	1	122	76	126	3/60	6/24	N.36	N.12	25	26	C	C	N	N
219	Prabha	27	F	Prednisolone	5	O	7	PU	2	118	78	32	6/36	6/6	N.12	N.6	22	22	C	C	PU	PU
220	Narayanan	28	M	Prednisolone	7.5	O	6	PU	2	110	70	110	6/12	6/6	N.8	N.6	14	15	C	C	PU	N
221	Gugan	39	M	Dexamethasone	0.1%	T	14	CAU	2	94	62	116	6/18p	6/12	N.8	N.8	26	28	P1	P1	N	N
222	Bagyam	42	F	Prednisolone	2.5	O	7	PU	2	126	78	124	6/6	6/36	N.6	N.10	24	23	C	C	N	PU
223	Anthony	28	M	Prednisolone acetate & Subtenon	1%	T	6	CAU	2	110	70	136	6/24	6/9	N.10	N.8	14	12	C	C	N	N
224	Janani	31	F	Dexamethasone	0.1%	T,ST	7	IU	2	130	80	120	6/60	6/12	N.18	N.8	22	22	C	C	VITRITIS	CSCR
225	Raman	37	M	Prednisolone	10	O	6	PU	2	120	80	88	6/36	6/6	N.10	N.6	17	15	C	C	PU	N
226	Chandrasekar	42	M	Dexamethasone	0.1%	T	9	CAU	1	90	60	92	6/18	6/9	N.10	N.8	24	25	C	C	N	N
227	Rajesh	38	M	Dexamethasone	0.1%	T	12	CAU	2	120	70	116	6/12	6/12	N.8	N.8	22	22	P1	P1	N	N
228	Vijaya	32	F	Dexamethasone	0.1%	T,ST	6	IU	2	130	80	124	5/60	6/9	N.36	N.8	23	22	C	C	VITRITIS	VITRITIS
229	Marudhapa	40	M	Prednisolone	2.5	O	7	PU	2	110	68	130	4/60	6/6	N.36	N.6	14	15	C	C	PU	N
230	Thulasiyammal	45	F	Dexamethasone	0.1%	T	8	CAU	2	118	80	122	6/24	6/9	N.10	N.6	22	21	C	C	N	N