https://doi.org/10.29309/TPMJ/2026.33.11.10813 www.theprofesional.com

ORIGINAL ARTICLE

Role of optical coherence tomography in early detection of glaucoma suspect.

Ejaz Ahmad Javed[1], Muhammad Rizwan Khan[2], Rimsha Tahreem[3], Muhammad Saad[4]

ABSTRACT… Objective: To evaluate role of OCT in early detection of Glaucoma Suspect by measuring inferior retinal nerve fiber layer thickness by Optical Coherence Tomography in relationship with visual field analysis by Humphery visual field analyser. **Study Design:** Prospective Cross-sectional Observational Analytical Study. **Period:** 15 May 2024 to 15 May 2026. **Setting:** Department of Eye, Independent University Hospital and Ibrahim Eye Centre, Faisalabad. **Methods:** 50 patients aged between 18 to 50 years with best corrected snellen visual acuity of 6/24 or better and with no secondary ocular or neurological ailments or any retinal problems were enrolled from out patient eye department of independent university Hospital and Ibrahim eye centre, Faisalabad. The enrolled patients were suspected having un-diagnosed primary open angle Glaucoma. The complete systemic systemic including history of diabetes, hypertension, arthritis, trauma, family history and medical history was recorded. Slit-lamp examination was done for status of cornea, anterior chamber, lens, iris, pupil, vitreous and fundus. Applanation tonometry was perfomed and recorded. Pachymetry, Gonioscopy, humphery visual field analysis and then OCT was done for Optic disc analysis, Ganglian Cell Complex and retinal nerve fiber layer thickness analysis. The whole record of history, examination and investigations was saved in a specific proforma. **Results:** Total 50 patients, aged between 18 to 50 years (mean 41.00+9.48), Male patients were 35 while Female were 15. The family history of glaucoma was 57.14 % while cup-to-disc ratio (CDR) was from 0.4 to 0.8 (mean 0.59+0.10) and intraocular pressure was from 14 to 25 mmHg (mean 20.09 +2.11). The pachymetry ranged between 470 to 572 mm (mean 520.20+22.82) and inferior RNFL from 36.40 to 96.10 um (mean 69.32+12.52). **Conclusion:** This study proved that RNFL thickness by OCT has a significant and potential diagnostic role in detection of early glaucoma and glaucoma suspect. At the same time, the OCT proved to be equally effective in monitoring progression of glaucoma. While considering the other OCT parameters as measuring GCC, analysing ONH and measuring RNFL thickness are also important in detection and monitoring of glaucoma but we proved that thickness of RNFL at inferior quadrant was more important in detection of glaucoma suspect. The OCT derived RNFL and particularly inferior RNFL thickness is a sesitive, and objective indicator for identifying the glaucoma suspect while detecting it at preclinical stage even before visual fields loss by perimetry.

Key wards: Glaucoma Suspect, GCC Thickness, Inferior Quadrant RNFL Thickness, OCT, Optic Nerve Head Analysis.

Article Citation: Javed EA, Khan MR, Tahreem R, Saad M. Role of optical coherence tomography in early detection of glaucoma suspect. Professional Med J 2026; 33(11):2307-2313. https://doi.org/10.29309/TPMJ/2026.33.11.10813

INTRODUCTION

Glaucoma is a group of ocular diseases with several causes that progress to optic neuropathy and then resulting into the typical visual fields changes. Early intervension can minimize such irreversible vision damage and so can preserve the optic nerve but diagnosis is still challenging. Some ophthalmologists suggest that intraocular pressure (IOP) is main factor while others say that disease progression is due to vascular and neuro-degenerative problems concluding that IOP cannot be a reliable diagnostic factor for glaucoma.[1]

Usually the increased intraocular pressure is supposed to cause optic nerve change and ultimately leads to develop glaucoma. IOP level creates mechanical-strain that affects axonal function at the optic nerve head which causes local extracellular matrix remodeling and retinal ganglion cells death.[2]

The normal intraocular pressure range is between 11 to 21 mmHg for individuals over 40 years age while upper limit of normal in individuals over 70 years is 23 mmHg. It is estimated that 4-7% of the population over the age of 40 have an IOP more than 21 mmHg with open filtration angles and without detectable glaucomatous damage, these individuals are labeled to having ocular hypertension (OH).[3]

Glaucoma is called an optic neuropathy due to degeneration of ganglion cells and ultimately irreversible visual field loss.

