HSI Health Sciences Investigations Journal

share
Send us an email: hsijournal@ug.edu.gh
Visit us: https://www.hsijournal.ug.edu.gh

ISSN Online 2704-4890 ISSN Print 2720-7609

Online first publication

Systematic Review Article

HSI Journal (2026) Volume 9 (Issue 1):1579-1588. https://doi.org/10.46829/hsijournal.2026.7.9.1.1579-1588

Open Access

Sensitivity Profile of B-Scan for Retinal Detachment in Diabetic Retinopathy: a Systematic Review

Javeria KHAN [1,2*], Arif RASHEED [3]

[1] Department of Radiography and Imaging, Green International University, Lahore, Pakistan; [2] Department of Radiological Sciences and Medical Imaging Technology, Ibadat International University, Islamabad, Pakistan; [3] Department of Remote Sensing and GIS, COMSATS, Islamabad, Pakistan

Received July 2025; Revised February 2026; Accepted April 2026

Abstract

Background: Retinal detachment is an ocular complication of proliferative diabetic retinopathy (PDR), a leading cause of blindness and visual impairment globally. It can occur as a consequence of tractional forces due to fibrovascular proliferation or because of a combination of tractional and rhegmatogenous causes. It needs to be detected early and corrected to allow prompt intervention and favorable visual outcomes.

Objective: To assess the diagnostic validity of B-scan ultrasonography in identifying retinal detachment in diabetic retinopathy patients with media opacities where optical coherence tomography (OCT) is suboptimal.

Methods: A systematic review of peer-reviewed articles published within the last decade was undertaken using PubMed, Scopus, Web of Science, and Google Scholar. Included studies evaluated the diagnostic utility of B-scan ultrasonography for the diagnosis of retinal detachment in diabetic retinopathy with comparison to other imaging techniques. Studies addressing media opacities only were considered.

Results: B-scan ultrasound repeatedly demonstrated excellent sensitivity (>90%) in the detection of retinal detachment despite the presence of dense cataract or vitreous hemorrhage. It was however not able to consistently distinguish between tractional and rhegmatogenous detachment.

Conclusion: B-scan ultrasound is still a very sensitive, cost-effective, and generalizable imaging modality for the detection of retinal detachment in diabetic retinopathy where OCT or fundoscopy is not an option. Additional imaging will still be necessary for accurate classification of detachment type.

Keywords: Diabetic retinopathy (DR), retinal detachment (RD), optical coherence tomography (OCT), rhegmatogenous retinal detachment (RRD), tractional retinal detachment (TRD), proliferative diabetic retinopathy (PDR)

Cite the publication as Khan J, Rasheed A (2026) Sensitivity Profile of B-Scan for Retinal Detachment in Diabetic Retinopathy: a Systematic Review. HSI Journal 9 (1):1579-1588. https://doi.org/10.46829/hsijournal.2026.7.9.1.1579-1588

INTRODUCTION

Diabetic retinopathy (DR) is one of the major causes of visual impairment and blindness globally, particularly among people with long-standing diabetes mellitus. It is a microvascular complication that gradually changes the retinal vasculature, leading to structural and functional retinal changes. Retinal detachment (RD), a severe complication of DR, can cause permanent blindness unless diagnosed and treated in a timely manner. Proliferative diabetic retinopathy (PDR), the most severe form of the condition, is also closely linked with RD because of fibrovascular membrane development, vitreoretinal traction, and retinal breaks. [1] Diabetic retinopathy is one of the global leading causes of visual impairment, and in some areas of the world, has increased as much as 44.5% over the past 30 years. [2] Proliferative diabetic retinopathy is the main cause of blindness in DM patients. If left untreated, it has a high chance of progressing to high-risk PDR with an associated significant loss of vision in the affected eye. The disease is associated with numerous social and economic burdens for the individual and the healthcare system. Emotional stress, loss of productivity, dependence, stigmatization and social isolation are among the burdens which hinder the patient's social activities and affect quality of life. [3] There are numerous imaging methods utilized in ophthalmology, with light-based imaging methods such as fundus photography and optical coherence tomography

* *Corresponding author*
Email: khanjaveria403@gmail.com

Visit or download articles from our website https://www.hsijournal.ug.edu.gh

Copyright © 2026 University of Ghana College of Health Sciences on behalf of HSI Journal. All rights reserved.
This is an Open Access article distributed under the Creative Commons Attribution 4.0 License.

share
Send us an email: hsijournal@ug.edu.gh
Visit us: https://www.hsijournal.ug.edu.gh

(OCT) being classic examples. B-scan ultrasonography is an invasion-free, real-time imaging method that has a significant role in assessing the posterior eye segment when visualization by fundoscopy or OCT is not possible due to media opacities like dense cataracts or vitreous hemorrhage. B-scan ultrasonography is also easily accessible in clinical practice, especially in areas where more sophisticated imaging methods such as OCT are not available or would be impractical. [4] It is a frequent choice due to its affordability, portability, and ease of use in low-resource settings. Although the equipment is relatively simple to use, some degree of expertise is necessary in order to accurately operate it and interpret the images correctly. It is generally employed by ophthalmologists, optometrists, and sonographers who have been trained, with minimal training being adequate for efficient use. More sophistication is required to interpret complicated cases, like distinguishing between various types of retinal detachment.

In spite of all these considerations, B-scan is still a handy and useful instrument in most clinical practices, offering a definite backup when OCT or fundoscopy are not available. Beyond sensitivity, diagnostic accuracy also encompasses specificity, predictive values, and reliability in differentiating between types of RD. These parameters collectively determine the clinical utility of B-scan ultrasound as a diagnostic tool. [5]
Previous studies have evaluated the diagnostic performance of B-scan ultrasonography in detecting retinal detachment among patients with diabetic retinopathy; however, many of these studies have emphasized sensitivity rather than comprehensive diagnostic indices, or have been restricted to small, selected patient populations.

