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Research Article

Clinical Pattern of Tractional Retinal Detachment at Menelik II Tertiary Hospital, Addis Ababa, Ethiopia

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Abstract

Background: Tractional retinal detachment (TRD) is a vision-threatening condition in which the neurosensory retina is pulled off from the retinal pigment epithelium due to contraction and elevation of proliferative membranes over the vitreous or retinal surfaces that occur in the absence of retinal tears. Early detection and timely surgical interventions are crucial to prevent permanent visual impairment. Despite its clinical significance, there is limited evidence on TRD in Ethiopia, and to our knowledge, no a published study has specifically addressed this condition.

Objective: To determine the prevalence, clinical characteristics, and associated factors of TRD among patients at Menelik II Comprehensive Specialized Hospital, Addis Ababa, Ethiopia.

Methods: A hospital-based cross-sectional study was conducted from November 2023 to September 2025, among all newly diagnosed TRD patients, 164 patients (190 eyes). Data were collected through structured interviews and comprehensive ophthalmic examinations, including slit-lamp bio-microscopy, dilated fundus evaluation, and optical coherence tomography when available. Data were entered into Epi Data and analyzed using SPSS version 27. Descriptive statistics summarized clinical profiles, while logistic regression identified predictors of macula-off status and poor visual outcomes. Statistical significance was set at $p < 0.05$.

Results: Among 2,940 new retina clinic patients, 164 patients (190 eyes) were diagnosed with TRD, giving a prevalence of 5.6%. The majority were male (60.4%) and aged ≥50 years (54.9%). PDR was the leading cause, accounting for 78.9% of cases, followed by BRVO (7.4%), CRVO (4.2%), and other causes (9.5%). Macula-off TRD was observed in 72.1% of eyes and was significantly associated with symptom duration; 6 months (AOR = 2.88, p = 0.001) and living; 100 km from Addis Ababa (AOR = 1.96, p = 0.017). Poor glycemic control (AOR = 4.35, p = 0.001) and diabetes duration ≥10 years (AOR = 3.82, p = 0.001) were major predictors of PDR-related TRD. Severe visual impairment (6/60) was present in 72.6% of eyes. Macula-off status remained the strongest determinant of poor vision (AOR = 7.91, p = 0.001).

Conclusion: TRD is an important cause of severe visual impairment at Menelik II Hospital, predominantly due to advanced PDR. Late presentation with macula-off detachment is common. Strengthening diabetic retinopathy screening, improving access to laser and intravitreal treatments, and expanding vitreoretinal surgical capacity are essential to reducing preventable blindness. Further multicenter studies are recommended to estimate the national burden of TRD.

Keywords: *Tractional Retinal Detachment; Proliferative Diabetic Retinopathy; Macula-off TRD; Visual Impairment; Retina; Ethiopia*

Introduction

Background

Retinal detachment occurs when the neurosensory retina (NSR) separates from the underlying retinal pigment epithelium (RPE). Embryologically, these two layers are neuroectodermal in origin and lack anatomic junctions between their cells [1,2].

Therefore, the forces of attachment between the neurosensory retina and retinal pigment epithelium are weak; when they are overcome, retinal detachment occurs, re-establishing the potential space between the two layers. The occurrence of retinal detachment carries a risk of visual impairment or blindness [1].

Retinal detachment is categorized into etiological types, each with characteristic clinical appearances, including the more common rhegmatogenous retinal detachment (RRD), tractional retinal detachment (TRD), and exudative retinal detachment (ERD) [1].

Retinal diseases are a significant cause of both irreversible and reversible vision loss. Retinal detachment (RD) was the most common indication for surgery in a series of vitrectomies reported in Europe and Africa [3,4]. Retinal detachment has been a significant occurrence in reports on retinal disease from Africa [5,6]. The occurrence of retinal detachment carries a risk of visual impairment or blindness [7].