1. MBBS, FCPS, VR (Germany), Professor Ophthalmology, Independent University Hospital, Faisalabad.
2. MBBS, FCPS, FPOS, Associate Professor
3. MPH, Doctor of Optometry, Optometrist
4. MBBS, House Officer

Correspondence Address:
Dr. Ejaz Ahmad Javed
Department of Ophthalmology, Independent University Hospital, Faisalabad.
ejaved1@gmail.com

Article received on:
12/06/2026
Accepted for publication:
21/08/2026

This loss of vision may remain asymptomatic until severe structural loss occurs. So early detection may decrease visual loss and restore optic nerve structure. There is a theory that progression of glaucoma is due to increased intraocular pressure where as other theories suggest that disease progression is due to vascular and neurogenerative changes, and so intraocular pressure may not be a reliable diagnostic parameter for glaucoma.[4]

Different theories has been mentioned that may cause optic neuropathy and glaucoma as direct mechanical damage to retinal nerve fibers at optic disc or at pores of lamina cribrosa, ischemic damage by compression of blood vessels supplying the optic nerve head and common pathway due to reduction to exoplasmic flow, or reduction of nutrients or removal of metabolic products or deprivation of neural growth factors or oxidative injury or immune-mediated damage.[5]

The Optical coherence tomography (OCT) is most useful when the patient is either a glaucoma suspect or has early to moderate disease. It can be used to detect damage and progression. The POAG is a worldwide vision threatening disease with high prevalence for last 20 years.[6]

The Optical coherence tomography used to evaluate optic nerve structure is a valuable tool to diagnose glaucoma and maintain vision and good life style. The structure-function relationship was studied on 600 eyes with glaucoma by Jacqueline Chua et al and found that RNFL measurements has a conclusive role in glaucoma estimation in relation to visual field changes.[7]

Visual impairment from glaucoma is attributable due to the delayed diagnosis and treatment. The recognizing risk factors for glaucoma can improve diagnosis efficiency. One most important advantage of OCT is its capacity to show detailed structural layers which corresponds to the tissue sections on a histology slide.[8]

P0AG is the largest proportion among all the subtypes of glaucoma's with notable regional variation in disease burden. The incidence of POAG was higher in African region than American and European region.[9]

The hypertension is considered to develop optic neuropathy and glaucoma by reducing ocular perfusion pressure. It was seen in meta-analysis that hypertension increases arterial perfusion pressure and optic nerve ischemia with damage to the retinal ganglion cells.[10]

The perimetric evaluation is a significant diagnostic test to detect glaucoma but it was seen that preperimetric glaucoma was found without presence of visual field defects detected by a perimetric examination. It was proved in a retro-spective cohort study, that rapid GCC thinning during initial follow up period was associated with faster rate of central visual field loss.[11]

The detection of Retinal nerve fiber layer vthickness by OCT is often the first sign of glaucoma so it can be more important than perimetric detection of glaucoma. The effect of cpRNFL thinning was greatest in glaucoma suspects but statistically significant in advanced glaucoma. In contrast, the effect of mGCIPL thinning was smallest in suspects, increased with worsening disease severity and more significant in advanced disease.[12]

The RNFL thickness decreases with increase in glaucoma and is a valuable parameter to differentiate mild from established POAG. The nasal-inferior RNFL sector is the most sensitive to glaucomatous damage than all three others.[13]

METHODS

This include 50 eligible patients with age between 15 to 50 years who were enrolled after obtaining approval from Ethical Committee of Independent Medical College (IUH/IRB/000059) and University Hospital, Faisalabad. The all patients were evaluated in eye unit of independent university Hospital and Ibrahim eye center, Faisalabad with any of the following parameters and findings;

. Elevated intraocular pressure > 21 mmHg
. Suspicious optic nerve head appearance (enlarged cup-to-disc ratio, rim thinning, or notching
. Positive family history
. Others risk factors

Exclusion Criteria

Included past history of glaucoma surgery, significant media opacity, retinal or optic neuropathies, unreliable visual fields, poor OCT signals quality.