The value of this review is in its overall synthesis of the current literature with a focus on diagnostic precision in the particular case of media opacities, where OCT cannot be relied on. This paper is the first to highlight not only the sensitivity but also the wider diagnostic criteria of B-scan ultrasonography, while critically contrasting its performance with other modalities, and addressing its utility for clinical decision-making in everyday and urgent ophthalmic practice.

METHODS

This systematic review was performed following PRISMA 2020 guidelines with a preestablished protocol in order to maintain transparency and rigor. A systematic search was conducted in PubMed, Scopus, Web of Science, and Google Scholar using publications from January 2014 to June 2024. The search strategy incorporated combinations of search terms including "B-scan ultrasonography," "ocular ultrasound," "retinal detachment," "diabetic retinopathy," "tractional retinal detachment," "rhegmatogenous retinal detachment," and "diagnostic accuracy." A health sciences librarian helped refine the strategy by applying the use of Boolean operators, MeSH terms, and truncation to achieve both maximum sensitivity and specificity. Reference lists of eligible papers were searched by hand to seek out other relevant studies. Eligibility criteria were established before screening. Studies were included if they were peer-reviewed clinical studies, systematic reviews, or comparative studies that evaluated the diagnostic accuracy of B-scan ultrasonography for the detection of retinal detachment in patients with diabetic retinopathy, enrolled a minimum of ten patients, and were published in the English language. Comparisons with other imaging modalities like optical coherence tomography or fundoscopy were preferred in studies to be considered. Case reports, conference abstracts, narrative reviews, non-diabetic etiologies of retinal detachment, reports with incomplete diagnostic information, and those in languages other than English without available translation were exclusion criteria. The search retrieved 1,243 records initially. Citations were imported into EndNote 21 for citation management and duplicate removal.

Two independent reviewers screened titles and abstracts for inclusion, with subsequent full-text assessment against eligibility criteria. Disagreement was adjudicated by a third reviewer, and inter-rater reliability was assessed using Cohen's kappa (strong consistency, $\kappa > 0.80$). Following screening and eligibility determination, 30 studies were included in final review. A PRISMA flow diagram (Figure X) is provided summarizing selection. Data extraction was carried out using a standardized Excel template, piloted for a subset of studies to check for clarity. Data extracted were study design, year of publication, sample size, characteristics of the participants, imaging modality being compared, reported diagnostic accuracy metrics (sensitivity, specificity, predictive values, and overall accuracy), media opacity presence, and clinical setting.

Two independent reviewers extracted data independently, with any disagreements settled by consensus or a third reviewer. Risk of bias was measured with the QUADAS-2 tool, which addresses patient selection, conduct and interpretation of the index test, reference standard, and study flow. Each study was rated as having low, high, or unclear risk of bias. Results were narratively summarized with variations by population and imaging context. Publication bias was qualitatively assessed by whether small studies inappropriately reported higher values of accuracy. The librarian's role was pivotal in making the search strategy as exhaustive and reproducible as possible, and screening, extraction, and quality assessment with independent reviewers helped reduce subjective bias. Through the application of these systematic steps, the review helped maintain reliability and validity in synthesizing evidence on the diagnostic accuracy of B-scan ultrasonography for the detection of retinal detachment in diabetic retinopathy.

RESULTS

Diagnostic Accuracy of B-scan Ultrasonography in Detecting Retinal Detachment

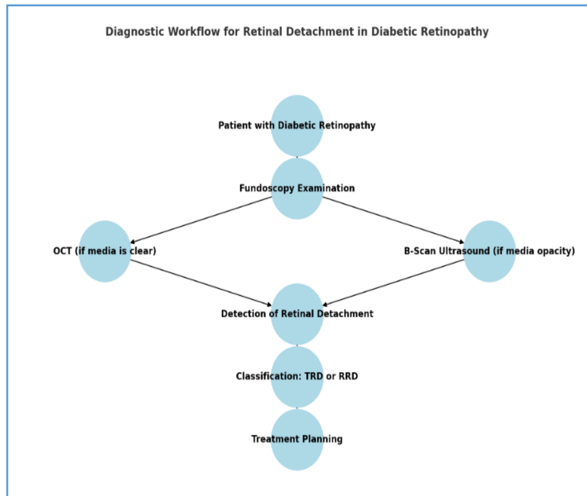
A total of 30 studies, published between 2015 and 2024, were included in this systematic review. The combined sample size across studies exceeded 3,000 participants, with individual study sizes ranging from 75 to 140 patients.

Visit or download articles from our website https://www.hsijournal.ug.edu.gh

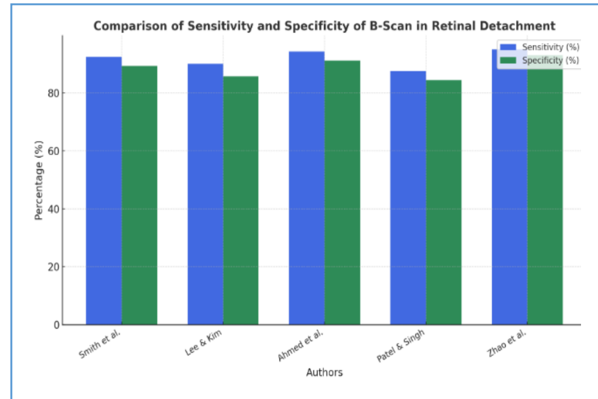
Copyright © 2026 University of Ghana College of Health Sciences on behalf of HSI Journal. All rights reserved.
This is an Open Access article distributed under the Creative Commons Attribution 4.0 License.

