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Ophthalomology

A CLINICAL STUDY ON OCULAR TOXICITY OF ETHAMBUTOL

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ABSTRACT A common first-line treatment for TB, which still has a significant impact on morbidity and death in underdeveloped countries, is ethambutol. Although serious drug toxicity from this extensively used medicine occur rarely, the possible consequences might be alarming for the medical world, which uses this drug incessantly. **Purpose:** To review the literature on ocular toxicity of ethambutol—its clinical presentation, toxicity characteristics, monitoring, and preventive measures. **Materials & Methods:** The participants underwent an eye evaluation consisting of detailed history, best corrected visual acuity by Snellen chart, fundoscopy examination, slit lamp examination, colour vision by Ishihara chart, and Visual fields using Humphrey field analyzer with the C-30-2 threshold program. All the enrolled patients were examined before the start of the anti-tubercular treatment and after the first and second months of treatment. Visual acuity loss was counted to see if it had exceeded two Snellen chart lines between the last ophthalmological examination before ethambutol was started and the first examination after the medication was started in the absence of other causal factors. **Results:** There were 50 participants, 30 males and 20 females, of age 13 to 70 years, with a mean of 34.23+-15.54 years. Decrease in Visual acuity was seen in eight eyes of four patients, one each in after one month and two eyes after two months of starting the therapy. Visual field defects were seen in six eyes of three participants. Optic disc abnormalities were noted in four eyes of two patients, one eye had disc edema and the other three had temporal pallor. Colour vision abnormalities were noted in twelve eyes of six patients of which four eyes showed impairment in red - green colour perception and the others showed impairment in blue - yellow colour perception. **Conclusion-** To ensure that ethambutol is a safe medication, the patient, the prescribing physician, and the ophthalmologist or optometrist should collaborate closely. Since TB is a public health issue, ethambutol usage is likely to persist. Before starting ethambutol therapy, all newly diagnosed TB patients should have an ophthalmological examination. Ethambutol's risk for ocular toxicity should be known to the prescribing physician, and all patients receiving this medication should be informed of any possible adverse effects (loss of visual acuity, contrast sensitivity, colour vision and visual fields). Ethambutol needs to be stopped right once if the negative effects are identified.

KEYWORDS : Ethambutol, Tuberculosis, Visual Acuity, Colour vision

INTRODUCTION

India is among the countries with the highest tuberculosis burden and accounts for one-fifth of the global burden[1].

National Tuberculosis Elimination Program has been implemented throughout the country. Under this patients receive intermittent treatment under supervision thrice weekly

The combination of drugs used in these categories is the same as in the daily regimen, but the dosage of ethambutol and isoniazid is almost double as compared to the daily regimen.

Ethambutol is a bacteriostatic drug, developed in 1962. Ethambutol can cause visual impairment as a result of retrobulbar neuritis, which is related to the dose and duration of treatment

Toxicity is dose and duration dependent, with an incidence as high as 18% at a daily dose over 35 mg/kg/day. It is rare with a standard daily dose of 15mg/kg/day.

Toxicity typically occurs between 3 to 6 months of starting treatment, though it has been reported after only a few days[2]. Renal dysfunction may confer a higher risk of toxicity as ethambutol is excreted via kidneys.

Symptoms may be absent, but typically include painless bilateral blurring usually central though sometimes paracentral or peripheral. Impairment of color vision may be noticed.

MATERIALS AND METHODS

Study Design:

A prospective observational study of 50 patients was conducted which includes patients registered at the NTEP – DOTS center between October 2020 to August 2021.

Setting:

The study was done at the REGIONAL EYE HOSPITAL, KURNOOL, after approval from the institutional ethics committee.

Patient Selection:

All patients coming to the institution NTEP-DOTS centre were enrolled in the study after their informed consent.

Exclusion Criteria:

Participants with systemic diseases such as diabetes, hypertension, renal failure, addiction to tobacco, alcohol.

Patients having other ocular diseases that might affect visual acuity or may possibly contribute to color vision defects like diabetic retinopathy, sickle cell retinopathy, retinitis pigmentosa, previous retinal detachment, optic neuropathies, glaucoma, optic neuritis, optic atrophy, cataract with more than +2 nuclear sclerosis were excluded from the study.

Also patients on medications implicated in causing color vision deficiency like oral contraceptives, digoxin, and indomethacin and those who had color vision deficiency at the baseline were excluded from the study.

RESULTS:

50 participants were enrolled in the study. There were 30 males and 20 females, of age 13 to 70 years ,with a mean of 34.23+-15.54 years. At the baseline, the visual acuity ranged from 6/6 to 6/60. Anterior segment examination by slit lamp, direct ophthalmoscopy, visual fields and colour vision were normal.