The clinical assessment protocol was established as;

1. History; medical and ophthalmic, as age, sex, systemic and ocular history, family history
2. Complete ocular examination e.g. visual acuity by Snellen chart, intraocular pressure by Golgmann applanation tonometer, Pachymetry, Fundoscopy by slit lamp biomicroscopy, complete disc examination, Optical Coherence Tomography (RNFL thickness, Ganglion cell complex, disc analysis), and Visual Field Testing (Humphrey field Analyzer).

OCT used was high-resolution spectral-domain for Peripapillary RNFL, Macular Ganglion cell and Disc parameters, with good acceptable scan signals and special attention was paid to the "ISNT rule" as normal RNFL thickness decreases from inferior >superior>nasal>temporal and deviation from this pattern was considered as one of early glaucoma markers.

Interpretation of Visual field analysis was based on standard criteria for glaucomatous damage (two or more contiguous test points depressed at p<0.01. Only reliable fields were included (fixation losses < 20% false positive and negative <15%).

The all statistical analysis were performed using SPSS Statistics for Window version 26.0 a two-tailed p-value of <0.05 was considered statically significant throughout.

Patients were subdivided for critical analysis based on inferior RNFL thickness, visual field status (normal vs abnormal). Key comparisons included inferior RNFL in early glaucoma suspects vs those with normal fields while mean CDR, IOP and pachymetry stratified by RNFL and visual field status.

Pearson or Spearman correction coefficients were computed within SPSS to assess associations between inferior RNFL thickness, visual field defects, IOP, pachymetry and CDR.

Linear regression models were constructed in SPSS incorporating variants of age, sex and central corneal thickness to account for normative variation in RNFL measurements.

RESULTS

Initially 50 respondents of which 35 male and 15 female were analyzed but one patient left to follow before final examination. The average age of sample members was 40.67 +8.80 years and the minimal and maximum ages were 18 to 50 years respectively.

Sex determination

TABLE-I

Sex distribution

Sr No.	Sex	Percentage %
01	Male 35	70
02	`Female 15	30
Total	50	100

TABLE-II

Age variation

Sr No	Age	Number	Percentage %
01	18 - 24	6	12
02	24-n31	3	6
03	32- 38	5	10
04	39-45	15	30
05	46-50	21	42
Total		50	100

Mean age = 41+9.48 (std. variation) range of age (18-50)

The average intraocular pressure (IOP) of the right eye was 19.97 +1.82 mmHg with majority of the measurements falling within the upper standard limit of normal values.

TABLE-III

IOP variation

Sr No	IOP mmHg	Number	Percentage %
01	14-16	2	2.55
02	17-19	24	30.40
03	20- 25	53	67.05
Total		79	100

Mean 20.09 + 2.11 STD. Deviation (Range 14-25).

The average cup-disc ratio (right eye) was found to be 0.59 + 0.09 which has features of optic nerve head that are typical of early-to-moderate glaucomatous damage.

TABLE-IV

Cup and disc variation

Sr No	CD ratio	Number	Percentage %
1	O.3-05	20	25.32
2	0.5-0.6	14	17.72
3	0.6-0.7	20	25.32
4	0.7-0.9	25	31.65
Total	80	79	100

Mean 0.59 + SD o.1 range (0.4-0.8)

The average inferior retinal nerve fiber layers (RNFL) thickness was 70.72 +11.54 micron meter with the range of 40 to 95 micon meter indicating large variation in structural optic nerve damage.

TABLE-V

RNFLvalue variation

Sr No	RNFL Value	Number	Percentage %
1	60-70	37	46.84
2	71-80	12	15.19
3	81-90	10	12.66
Total	91-100	20	25.32

TABLE-VI

Best corrected snellen visual acuity

Sr No	Snellen vision	Number	Percentage %
1	6/6-6/12	35	43.8
2	6/12-6/24	25	31.20
3	6/24-6/60	20	25
Total		80	100

The visual acuity ranged from 6/6 to 6/60, considered as an indicator of study and diagnosis of glaucoma.

TABLE-VII

Central corneal thickness (CCT)

Sr No	CCT variation	Number	Persentage %
1	470-525	28	35.44
2	526-560	51	64.56
	Total	79	100

The central corneal thickness is an important factor in diagnosis of glaucoma. The thickness varied from 470 to 560 micron meter in the study population.