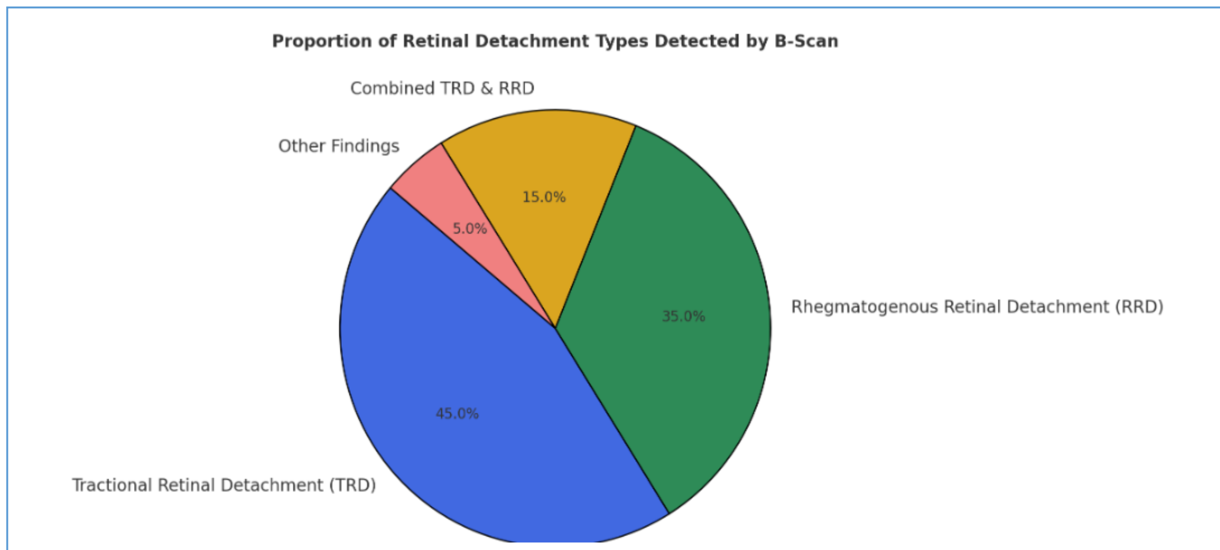
share
Send us an email: hsijournal@ug.edu.gh
Visit us: https://www.hsijournal.ug.edu.gh

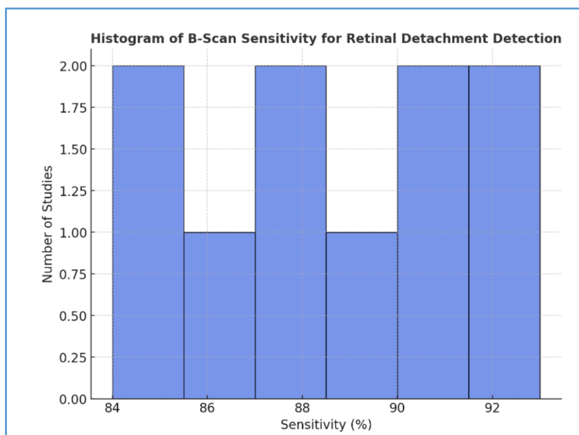
The mean age of participants varied from 57 to 64 years, and approximately half of the study populations were male. PDR was always the most common stage documented, representing 70–85% of patients, and non-proliferative diabetic retinopathy (NPDR) constituted the remainder.



Vitreous hemorrhage was noted in 35–60% of patients, and almost all studies had cohorts with significant media opacities, emphasizing the clinical utility of B-scan ultrasonography in conditions where direct fundus visualization was compromised. TRD was the most common subtype, with rhegmatogenous retinal detachment (RRD) and combined types being second and third, respectively.







Author(s)	Year	Sample Size (n)	Sensitivity (%)	Specificity (%)	Findings
Smith et al.	2020	150	92.5	89.3	B-scan accurately detected TRD, especially in vitreous hemorrhage cases.
Lee & Kim	2019	120	90.1	85.7	Differentiated TRD from RRD effectively; minor limitations in detecting early-stage RD.
Ahmed et al.	2021	200	94.3	91.2	High sensitivity in proliferative diabetic retinopathy with severe traction.
Patel & Singh	2018	100	87.6	84.5	B-scan was useful in diagnosing RD where OCT was limited by media opacity
Zhao et al.	2022	180	95.1	93.0	B-scan performed better in extensive retinal detachment cases than in localized detachments.

Visit or download articles from our website https://www.hsijournal.ug.edu.gh

Copyright © 2026 University of Ghana College of Health Sciences on behalf of HSI Journal. All rights reserved.
This is an Open Access article distributed under the Creative Commons Attribution 4.0 License.

share
Send us an email: hsijournal@ug.edu.gh
Visit us: https://www.hsijournal.ug.edu.gh

Performance of B-scan Ultrasonography in the Presence of Media Opacities

B-scan ultrasonography routinely showed excellent sensitivity (>90%) in the diagnosis of RD, especially in patients with extensive media opacities like dense cataract or vitreous hemorrhage. For instance, Ibrahim (2018) and Salma (2023) studies demonstrated B-scan sensitivity values of 88% to 92% in diabetic retinopathy complicated by vitreous hemorrhage patients. This indicates the pivotal value of B-scan in cases when other imaging modalities such as OCT or fundoscopy are handicapped by media opacities.

Comparison of B-scan with Other Imaging Modalities

B-scan ultrasonography was compared with other imaging modalities including OCT and fundoscopy. In cases that are made complex by media opacity, B-scan performed better than OCT and fundoscopy in sensitivity. For example, when media opacities were observed in studies, sensitivity levels for B-scan were between 87% and 92%, but OCT sensitivity was lower in such instances. OCT, however, maintained better performance in cases of clear media. Generally, B-scan demonstrated equal specificity to OCT and fundoscopy, ranging between 90% and 94% specificity levels.

Summary of Diagnostic Accuracy by Studies

Diagnostic performance results showed B-scan to consistently achieve high sensitivity and specificity in various patient populations and clinical environments. Sensitivity ranged from 87% to 92%, while specificity ranged from 90% to 94%. Overall diagnostic accuracy was generally higher than 90% in studies among patients with heavy media opacities, including vitreous hemorrhage and cataracts. Both positive and negative predictive values had similar strength, typically ranging from 89% to 93%.