In tractional retinal detachment, the neurosensory retina is pulled away from the retinal pigment epithelium due to the contractile and elevating effect of proliferative membranes over the vitreous or retinal surfaces, in the absence of retinal tears [1]. Proliferative membranes, primarily responsible for the tractional forces, could arise from various etiologies, such as proliferative diabetic retinopathy (PDR), which accounts for most cases of tractional retinal detachment [8,9]. Out of all diabetic vitrectomies, TRDs are reported to be 20% in early series and 46% in more recent studies [8-10]. Other causes of tractional retinal detachment include penetrating trauma, proliferative sickle-cell retinopathy, posterior uveitis, retinal vasculitis, Retinal vein occlusion, etc. [11,12].

The exact epidemiology of tractional retinal detachment has not been reported in large-scale studies, and research on tractional retinal detachment is far less common than on rhegmatogenous retinal detachment, mainly because of its multifactorial etiology [11]. However, one study in southern Denmark reported an incidence of primary TRD of 1.25 per 100,000 inhabitants per year [13]. In some cases, the contractual forces induce a retinal tear, resulting in combined traction-rhegmatogenous RD (TRRD) [1].

To our knowledge, there is no publication specific to tractional retinal detachment in Ethiopia. Understanding the clinical pattern of tractional retinal detachment in the Ethiopian context will help us improve diagnosis and treatment, enhance patient care, increase awareness and education among healthcare professionals, and inform public health policymakers on resource allocation and preventive measures.

Methods

Study design and population

A hospital-based cross-sectional study was conducted from November 2023 to September 2025 at Menelik II Comprehensive Specialized Hospital, Addis Ababa, Ethiopia. The hospital is one of the largest tertiary eye care centers in the country, serving as a referral facility with a dedicated retina clinic staffed by vitreoretinal surgeons and residents.

The study population included all consecutive new patients diagnosed with tractional retinal detachment (TRD) who presented to the retina clinic during the study period. Patients were included if TRD was confirmed clinically by a vitreoretinal surgeon. Follow-up cases and those with significant media opacity precluding adequate fundus evaluation were excluded from the study.

Sample size determination

All eligible and consecutive patients who presented to the vitreoretinal clinic during the study period and met the inclusion criteria were included. Accordingly, a total of 164 patients (190 eyes) were enrolled in the study

Study variables

The dependent variable was the presence and clinical characteristics of tractional retinal detachment.

The independent variables included:

- Sociodemographic factors: Age, sex, residence, occupation, and education level.
- Clinical history: Duration of visual symptoms, ocular complaints, systemic conditions (diabetes mellitus, hypertension), and history of ocular trauma or uveitis.
- Ocular examination findings: Laterality, macular status, extent of detachment, vitreous changes, associated ocular pathologies, and visual acuity.

Operational definitions

- Blunt ocular injury is defined as trauma to the eye caused by a non-penetrating force, resulting in damage to ocular structures without full-thickness penetration of the eye wall [14].
- Penetrating ocular injury: Full-thickness laceration of the eye wall, usually caused by a sharp object, and no exit wound has occurred [14].
- Tractional retinal detachment (TRD): Separation of the neurosensory retina from the underlying retinal pigment epithelium due to fibrovascular proliferation and contraction in the absence of retinal breaks [15].
- Macula-off TRD: Is defined as a tractional retinal detachment in which the fibrous or fibro-vascular traction has extended to involve the macula, resulting in detachment of the central retina, confirmed clinically or by OCT [15].
- Macula-on TRD: Is defined as a tractional retinal detachment in which the fibrovascular or epiretinal traction elevates the retina. Still, the fovea (macula) remains attached, as confirmed by clinical or OCT. Central vision is preserved, although peripheral or mid-peripheral retina may be detached [15].
- Visual impairment classification: Visual acuity was categorized according to the WHO classification (Mild-BCVA in the better eye <6/12-6/18, Moderate-BCVA in better eye <6/18-6/60, Severe-BCVA in better eye<6/60-3/60, and Blindness-BCVA <3/60) [16].
- Duration of symptoms is defined as the length of time (in days, weeks, or months) from the onset of the first symptom(s) related to the ocular condition until the patient presents for clinical evaluation [17].
- Poor glycemic control is defined as a fasting blood sugar (FBS) level greater than 183 mg/dL or an HbA1c> 8.0% according to ADA recommendations [18].