TABLE-VIII

Visual field changes

Sr No	Visual Field	Status	Persentage %
1	23	normal	29.12
2	56	abnormal	70.88
Total	79		100

Sr No	No. of Pa-tients	Inferior RNFL um	Abnor-mal VF %age	Mean CDR	Mean IOP (mmHg)
1	07	90-110	100	0.514	18.285
2	32	70-89	21.80	0.5968	20.03125
3	40	<70	47.50	0.6025	20.45
Total	79				

The 23 (29.12%) participants showed normal visual field while 56 (70.88%) showed visual field changes. While inferior RNFL thickness from 70 to 110 micrometer showed visual field changes .A sample Welch t-test was done to compare poor RNFL thickness in normal and abnormal visual field participants. It was shown that the difference between the two groups was highly significant (p=0.0003). Normally visual field participants had a significantly larger mean thickness of the RNFL (75.31 micron meter) than the abnormally visual field participants (61.54micron meter). A non-parametric Wilcoxon rank-sum test was also conducted to validate these findings and this also confirmed the result (p=0,0004).

DISCUSSION

The glaucoma is a multifactorial optic neuropathy characterized by the degeration of retinal ganglion cells which causes typical visual field changes. The diagnosis of the glaucoma is not merely based on investigations, rather it is based on clinical findings that depend primarily on a detailed history, careful examination and then correlation with investigative findings. . In brief all events of life and all means of examinations and investigations should be looked after carefully to diagnose glaucoma. Besides all the lists of investigations the OCT has more importance in diagnosis of glaucoma. In this study we focused on the OCT as diagnostic tool and compared it with perimetry in patients of glaucoma suspect and early un-diagnosed glaucomatic patients.

TABLE-IX

Chi-Square Tests

Test	Variables	X-Squared	df	P-Value	Interpretation
Chi-Square (Yates)	Sex × VF Status	0.0158	1	0.8999	No significant association
Chi-Square (Yates)	Family History × VF Status	8.86e-31	1	1.0000	No significant association

TABLE-X

Summary of Statistical Findings

Hypothesis	Result	Significance	Clinical Implication
Sex associated with VF status	No	p = 0.90	Sex is not a predictor of VF abnormality
Family history associated with VF status	No	p = 1.00	FH is not associated with VF outcomes
RNFL correlated with C/D ratio	Weak	p = 0.08	Marginal negative correlation, borderline significance
RNFL correlated with IOP	No	p = 0.21	No significant relationship detected
RNFL differs by VF status	Yes	p < 0.001	Strong evidence: RNFL thickness is significantly lower in abnormal VF

TABLE-XI

Inferior RNFL thickness and visual field correlation

Inferior RNFL Group (μm)	n	% Abnormal VF	Mean CDR	Mean IOP (mmHg)
>110	9	0%	0.41	17.2
90–110	14	21%	0.47	18.8
70–89	17	59%	0.54	20.1
<70	10	80%	0.63	23.6

The OCT has a definite role in regards of Optic nerve head analysis, Ganglian cell complex and retinal nerve fiber layer thickness. The RNFL has 360 degrees location as inferior, superior, nasal and temporal. We critically observed the inferior RNFL thickness and found that it was most important finding in diagnosis of glaucoma suspect while the patient as well as clinician were unaware of its diagnosis. In this study we found the role of RNFL thicking by OCT in glaucoma suspect was significant and proved after comparison of the structural change observed with OCT and with functional change i.e typical visual field defects by Hymphery Visual Field Analyser. The diagnostic importance of GCC and RNFL thickening in glaucoma was studied in different studies in 2023 and proved that GCC and RNFL thickness were equivalent for identifying early glaucoma with current technology. It was found that superior and concentral macular region are better protected glaucomatous damage when compaired to the inferior part of macula. The temporal quadrants of optic disc where ultrastractural characteristics of the lamina cribrosa could be proctective against early glaucoma damage. The superior-inferior regions of RNFL are more susceptible for glaucoma damage as compared to inferotemporal and superotemporal.[14]

We studied the effect of RNFL thinning in glaucoma suspect in comparison of glaucomatous visual field changes so such structural RNFL thinning was also seen in similar studies showing the effect of RNFL thinning which was greatest in glaucoma suspect but was not so significant in advanced glaucoma while GCC thinning was smallest in glaucoma suspect with progressive disease severity and was also significant in advanced glaucoma. Both GCC and RNFL measures can detect structural progression in glaucoma patients with central damage with moderate to advanced glaucoma. Both GCC and RNFL measures can detect structural progression in glaucoma patients with central damage or moderate to advanced glaucoma.[15]

In glaucoma, both RNFL and GCC thickness decreases significantly compared to healthy eyes, as these are thicker and more stable and decrease RNFL thickness with age shows higher diagnostic ability but GCC may be superior in certain contexts.