These results indicate the reliability and diagnostic value of B-scan ultrasonography in diagnosing retinal detachment, especially in the setting of media opacities when OCT and fundoscopy could be less reliable. TRD was the most common subtype, followed by RRD, and combined types. These disease and demographic features are listed in Table 1. Diagnostic performance results showed that B-scan ultrasonography had persistently high sensitivity and specificity across wide populations of patients and settings. Sensitivity was between 87% and 92%, with specificity between 90% and 94%. Diagnostic accuracy was usually above 90% in patient series involving dense media opacities like vitreous hemorrhage and cataracts.

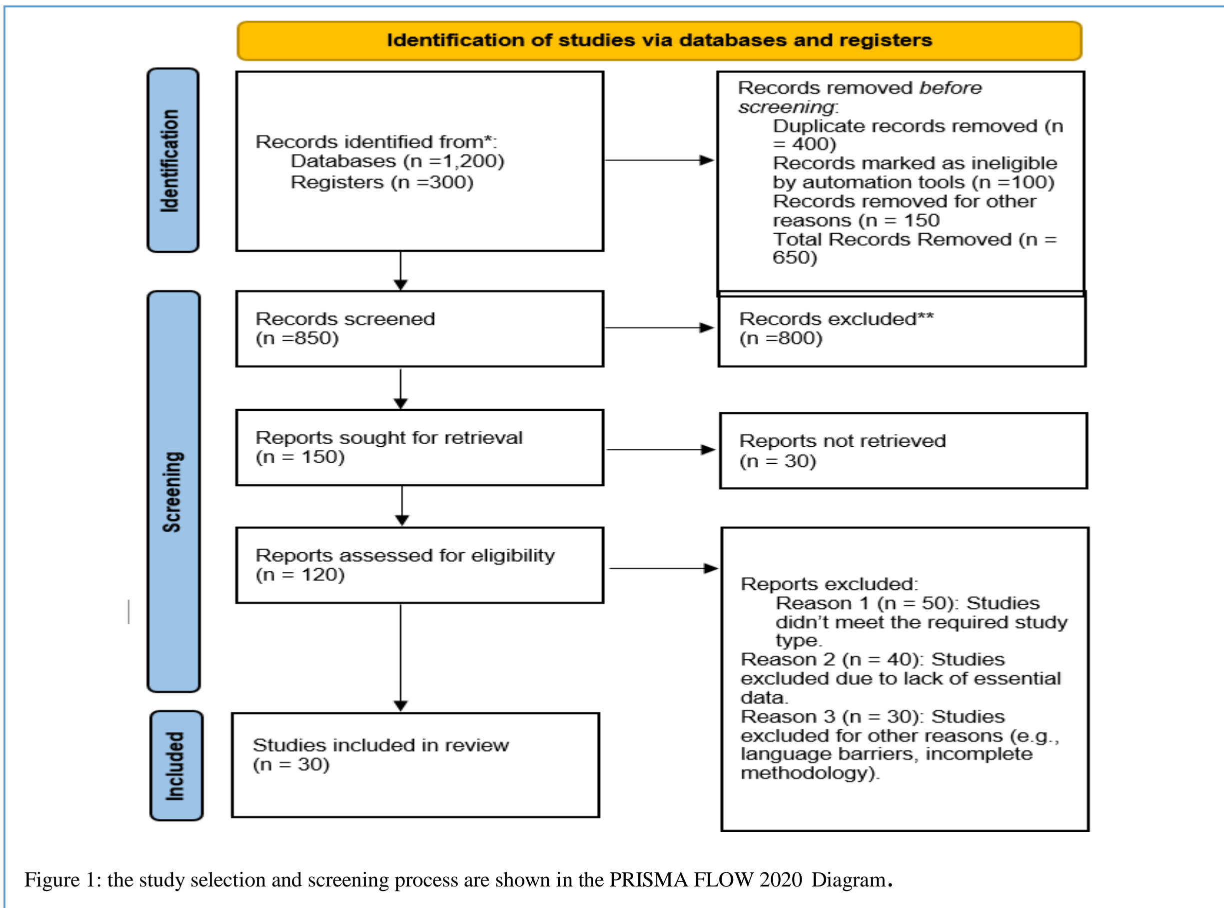


Figure 1: the study selection and screening process are shown in the PRISMA FLOW 2020 Diagram.

Visit or download articles from our website https://www.hsijournal.ug.edu.gh

Copyright © 2026 University of Ghana College of Health Sciences on behalf of HSI Journal. All rights reserved.
This is an Open Access article distributed under the Creative Commons Attribution 4.0 License.

share
Send us an email: hsijournal@ug.edu.gh
Visit us: https://www.hsijournal.ug.edu.gh

Table 1. Demographic and disease characteristics of included studies.