Data collection procedure

Data were collected using a pre-tested structured questionnaire and clinical examination checklist. Visual acuity was assessed using the Snellen chart, with counting fingers, hand motion, or light perception tests for those unable to read the chart. Intraocular pressure was measured with a non-contact tonometer. Anterior and posterior segments were examined using slit-lamp bio microscopy, 90D lens, and indirect ophthalmoscopy after pupillary dilation with 1% tropicamide. Optical coherence tomography (OCT) was performed when possible to evaluate macular involvement. A vitreoretinal surgeon confirmed the diagnosis of all cases.

Data processing and analysis

Data were checked for completeness and accuracy daily, coded, and entered into SPSS version 27.0 for analysis. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize sociodemographic and clinical data. Associations between independent variables and clinical features of TRD were analyzed using the chi-square test and Logistic regression. A p-value < 0.05 was considered statistically significant.

Ethical considerations

Ethical clearance was obtained from the Department of Ophthalmology and the Addis Ababa University Research and Publication Committee. Informed verbal consent was obtained from all participants before data collection. Confidentiality was maintained by avoiding the use of personal identifiers. Patients diagnosed with TRD were counseled and managed according to standard clinical protocol.

Results

Sociodemographic characteristics

A total of 164 participants (190 eyes) were included in this hospital-based cross-sectional study. Of these, the majority were males (60.4%) and aged ≥50 years (54.9%) with a mean age of 44.3 ± 7.4 years (Table 1).

The majority (40.9 %) could read and write, while 31.1% were illiterate. Most were housewives (36.6%), followed by merchants (20.7%). Most of them (40.9%) lived more than 100 km from Addis Ababa (Table 1).

Variables Group		Frequency (n)	Percent (%)
Gender	Male	99	60.4%
	Female	65	39.6%
	Total	164	100.0%
Age in years	18 - 29	6	3.7%
	30 - 39	7	4.3%
	40 - 49	61	37.2%
	≥ 50	90	54.9%
	Total	164	100.0%
Educational level	Illiterate	51	31.1%
	Read and write	67	40.9%
	Primary education	27	16.5%
	Secondary education	17	10.4%
	College and above	2	1.2%
	Total	164	100%
Occupation	House wife	60	36.6%
	Merchant	34	20.7%
	Government employer	33	20.1%
	Farmer	25	15.2%
	Student	4	2.4%
	Daily laborer	2	1.2%
	Retired	6	3.7%
	Total	160	100%

Residence	Addis Ababa	59	36.0%
	Lives within 100 kilometers of Addis Ababa	38	23.2%
	Lives beyond 100 kilometers from Addis Ababa	67	40.9%
	Total	164	100.0%

Table 1: *Socio-demographic characteristics of study participants.*

Prevalence of TRD

During the study period, a total of 2,940 new patients were seen in the retina clinic. Among these, 164 patients (190 eyes) were diagnosed with tractional retinal detachment, giving an overall prevalence of TRD of 5.6% per patient.

TRD was more frequent in males (60.4%) than in females (39.6%), and this difference was statistically significant ($\chi^2 = 11.244$, df = 7, P = 0.0128).

Laterality and symptom duration

Of the 190 affected eyes, 110 (57.9%) were right eyes (OD) and 80 (42.1%) were left eyes (OS). Bilateral involvement was observed in 15.9% of patients. The median duration of visual symptoms before presentation was 6 months (range: 1 - 24 months).

Presenting complaints

The most common presenting complaint was decreased vision (73 eyes, 44.5%), followed by a curtain-like visual field defect (31 eyes, 18.9%). Other complaints included flashes (15.9%), floaters (13.4%), and ocular pain (7.3%).

Etiology of TRD

Proliferative diabetic retinopathy (PDR) was the leading cause of TRD, accounting for 150 eyes (78.9%), followed by BRVO-related TRD (14 eyes, 7.4%). CRVO and retinal vasculitis each contributed eight eyes (4.2%). Traumatic TRD accounted for six eyes (3.2%), while undetermined causes accounted for 2.1% (Figure 1).