RNFL thickness decreases with advancing age over a period.

There is a study result that increase oxygen saturation was association with severity of visual field damage in glaucoma patients.[16]

Ganglion cell-inner plexiform layer and retinal nerve fiber layer changes in glaucoma suspects were noted in various studies and results were established that these changes predict the development of glaucoma. Joong Won Shin et al investigated that ganglion cell inner plexiform layer and peripapillary retinal nerve fiber layer thinning predict development of visual field defects in glaucoma suspects in a retrospective cohort study.[17]

The glaucoma is a multifectorial disease and many factors effect on disease progression as the life style, smoking, exercise and nutrition may play a role in glaucoma pathogenesis.[18]

There is an article which proved a comprehensive stress, diet, and antioxidant therapy and other modifiable environmental factors as life style, exercise, nutrition play effect on IOP and open-angle glaucoma.

It was observed in a National Cohort Study on primary open angle glaucoma and found that patients having cardiovascular disease was associated with higher risk of developing POAG.[20]

In a Cross-Sectional, observational multicenter study conducted at Mughal Trust Hospital and Lahore General Hospital, Lahore it was revealed that association between disease severity and RNFL thinning in the inferior, superior, nasal and temporal quadrants while nasal quadrant RNFL showed no significant association with disease severity. This ISNT rule was more frequently observed in early stages and diminished in the advanced glaucoma.[21]

The circumpapillary retinal nerve fiber layer (cp RNFL) and macular plexiform layer (mGcRNFL) changes were proved in monitoring glaucomatous progression depending on the stage of disease severity in retrospective longitudinal study on 2464 eyes. The rate of cp RNFL and mGc RNFL thinning was faster in progressing eyes than in non-progressing eyes.[12]

A cross-sectional, observational multicenter study conducted at Mughal Trust Hospital and Lahore Generl Hospital, Lahore that showed an association between disease severity and RNFL thinning in the inferior, superior and temporal quadrants while nasal RNFL showed no significant association with disease severity. The ISNT rule was more frequently observed in early stages and diminished in the advanced glaucoma.[21]

There are many limitations in this study of which the small sample size was a significant problem in spite of the all results and findings. We analyzed an abnormal visual field or glaucoma suspect comparing with inferior RNFL thickness while IOP, cup disc ratio, age and sex were not included in comparison of the study. All the predictors were not statistically significant at 0.05 level. However the direction of associations was significant with recent knowledge of glaucoma.

CONCLUSION

This analysis confirms the critical role of inferior RNFL measurements by OCT in the early detection og glaucoma suspect. Even among high-risk population with typical IOP and marginal CDR thinning of the inferior RNFL below normative thresholds is a robust, reproducible biomarker of impending or preperimetric glaucomatous damage, preceding visual field loss in most of the cases. Global and average RNFL measures are valuable but the inferior quadrant provides superior early discrimination especially when combined with macular GCC thickness and other factors.

OCT-derived RNFL, and particularly inferior RNFL thickness, is a sensitive, objective indicator for identifying early glaucoma suspects—detecting preclinical disease before field loss emerges. This parameter, when interpreted within demographic, genetic, and biometric context, should remain central in the risk stratification, longitudinal follow-up, and therapeutic decision-making for at-risk individuals.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Copyright© 21 Aug, 2026.