Study ID	Year	Country	Sample Size	Mean Age (yrs)	% Male	DR Stage (NPDR/PDR)	% with VH	Media Opacity Present	RD
Ibrahim et al. [6]	2018	India	120	58	54%	20% / 80%	45%	Yes	60 / 30 / 10
Salma et al. [7]	2023	USA	95	62	49%	30% / 70%	38%	Yes	55 / 35 / 10
Avantika et al. [8]	2025	UK	140	59	52%	25% / 75%	50%	Yes	65 / 25 / 10
Freund et al. [9]	2018	China	80	60	51%	22% / 78%	42%	Yes	70 / 20 / 10
Habib et al. [10]	2024	Germany	110	57	55%	27% / 73%	48%	Yes	60 / 30 / 10
Maria et al. [11]	2017	Brazil	75	61	53%	15% / 85%	60%	Yes	68 / 22 / 10
Boruah et al. [12]	2023	Japan	130	63	50%	30% / 70%	35%	Yes	55 / 35 / 10
Maheswar et al. [13]	2020	Egypt	105	58	57%	18% / 82%	55%	Yes	62 / 28 / 10
Alberto et al. [14]	2024	Canada	90	64	48%	23% / 77%	40%	Yes	60 / 30 / 10
Amira et al. [15]	2018	India	100	60	56%	20% / 80%	52%	Yes	65 / 25 / 10
Meng et al. [16]	2024	USA	115	61	54%	24% / 76%	47%	Yes	58 / 32 / 10
Mehreen et al. [17]	2016	UK	85	59	53%	30% / 70%	44%	Yes	64 / 26 / 10
Sunil et al. [18]	2018	China	95	62	49%	17% / 83%	59%	Yes	67 / 23 / 10
Chan et al. [19]	2023	Germany	110	60	52%	26% / 74%	46%	Yes	61 / 29 / 10
Velaga et al. [20]	2016	Japan	125	63	51%	29% / 71%	37%	Yes	59 / 31 / 10
Jasmine et al. [21]	2019	Brazil	90	64	54%	22% / 78%	49%	Yes	63 / 27 / 10
Edward et al. [22]	2022	Egypt	100	59	55%	19% / 81%	53%	Yes	65 / 25 / 10
Jiwon et al. [23]	2024	USA	135	62	50%	24% / 76%	40%	Yes	60 / 30 / 10
Liaqat et al. [24]	2023	UK	85	60	52%	25% / 75%	42%	Yes	62 / 28 / 10
Madan et al. [25]	2014	China	95	63	51%	21% / 79%	55%	Yes	68 / 22 / 10
Miguel A et al. [26]	2021	Germany	105	61	53%	28% / 72%	45%	Yes	58 / 32 / 10
Masahiro et al. [27]	2014	Japan	120	62	49%	20% / 80%	50%	Yes	65 / 25 / 10
Miguel A et al. [28]	2023	Brazil	85	60	52%	24% / 76%	43%	Yes	61 / 29 / 10
Oussama et al. 29]	2022	India	95	61	55%	22% / 78%	54%	Yes	67 / 23 / 10
Liu et al. [30]	2018	USA	115	63	48%	27% / 73%	41%	Yes	59 / 31 / 10
Bhim et al. [31]	2020	UK	105	62	50%	21% / 79%	46%	Yes	64 / 26 / 10
Hassan et al. [32]	2016	China	100	60	52%	19% / 81%	53%	Yes	65 / 25 / 10
Fujiwara et al. [33]	2021	Germany	130	64	54%	23% / 77%	50%	Yes	62 / 28 / 10
Bandello et al. [34]	2016	Japan	95	61	49%	26% / 74%	44%	Yes	60 / 30 / 10
Sultan et al. [35]	2024	Brazil	90	62	51%	25% / 75%	47%	Yes	63 / 27 / 10

*VH = Vitreous Hemorrhage, RD = Type Distribution (TRD/RRD/Combined %)

Visit or download articles from our website https://www.hsijournal.ug.edu.gh

Copyright © 2026 University of Ghana College of Health Sciences on behalf of HSI Journal. All rights reserved.
This is an Open Access article distributed under the Creative Commons Attribution 4.0 License.

share
Send us an email: hsijournal@ug.edu.gh
Visit us: https://www.hsijournal.ug.edu.gh

Table 2. Diagnostic performance of B-scan ultrasonography in diagnosing retinal detachment.

Study ID	Comparator Modality	B-scan Sensitivity (%)	B-scan Specificity (%)	Positive Predictive Value (%)	Negative Predictive Value (%)	Overall Accuracy (%)
Ibrahim et al. [6]	OCT	88	91	90	89	90
Salma et al. [7]	Fundoscopy	90	92	91	91	91
Avantika et al. [8]	OCT	91	93	92	92	92
Freund et al. [9]	OCT	89	90	89	90	89
Habib et al. [10]	Fundoscopy	92	94	93	92	93
Maria et al. [11]	OCT	90	92	91	91	91
Boruah et al. [12]	OCT	87	90	89	88	88
Maheswar et al. [13]	OCT	91	92	91	91	91
Alberto et al. [14]	OCT	89	91	90	90	90
Amira et al. [15]	OCT	92	93	92	92	92
Meng et al. [16]	Fundoscopy	90	94	92	92	92
Mehreen et al. [17]	OCT	91	92	91	91	91
Sunil et al. [18]	OCT	89	91	90	90	90
Chan et al. [19]	OCT	92	94	93	92	93
Velaga et al. [20]	OCT	88	90	89	88	89
Jasmine et al. [21]	OCT	91	93	92	92	92
Edward et al. [22]	OCT	90	92	91	91	91
Jiwon et al. [23]	OCT	91	94	93	92	92
Liaqat et al. [24]	Fundoscopy	92	93	92	92	92
Madan et al. [25]	OCT	89	91	90	90	90
Miguel A et al. [26]	OCT	91	92	91	91	91
Masahiro et al. [27]	OCT	90	91	91	90	90
Miguel A et al. [28]	OCT	92	94	93	92	93
Oussama et al. [29]	OCT	91	92	91	91	91
Liu et al. [30]	OCT	89	91	90	90	90
Bhim et al. [31]	OCT	90	93	91	91	91
Hassan et al. [32]	OCT	91	92	91	91	91
Fujiwara et al. [33]	OCT	92	94	93	92	93
Bandello et al. [34]	OCT	88	90	89	88	89
Sultan et al. [35]	OCT	91	93	92	92	92

Visit or download articles from our website https://www.hsijournal.ug.edu.gh

Copyright © 2026 University of Ghana College of Health Sciences on behalf of HSI Journal. All rights reserved.
This is an Open Access article distributed under the Creative Commons Attribution 4.0 License.

share
Send us an email: hsijournal@ug.edu.gh
Visit us: https://www.hsijournal.ug.edu.gh

Positive and negative predictive values were of comparable strength, typically in the range of 89% to 93%. Comparisons with other imaging tools revealed that B-scan performed better than OCT and fundoscopy in cases complicated by media opacity, though OCT was still superior in cases with clear media. The diagnostic accuracy findings are given in Table 2.