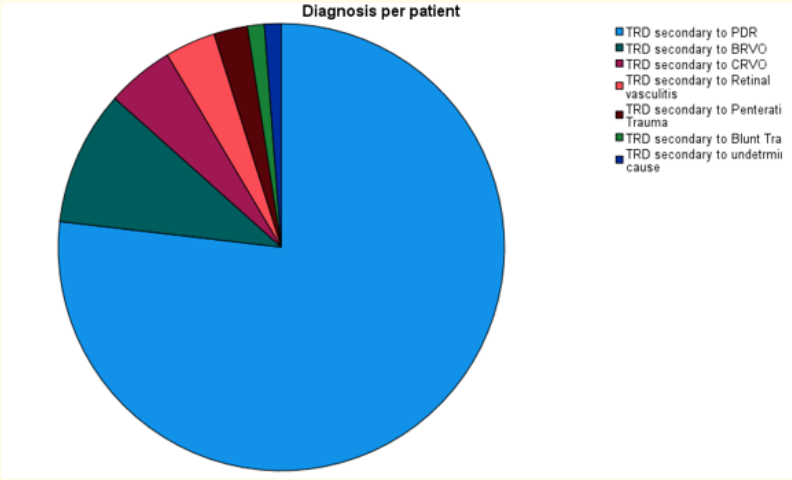

Figure 1: *Distribution of causes of tractional retinal detachment (TRD).*

Distribution of causes of TRD by sex

A total of 164 patients (190 eyes) with TRD were analyzed, the majority being male (60.4%). TRD from PDR was the leading cause; the majority were males (45.7%), and 31.1% of females. Followed by TRD from BRVO, which occurred in 6.1% of males and 2.4% of females; CRVO in 2.4% of both males and females; and other causes accounted for the remaining 9.9%.

Overall, TRD secondary to PDR was the predominant etiology in both sexes, with a higher frequency observed among males across nearly all causes (Figure 2).

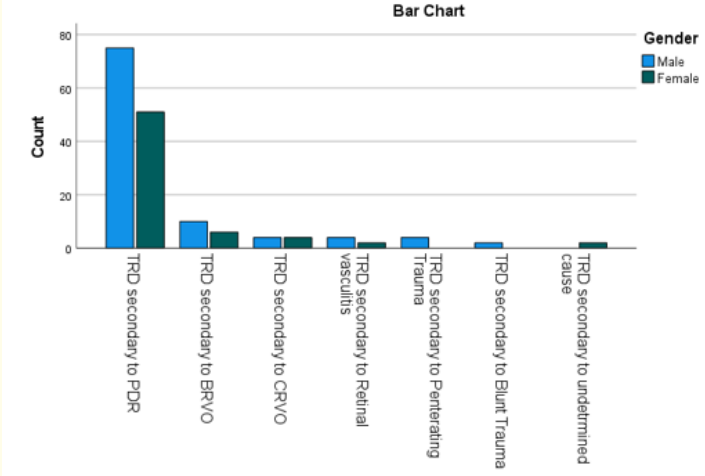

Figure 2: *Causes of TRD stratified by sex.*

Distribution of causes of TRD by age

The majority of TRD cases (54.9%) occurred in patients aged > 50 years, followed by those aged 40 - 49 years (37.2%). PDR-related TRD was the predominant cause, especially in patients > 50 (42.1%) and 40 - 49 years (32.9%). CRVO- and BRVO-related TRDs occurred only in patients > 40 years, whereas retinal vasculitis- and trauma-related TRDs were confined to younger adults (18 - 49 years). Undetermined causes were rare and occurred only in those >50 years (Figure 3).