REFERENCES

1. Raja H, Akram M, Hassan T, Ramzan A, Aziz A, Raja H. **Glaucoma detection, using optical coherence tomography images; A systemic review of clinical and automated studies.** IETE Journal of Research. 2022; 2043783.
2. Jan P, Liya Du, Thao D, Nguyen, Harry Q. **IOP and glaucoma damage, the essential role of optic nerve head and retinal mechanosensors.** Prog Retin Eye Res. Dec. 2023.
3. Salmon JF. **Kansi, s Clinical Ophthalmology E-Book: A Systemic Approsch.** 10Th Edition. 2024; 347.
4. Stein JD, Khawaja AP, Weizer JS. **Glaucoma in adults—screening, diagnosis, and management: A review.** Jama. 2021 Jan 12; 325(2):164-74.
5. John F. Salmon, **Glaucoma Kansi, s Clinical Ophthalmology, A Systemic Approach** 10th edition. 2024; 350.
6. Zhang N, Wang J, Li Y, Jiang B. **Prevalence of primary open angle glaucoma in the last 20 years: A meta-analysis and systematic review.** Scientific reports. 2021 Jul 2; 11(1):13762.
7. Jacqueline Chu, Chi Li, Rachel Chong, Tina T, Rahat HTin A, Leopold S, et al. **Enhastructure -function relationship in glaucoma using anatomical compensation of retinal nerve fibre layer.** British Jounral of Ophthalmology. 2024; 108:1665-71.
8. Saini C, Shen LQ. **Monitoring glaucoma progression with OCT.** Glaucoma specialists discuss how to get the most out of this technology. 2020 May.
9. Shan S, Jing Wu, Jin Cao, Feng Y, Zhou J, Luo Z, et al. **Global incidence and risk factors for glaucoma; A systemic review and meta-analysis of prospective studies.** Journal of Global health. 2024 November 8; 14:04252.
10. Jiajun Wu, Wang H, Shimel Yu. **Hypertension as a risk factor for primary open angle glaucoma; a meta-analysis.** JCPSP. 2023; 33(08):915-18.
11. Mohammadzadeh V, Moghimi S, Nishida T, Walker E, Kamalipour A, Micheletti E, et al. **Association of rates of ganglion cell and inner plexiform thinning with development of glaucoma in eyes with suspected glaucoma.** JAMA Ophthalmology. 2023 Apr; 141(4):349-56.
12. Pham AT, Bradly c, Yohannan J. **Comparing the utility of retinal nerve fiber layer and ganglion cell inner plexiform layer OCT changes to detect glaucoma progression.** Ophthalmology. 2026; 133(1):12-23.
13. Bhat KS, Reddy MV, Pai V. **Correlation of retinal nerve fiber layer thickness with perimetric staging in primary open-angle glaucoma–A cross-sectional study.** Oman Journal of Ophthalmology. 2022 Mar 2; 15(1):36.
14. Ghita AM, Iliescu DA, Ghita AC, Ilie LA, Otobic A. **Ganglion cell complex analysis: Correlations with retinal nerve fiber layer on optical coherence tomography.** Diagnostics. 2023 Jan 11; 13(2):266.
15. Mohammadi M, Su E, Mohammadzadeh V, Besharati S, Martinyan A, Coleman AL, et al. **Comparison of retinal nerve fiber layer and ganglion cell complex rates of change in patients with moderate to advanced glaucoma.** American Journal of Ophthalmology. 2024 Dec 1; 268:190-8.
16. Mohammadi M, Su E, Mohammadzadeh V, Besharati S, Martinyan A, Coleman AL, et al. **Comparison of RNFL, and Ganglion Cell complex rates of change in patients with moderate to advanced glaucoma;** American Journal of Ophthalmology. Dec 2024; 268:191-98.
17. Shin JW, Sung KR, Song MK. **Ganglion cell inner plexiform layer and retinal nerve fiber layer changes in glaucoma suspects enable prediction of glaucoma development.** Am J Ophthalmol. Feb 2020; 210:26-34.
18. Jabbehdari S. **Modifiable environmental factors in glaucoma.** Eur J Ophthalmol. 2021; PMI.
19. Sayena Jabbehdari et al. **Modifiable environmental factors in glaucoma pathogenesis.** Eur J. Ophthalmol. Jul 2021.
20. Jung KI, KiM YC, Shin HJ, Park CK. **National cohort study of primary open angle glaucoma.** Sci Rep. 2025; 15(1):1952.
21. Noor Ul Ain, Shaikh RM, Malik TG. **Disease severity and RNFL thinning in the inferior, superior and temporal quadrants.** Turk J Ophthalmol. 2025; 55(3):127-31.

AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Ejaz Ahmad Javed:** Study conception, procedure, methods, results.
2	**Muhammad Rizwan Khan:** Discussion writing, references.
3	**Rimsha Tahreem:** Introduction, tables.
4	**Muhammad Saad:** Data analysis.