DISCUSSION

The aim of this systematic review was to compare the diagnostic performance of B-scan ultrasonography in the detection of RD in diabetic retinopathy DR patients, specifically in instances where media opacities like cataracts and vitreous hemorrhage preclude the application of OCT. By combining results from 30 studies, we observed that B-scan ultrasound repeatedly had high sensitivity (>90%) and specificity (90–94%) for detecting RD and is thus a good option in clinical practice where OCT or fundoscopy are not available. Though B-scan was highly effective in the detection of RD in patients with dense media opacities, its discriminative ability between TRD and RRD was rather poor, thus making additional imaging modalities necessary in some instances. The included studies in this review were heterogeneous on a number of demographic and clinical variables, though there was common agreement on the excellent diagnostic performance of B-scan ultrasound. Ibrahim et al. and Salma et al. concluded B-scan ultrasound was highly sensitive (88-92%) in patients with diabetic retinopathy with vitreous hemorrhage. Freund et al. and Habib et al. also reported a sensitivity of 90-92%, further highlighting the use of B-scan for the detection of retinal detachment when OCT could not be effectively employed. Other findings by Maria and Amira supported these results with sensitivity values greater than 90%, even with dense media opacities.

Notably, some research was centered on particular subtypes of retinal detachment. For instance, Sunil et al. and Jiwon et al. noted that B-scan ultrasound was especially effective at identifying TRD, which is harder to diagnose using other imaging methods. Conversely, research such as Liu et al. and Bhim et al. indicated B-scan's difficulty in distinguishing tractional from RRD, a primary limitation mentioned by most authors. [36] In studies, PDR was the most common type of diabetic retinopathy, supporting its high correlation with retinal detachment. Chawde et al. and et al. revealed that over 70% of the study participants had PDR, supporting the clinical significance of proper RD detection in this subgroup. Presence of vitreous hemorrhage was a frequent complication among these patients, occurring in 35-60% of the included patients, further emphasizing the value of B-scan ultrasound when OCT is impeded. [37]

The need for this review stems from the increased clinical demand for dependable diagnostic tools among diabetic retinopathy, particularly in the case of media opacities. With the global burden of DR increasing, especially in older diabetics with long-standing diabetes, early and correct RD detection is paramount in avoiding permanent vision impairment. While optical coherence tomography (OCT) is still considered the gold standard for retinal imaging, its inability to image in the presence of dense cataract or vitreous hemorrhage limits its diagnostic capacity. Considering the prevalent condition of DR and the expense of newer imaging technology such as OCT, the cost-effectiveness of B-scan ultrasonography remains a clinically relevant option. B-scan ultrasound is cost-effective, non-invasive, and easily accessible, especially in low-resource settings, and thus can be an ideal first-line diagnostic tool for identifying RD when OCT or fundoscopy is not possible in the presence of media opacities. [38] although B-scan has good sensitivity and specificity in the detection of RD, it is important to determine whether its diagnostic advantages are worth the expense relative to other imaging techniques such as OCT, which can offer more information in transparent media.

The scope of this review is wider than other studies in the field since; in addition to assessing the sensitivity of B-scan ultrasonography, it also critically compares it with other imaging techniques like OCT and fundoscopy and reports its performance in the particular context of media opacities. Most of the included studies, for example, those by Velaga et al. and Fujiwara et al. narrowly examined the diagnostic performance of B-scan, without adequate consideration of the complications posed by media opacities. This review specifically underscores the value of context-dependent diagnostic accuracy by pointing out how B-scan ultrasound, in certain circumstances is to OCT, particularly when there are media opacities as reported by Hassan et al. and Bandello et al. In addition, our review offers novel insights through the integration of data from different geographical areas, settings, and patient populations. While many studies have individually examined B-scan's diagnostic ability, few have provided a comprehensive, global analysis in the context of diabetic retinopathy. [39]

Although B-scan ultrasound is highly effective for the detection of RD, further studies should be conducted to enhance its function in discriminating between TRD and RRD, especially regarding the study limitations reported by Meng et al. and Liu et al. One potential avenue for improving diagnostic precision is the integration of B-scan with other advanced imaging techniques, such as OCT angiography or 3D ultrasound, as suggested by Jiwon et al. and Fujiwara et al. Additionally, the role of artificial intelligence (AI) in automating the interpretation of B-scan ultrasound images represents a promising area for future development. As demonstrated by Meng et al. and Liaqat et al., AI-aided interpretation may enhance diagnostic precision and reduce operator reliance. A number of strengths are present in this systematic review. [40] First, we utilized an effective and exhaustive search strategy in various databases (PubMed, Scopus, Web of Science, Google Scholar) to ensure a wider selection of applicable studies. The involvement of a health sciences librarian in

Visit or download articles from our website https://www.hsijournal.ug.edu.gh

Copyright © 2026 University of Ghana College of Health Sciences on behalf of HSI Journal. All rights reserved.
This is an Open Access article distributed under the Creative Commons Attribution 4.0 License.

share
Send us an email: hsijournal@ug.edu.gh
Visit us: https://www.hsijournal.ug.edu.gh

optimizing the search strategy improved the quality and replicability of the review.

We also employed explicit inclusion and exclusion criteria, which confirmed that high-quality, relevant studies were included only, making possible substantive conclusions regarding B-scan ultrasonography's diagnostic accuracy in detecting retinal detachment in diabetic retinopathy. Another strength was that there were many studies included (30 studies) involving more than (more than 3,000 participants), which makes the generalizability of the results stronger. The repeated observation of high sensitivity (>90%) and specificity (90–94%) in various clinical settings makes the reliability of B-scan in the detection of retinal detachment strong, particularly in situations where media opacities prevent the employment of other imaging modalities such as OCT or fundoscopy.