Visual acuity loss was seen in eight eyes of four patients, one each in after one month and two eyes after two months of starting the therapy. Visual field defects were seen in six eyes of three participants. One participant showed centrocaecal scotoma on the Humphrey perimeter, while the remaining showed peripheral constriction. The defects were bilateral in all cases.

Optic disc abnormalities were noted in four eyes of two patients .One eye had disc edema and the other three had temporal pallor. Colour vision abnormalities were noted in twelve eyes of six patients, four eyes showed impairment in red - green color perception and the others showed impairment in blue - yellow color perception.

Six patients had ocular symptoms and they were advised to stop

ethambutol and all of them showed improvement in visual acuity, fundus findings and color vision after follow up of one to two months.

DISCUSSION:

Ethambutol is being used to treat tuberculosis since 1960.The potential for visual impairment was recognized soon after its introduction Ocular toxicity due to ethambutol usually develops after two months of therapy and is related to dose, as was also evident in the present study.

Signs include minimal to severe reduction in VA, normal or slightly swollen optic discs with splinter haemorrhages and normal or sluggish pupils.

Red – Green dyschromatopsia is the most common objective abnormality of color vision, but blue-yellow defects may be an early finding.

Loss of contrast sensitivity is an early sign. Retrobulbar neuritis was reversible after two to four months of withdrawal of the drug as was seen in our case, and also where improvement, both in terms of visual acuity and fundus changes was seen as early as one month of withdrawal of drug. The overall outcome of treatment was not affected by discontinuation of ethambutol in these patients.

TOTAL NUMBER OF PATIENTS	N=50
Male	30
Female	20
Total number of eyes	100

Fig 1: Characteristics Of The Study Subjects

SEX	NUMBER	AGE RANGE(IN YEARS)
MALES	30	13-70
FEMALES	20	14-70

Fig 2: Age And Sex Distribution Of Study Subjects

CONCLUSION:

This study on the evaluation of visual functions in patients receiving ethambutol as a part of DOTS therapy does hint at the fact that ethambutol when taken according to the dose and duration, as prescribed under DOTS REGIMEN, can cause ocular toxicity.

It has also seen that a reversal of these toxic effects occurs if the drug is immediately stopped[3].

Thus, early diagnosis using a sensitive indicator is necessary and may be helpful in preventing irreversible visual loss that may occur if the drug is used continuously.

Baseline visual Acuity and ishihara testing are prudent prior to starting ethambutol Repeat testing should be performed every 6 months in patients on the standard dose To reduce the risk of toxic optic neuropathy, the dose of ethambutol should not exceed 15mg/kg/day

Ethambutol should be stopped immediately if toxicity develops, with consideration given to discontinuation of isoniazid if being used synchronously[4].

The study findings have shown that there is a need to formulate guidelines for mandatory routine ophthalmic checkups in patients receiving ethambutol and compulsory education to the patient about blurring of vision, problems in appreciating different colors and any non seeing areas in the central field.

This can be carried out by the DOTS provider and will not require an ophthalmologist consultation at the base level. It is important to preserve the sight while treating tuberculosis.

PARAMETER EXAMINED (N=50)	AFTER FIRST MONTH	AFTER SECOND MONTH	TOTAL N (%)
VISUAL ACUITY	02	02	04
OCULAR TENSION	Normal	Normal	No change
FUNDUS CHANGES	No change	02	02
FIELD CHANGES	01	02	03
COLOR VISION	04	02	06

Fig 3: Ocular examination during follow up distributed category wise

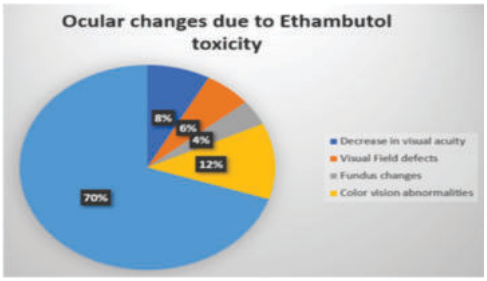

Fig 4: Ocular changes due to ethambutol toxicity

REFERENCES:

1. Narang RK, Varma BM. Ocular toxicity of ethambutol (a clinical study). Indian J Ophthalmol. 1979.
2. Sharma GS, Purohit SD, Lodha SC. Comparative study of isoniazid and ethambutol with isoniazid ethambutol and pyrazinamide in the retreatment of pulmonary tuberculosis. Ind Med Gaz. 1975;15:140.
3. Menon V, Jain D, Saxena R, Sood R. Prospective evaluation of visual function for early detection of ethambutol toxicity. British journal of ophthalmology. 2009 Sep1; 93(9):1251-4.
4. Garg P, Garg R, Prasad R, Mishra AK. A prospective study of ocular toxicity in patients receiving ethambutol as a part of directly observed treatment strategy therapy. Lung India: Official Organ of Indian Chest Society. 2015 Jan; 32(1):16.