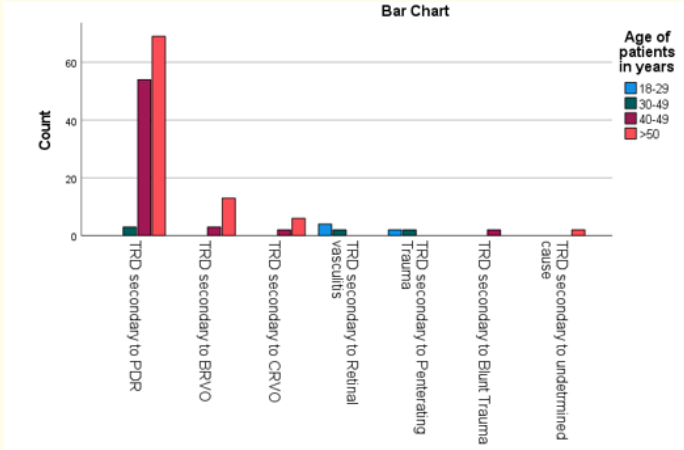

Figure 3: *Causes of TRD stratified by age.*

Diabetes-related factors

Among the 164 participants, 74.4% were diabetic. Of these, 71.3% developed PDR-related TRD.

Poor glycemic control (FBS >183 mg/dl) was documented in 44.3% of diabetic patients, of whom 94.4 % developed PDR-related TRD.

Chi-square analysis showed that PDR-related TRD was significantly more common in patients with longer diabetes duration (≥10 years) than in those with <10 years ($\chi^2 = 42.748$, df = 2, $P < 0.05$).

Binary logistic regression confirmed that both longer diabetes duration and poor glycemic control were independent predictors of PDR-related TRD:

- Diabetes duration ≥ 10 years: AOR = 3.82 (95% CI: 2.04-7.12), $P < 0.001$.
- Poor glycemic control: AOR = 4.35 (95% CI: 1.76-10.77), $P = 0.001$.

Hypertension-related factors

Among 164 patients with TRD, hypertension was present in 32.9% of patients, either alone (6.1%) or with diabetes (26.8%). Hypertension was present with diabetes in 31.0% of TRD secondary to PDR, and with CRVO (64.3%) or BRVO (75.0%) when present alone.

Macular status

Macula-off TRD was present in 137 eyes (72.1%), while macula-on TRD was seen in 53 eyes (27.9%).

PDR-related TRD had the highest proportion of macula-off involvement (74.4%), followed by BRVO and CRVO-related TRD ($P < 0.05$) (Figure 4).

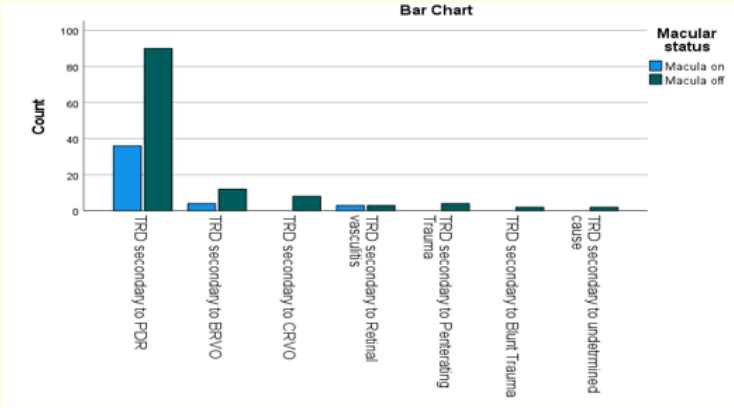

Figure 4: *Causes of TRD stratified by macular status.*

Macula-off TRD was more common in patients living >100 km from Addis Ababa (64 eyes, 46.7%) compared to those residing in Addis Ababa (47 eyes, 34.3%) and within 100 km of Addis Ababa (26 eyes, 19.0%) ($\chi^2 = 16.053$, df = 2, $P < 0.05$) (Figure 5).