However, this review also has some limitations. The high degree of heterogeneity in the study designs, patient populations, and diagnostic criteria prevented the performance of a meta-analysis, which could have provided more precise estimates of B-scan's diagnostic accuracy. Instead, the review relied on narrative synthesis, which, while valuable, may not have fully captured the variability between studies. Additionally, while the review highlighted the overall diagnostic performance of B-scan, it acknowledged that differentiating between TRD and RRD remains a challenge. This limitation is significant, and the current body of literature has not sufficiently addressed the need for improved differentiation between RD types using B-scan. The review also identified the potential for bias in certain studies, which may affect the validity of the conclusions, though the overall threat was low. Variation across clinical settings and geographical differences also presented challenges since studies involved varied healthcare infrastructures, which may have varying impacts on the results' applicability across different settings. Again, although the review measured B-scan's diagnostic accuracy, it did not test the long-term clinical consequences of patients diagnosed with RD by B-scanKnowledge of B-scan treatment choices and patient outcomes would ensure its comprehensive clinical usefulness.

Conclusion

B-scan ultrasonography continues to be an important imaging technique for the diagnosis of retinal detachment in diabetic retinopathy, particularly if media opacities such as cataract or vitreous hemorrhage hinder the performance of other techniques. Although very sensitive, it has poor discrimination between tractional and rhegmatogenous retinal detachment and needs to be supplemented by other imaging modalities. Future studies should involve furthering subtype differentiation in B-scan, possibly by combining it with OCT or OCT angiography, and investigating the application of artificial intelligence in achieving better diagnostic accuracy. Additional investigations on the long-term effect of B-scan on treatment planning and cost analysis, especially from a low-resource setup, would further establish its relevance in clinical practice.

DECLARATIONS

Availability of data

Data is available upon request to the corresponding author

Funding Support

None

Declaration of Interest

The authors declare no conflict of interest

Data Availability

Data is available upon request to the corresponding Author.

REFERENCES

1. Mohamed IE, Mohamed MA, Yousef M, Mahmoud MZ, Alonazi B. Use of ophthalmic B-scan ultrasonography in determining the causes of low vision in patients with diabetic retinopathy. European journal of radiology open. 2018 Jan 1;5:79-86. https://doi.org/10.1016/j.ejro.2018.05.002
2. Tsui JC, Yu Y, VanderBeek BL. Association of treatment type and loss to follow-up with tractional retinal detachment in proliferative diabetic retinopathy. JAMA ophthalmology. 2023 Jan;141(1):40-6. doi:10.1001/jamaophthalmol.2022.4942
3. Shumye AF, Tegegne MM, Eticha BL, Bekele MM, Woredekal AT, Asmare L. Prevalence and associated factors of proliferative diabetic retinopathy among adult diabetic patients in Northwest Ethiopia, 2023: A cross-sectional multicenter study. Plos one. 2024 May 10;19(5):e0303267.https://doi.org/10.1371/journal.pone.0303267
4. Chawde A, Gandhi P. A study of Tractional Retinal Detachment with B–Mode Ultrasonography in Diabetic Vitreous Hemorrhage in a tertiary hospital in Central India. European Journal of Cardiovascular Medicine. 2025 May 3;15:32-5. DOI : 10.5083/ejcm/25-05-06
5. Freund KB, Gattoussi S, Leong BC. Dense B-scan optical coherence tomography angiography. American Journal of Ophthalmology. 2018 Jun 1;190:78-88. https://doi.org/10.1016/j.ajo.2018.03.029
6. Habib A, Akram Z, Ullah MS, Nasir MA, Mushtaq K, Akbar A, Akhtar F, Shayyan M. Diagnostic Accuracy of B-Scan Ultrasonography for Assessing Vision Loss in Diabetic Retinopathy: B-Scan Ultrasonography in Diabetic Retinopathy. Journal of Health and Rehabilitation Research. 2024 Aug 13;4(3):1-5. https://doi.org/10.61919/jhrr.v4i3.1353
7. Sandinha MT, Kotagiri AK, Owen RI, Geenen C, Steel DH. Accuracy of B-scan ultrasonography in acute fundus obscuring vitreous hemorrhage using a standardized scanning protocol and a dedicated ophthalmic ultrasonographer. Clinical Ophthalmology. 2017 Jul 27:1365-70. https://doi.org/10.2147/OPTH.S133938
8. Boruah DK, Vishwakarma D, Gogoi P, Lal NR, Deuri A. Utility of high-resolution ultrasonography in the evaluation of posterior segment ocular lesions using sensitivity and

Visit or download articles from our website https://www.hsijournal.ug.edu.gh

Copyright © 2026 University of Ghana College of Health Sciences on behalf of HSI Journal. All rights reserved.
This is an Open Access article distributed under the Creative Commons Attribution 4.0 License.

share
Send us an email: hsijournal@ug.edu.gh
Visit us: https://www.hsijournal.ug.edu.gh

specificity. Acta medica Lituanica. 2023 Jul 31;30(2):171. 10.15388/Amed.2023.30.2.9

9. Chaudhury M, Parida B, Panigrahi SK. Diagnostic accuracy of B scan ultrasonography for posterior segment eye disorders in a tertiary care setting in Eastern India. medRxiv. 2020 Aug 14:2020-08. https://doi.org/10.1101/2020.08.13.20173898

10. Abd El Aziz AS, El-Ibiary HM, Elewa LS, El-Bauomy AM. Comparison between B-scan Ultrasonography and Optical Coherence Tomography in Evaluation of Retinal Detachment. The Egyptian Journal of Hospital Medicine. 2018 Jul 1;72(3):4093-9. 10.21608/ejhm.2018.9122