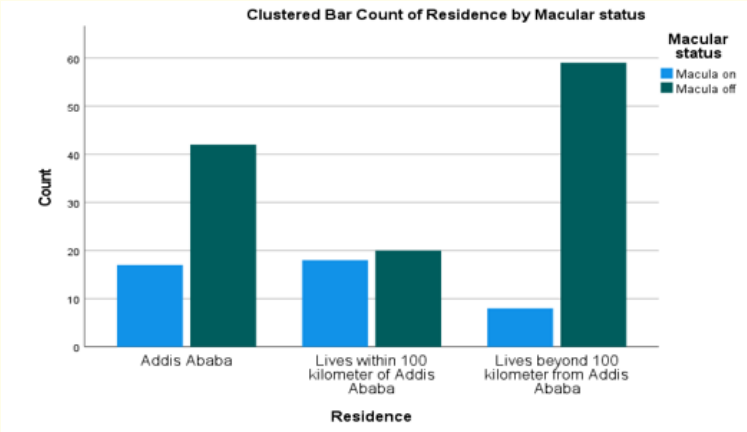

Figure 5: *Macular status of TRD patients by place of residence.*

Duration of symptoms was significantly associated with macular status: 6 eyes (4.4%) with <1 month, 45 eyes (32.8%) with 1 - 6 months, and 86 eyes (62%) with > 6 months had macula-off TRD ($\chi^2 = 40.948$, df = 2, P < 0.001) (Figure 6).

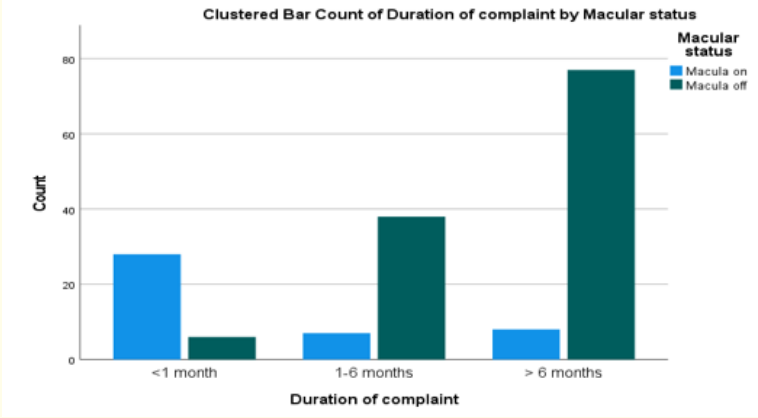

Figure 6: *Macular status distribution by duration of symptoms.*

Binary logistic regression showed that:

- Residence >100 km was independently associated with macula-off TRD (AOR = 1.96, 95% CI: 1.13 - 3.38, P = 0.017).
- Longer symptom duration >6 months significantly increased the odds of macula-off TRD (AOR = 2.88, 95% CI: 1.64 - 5.07, P < 0.001).

Quadratic involvement

Most TRDs involved all four quadrants (87 eyes, 45.8%), followed by three quadrants (45 eyes, 23.7%) and two quadrants (36 eyes, 18.9%). Extensive TRDs involving all four quadrants were more common in PDR and CRVO-related cases (P < 0.05) (Table 2).

Quadrant involved	N (number of eyes)	%
One quadrant	22	11.6%
Two quadrant	36	18.9%
Three quadrant	45	23.7%
Four quadrant	87	45.8%
Total	190	100.0%

Table 2: *Distribution of quadratic involvement among TRD eyes of retinal detachment.*

Anterior segment and intraocular pressure

Anterior segment findings were common among eyes with TRD. Neovascularization of the iris (NVI) was observed in a total of 51 eyes (26.8%), most of which were associated with PDR and CRVO-related TRD ($P < 0.05$) (Table 3).

Low IOP (< 10 mmHg) was seen in 57 eyes (30%), predominantly in chronic TRD. Elevated IOP (> 21 mmHg) was observed in 41 eyes (21.6%), mainly in PDR and CRVO-related TRD with rubeosis ($P < 0.05$). Meanwhile, 92 eyes (48.4%) had IOP between 10 - 21 mmHg (mean IOP 14.8 ± 3.6 mmHg).

Binary logistic regression analysis demonstrated

NVI was independently associated with elevated IOP >21 mmHg (AOR = 3.26, 95% CI: 1.52 - 6.98, P = 0.002).

RAPD was a strong predictor of macula-off TRD (AOR = 4.78, 95% CI: 2.31 - 9.87, P < 0.001).

Low IOP (< 10 mmHg) was independently associated with longer symptom duration (> 6 months) (AOR = 2.44, 95% CI: 1.21 - 4.94, P = 0.012).

	N (number of eyes)	%
RAPD	80	42.1%
AC cell and flare	4	2.1%
Neovascularization of Iris	15	7.9%
RAPD and posterior synechiae	7	3.7%
RAPD and neovascularization of iris	36	18.9%
KPC over the cornea	4	2.1%
Corneal scar	5	2.6%
Aphakic	2	1.1%
Normal finding	37	19.5%
Total	190	100.0%

Table 3: *Anterior segment findings in eyes with TRD.*

Visual acuity at presentation

Among patients who presented after more than 6 months from symptom onset, 72% had poor visual acuity (<6/60) at presentation, compared to 28% among those who presented within 6 months.

At presentation, 138 eyes (72.6%) with TRD had best corrected visual acuity worse than 6/60, while 31 eyes (16.3%) had 6/60 - 6/18, and 21 eyes (11.1%) had 6/18 or better

Among eyes with macula-off TRD, the majority (130 eyes, 94.8%) had poor presenting vision (< 6/60). In contrast, macula-on TRD eyes showed relatively preserved vision, with 28 eyes (52.8%) having ≥ 6/18. The association was statistically significant (χ^2 = 46.694, df = 2, P < 0.05) (Figure 7).

Binary logistic regression analysis

Macula-off status was the strongest predictor of poor presenting vision <6/60 (AOR = 7.91, 95% CI: 3.45 - 18.13, P < 0.001).

Presence of RAPD was also associated with poor vision (AOR = 3.64, 95% CI: 1.72 - 7.71, P = 0.001).

Elevated IOP with rubeosis was significantly associated with poor presenting vision (AOR = 2.12, 95% CI: 1.01 - 4.47, P = 0.048).

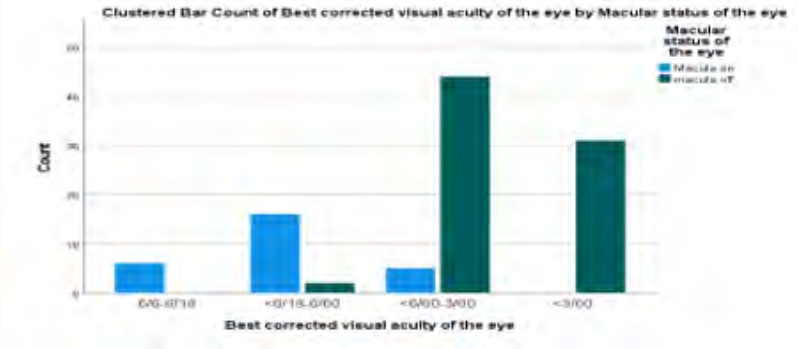

Figure 7: *Distribution of visual acuity at presentation. According to macular status.*

Prior intra-ocular interventions

Different prior intraocular interventions were documented depending on the underlying cause of TRD.

Retinal laser surgery: 36 eyes with PDR-related TRD, four eyes with BRVO-related TRD.

Intraocular injection: 43 eyes (22.6%) had a history of prior Anti-VEGF injection before presentation. Most were in PDR-related TRD (36 eyes, 83.7%), followed by BRVO (5 eyes) and CRVO (2 eyes).

No prior injections were documented in TRD cases secondary to retinal vasculitis, trauma, and undetermined causes. Chi-square analysis did not show a statistically significant association between the underlying diagnosis and prior intraocular injection (χ^2 = 6.705, df = 7, P = 0.460).

When stratified by macular status, prior intraocular injection was present in 17 macula-on eyes (30.4%) compared with 26 macula-off eyes (19.4%). Chi-square analysis demonstrated a statistically significant association between macular status and prior intraocular injection (χ^2 = 5.34, df = 1, P = 0.021).

Binary logistic regression analysis

Prior intraocular injection was independently associated with higher odds of macula-on TRD at presentation (AOR = 1.92, 95% CI: 1.03-3.58, P = 0.041).

The protective effect of prior injection on vision (≥ 6/18) approached significance but did not reach statistical cutoff (AOR = 1.67, 95% CI: 0.89-3.14, P = 0.098).

Discussion

This hospital-based cross-sectional study aimed to evaluate the clinical characteristics of tractional retinal detachment (TRD) at Menelik II Hospital. Among 164 participants (190 eyes), the overall prevalence of TRD was 5.6% per patient, closely matching the prevalence reported in Denmark at 5.7% [13]. This similarity suggests that TRD represents a comparable burden in tertiary care populations across different regions, although variations in risk factors, health-seeking behaviors, and demographic profiles exist. In this study, 36.6% of patients were homemakers, and 40.9% had limited literacy. While these factors had no statistically significant association with TRD, previous studies suggest that low socioeconomic status and educational level can contribute to delayed presentation and advanced disease at diagnosis [19]. Socioeconomic barriers were also highlighted as a factor for late presentation, although quantitative analysis was not provided [20].

In our study, TRD was more frequent in males (60.4%) than in females (39.6%), though this difference was not statistically significant. This contrasts with the Danish study, which found a higher prevalence among females (56.8%) [13], but aligns with findings from Nigeria, where males accounted for 62.5% [19]. Similarly, an Ethiopian study found a male predominance of 58.3% among TRD patients [20], suggesting a possible pattern in the local population that could reflect both higher diabetes prevalence in men and differences in healthcare access.

The majority of participants in our study were aged ≥50 years (54.9%), with a mean age of 44.3 ± 7.4 years. Older age was significantly associated with TRD (P<0.001). This is consistent with previous findings, which showed that TRD mainly affected middle-aged and older adults, reflecting the cumulative impact of chronic systemic conditions, particularly diabetes mellitus, on retinal health [20]. A similar age pattern for retinal detachment was reported, although the TRD-specific age breakdown was not provided [21].

Proliferative diabetic retinopathy (PDR) was the leading cause of TRD, accounting for 78.9% of eyes, followed by BRVO, CRVO, and retinal vasculitis. This finding aligns with prior studies in Nigeria (77.5%) and South West-Ethiopia (40.9%) [19,20]. Among diabetic patients, longer duration of diabetes and poor glycemic control were strongly associated with PDR-related TRD. This supports established evidence linking chronic hyperglycemia to neovascularization and tractional complications. Compared with Ethiopian studies, diabetic retinopathy was identified as a significant risk factor for TRD. Still, a less detailed characterization of ocular involvement-including macular status, quadrantic involvement, and bilateral cases-was provided [20]. TRD was reported as the second most common type of retinal detachment following rhegmatogenous retinal detachment, although detailed clinical profiles were lacking [21]. Our study adds to the literature by providing a more comprehensive evaluation that includes laterality, macular status, symptom duration, and the extent of traction.

The most common presenting complaint in this study was decreased vision (44.5%), followed by curtain-like visual field defects (18.9%), which is consistent with previous reports from Denmark, Nigeria, Gondar, and Southwest Ethiopia [13,19-21]. The high proportion of Macula-off TRD (72.1%) indicates delayed presentation, comparable to findings from South West Ethiopia (74.1%) [20] and Nigeria (78.4%) [19].

Most TRDs in this study involved multiple quadrants, with 45.8% affecting all four quadrants, particularly in PDR and CRVO-related cases. This observation underscores the extensive tractional pathology associated with neovascular retinal disease and the surgical challenges it presents. Quadrantic involvement data were not provided in other studies, limiting direct comparison [19-21].

Conclusion and Recommendation

Tractional retinal detachment at Menelik II Hospital was mainly associated with proliferative diabetic retinopathy. Most patients presented late with macula-off disease and severe visual impairment, reflecting delayed diagnosis and limited access to timely retinal care. This pattern underscores the urgent need for earlier detection and intervention to reduce blindness caused by TRD.

To address this, diabetic retinopathy screening should be strengthened and integrated into diabetes follow-up clinics. Access to retinal laser treatment, intravitreal therapy, and vitreoretinal surgery needs to be expanded. Community awareness programs should emphasize the importance of early eye examinations for patients with diabetes. Furthermore, building national capacity in vitreoretinal subspecialty services is crucial, and multicenter studies are recommended better to define the epidemiology and outcomes of TRD in Ethiopia.

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