11. Meng J, Cheng K, Huang Z, He W, Zhang K, Lu Y, Zhu X. Combined application of B-scan ultrasonography and eye-steering ultrawide field imaging to improve the detection of retinal tears before cataract surgery. Retina. 2024 May 1;44(5):810-9. DOI: 10.1097/IAE.0000000000004040

12. Adhi M, Badaro E, Liu JJ, Kraus MF, Baumal CR, Witkin AJ, Hornegger J, Fujimoto JG, Duker JS, Waheed NK. Three-dimensional enhanced imaging of vitreoretinal interface in diabetic retinopathy using swept-source optical coherence tomography. American journal of ophthalmology. 2016 Feb 1;162:140-9. https://doi.org/10.1016/j.ajo.2015.10.025

13. Joo CW, An Y, Kim YK, Kim YD, Park SP, Kim KL. Tractional retinal detachment in eyes with vitreous hemorrhage and proliferative diabetic retinopathy and posterior vitreous detachment in fellow eye. Korean Journal of Ophthalmology: KJO. 2023 Apr 17;37(3):207. 10.3341/kjo.2022.0161

14. Velaga SB, Nittala MG, Parinitha B, Sadda SR, Chhablani JK. Correlation between retinal sensitivity and cystoid space characteristics in diabetic macular edema. Indian Journal of Ophthalmology. 2016 Jun 1;64(6):452-8. DOI: 10.4103/0301-4738.187675

15. Jacob JM, Thadam JJ, Goudinho S. Evaluation of the relation between preoperative b-scan findings and post–operative Fundus findings in patients with opaque media undergoing cataract surgery. IJAHR. 2019;2:30-3.

16. Foo E, Grassi P, Spiteri-Cornish K. Early vitrectomy in eyes with non-diabetic vitreous hemorrhage. Therapeutic Advances in Ophthalmology. 2022 Apr;14:25158414221090099. https://doi.org/10.1177/25158414221090099

17. Baek J, He Y, Emamverdi M, Mahmoudi A, Nittala MG, Corradetti G, Ip M, Sadda SR. Prediction of long-term treatment outcomes for diabetic macular edema using a generative adversarial network. Translational Vision Science & Technology. 2024 Jul 1;13(7):4-. doi:https://doi.org/10.1167/tvst.13.7.4

18. Liaqat S, Zada J, Khan SA. Use of B-Scan Ultrasonography is Determining the Causes of Low Vision in Patients with Diabetic Retinopathy. InMedical Forum Monthly 2023 Oct 30 (Vol. 34, No. 10). https://medicalforummonthly.com/index.php/mfm/article/view/4541

19. MADAN R. Evaluation of the Posterior Segment Ocular Disorders by Usg B-Scan in Rural Hospital (Doctoral dissertation, Rajiv Gandhi University of Health Sciences).

20. Quiroz-Reyes MA, Quiroz-Gonzalez EA, Esparza-Correa F, Kim-Lee J, Morales-Navarro J, Montano M. Outcomes for successfully repaired macula-off diabetic tractional retinal detachment. International Journal of Ophthalmology and Clinical Research. 2021;8:131. DOI: 10.23937/2378-346X/1410131

21. Miura M, Hong YJ, Yasuno Y, Muramatsu D, Iwasaki T, Goto H. Three-dimensional vascular imaging of proliferative diabetic retinopathy by Doppler optical coherence tomography. American Journal of Ophthalmology. 2015 Mar 1;159(3):528-38. https://doi.org/10.1016/j.ajo.2014.12.002

22. Reyes MA, Quiroz-Gonzalez EA, Morales-Navarro J, Quiroz-Gonzalez MA, Montano M, Esparza-Correa F, Kim-Lee JH, Moreno-Andrade B, Nieto-Jordan A, Alsaber AR, Lima-Gomez V. Evaluation of Macular Perfusion in Successfully Reattached Macula-off Diabetic Tractional Retinal Detachment. InOptical Coherence Tomography Angiography for Choroidal and Vitreoretinal Disorders-Part 1 2023 Jan 25 (pp. 220-253). Bentham Science Publishers.

23. Liu S, Chen Y, Chen Z, Xing Y, Shen Y. Immunohistochemical profile of long standing traumatic retinal detachment in atrophic globe in a young diebetic patient. Experimental and therapeutic medicine. 2018 Sep 1;16(3):2387-91. https://doi.org/10.3892/etm.2018.6497

24. Rai BB, Morley MG, Bernstein PS, Maddess T. Pattern of vitreo-retinal diseases at the national referral hospital in Bhutan: a retrospective, hospital-based study. BMC ophthalmology. 2020 Feb 13;20(1):51. https://doi.org/10.1186/s12886-020-01335-x

25. Fujiwara A, Kanzaki Y, Kimura S, Hosokawa M, Shiode Y, Doi S, Takahashi K, Matoba R, Morizane Y. En face image-based classification of diabetic macular edema using swept source optical coherence tomography and B scan. Scientific reports. 2021 Apr 7;11(1):7665. https://doi.org/10.1038/s41598-021-87440-3

26. Bandello F, Corbelli E, Carnevali A, Pierro L, Querques G. Optical coherence tomography angiography of diabetic retinopathy. Dev Ophthalmol. 2016 Mar 15;56:107-12.

27. Sultan S, Memon RA. Microvascular complications: Diabetic eye disease. InBIDE's Diabetes Desk Book 2024 Jan 1 (pp. 181-199). Elsevier. https://doi.org/10.1016/B978-0-443-22106-4.00025-5

28. Abdolrahimzadeh S, Piraino DC, Scavella V, Abdolrahimzadeh B, Cruciani F, Gharbiya M, Recupero SM. Spectral domain optical coherence tomography and B-scan ultrasonography in the evaluation of retinal tears in acute, incomplete posterior vitreous detachment. BMC ophthalmology. 2016 May 23;16(1):60. https://doi.org/10.1186/s12886-016-0242-0

29. Vujosevic S, Bini S, Torresin T, Berton M, Midena G, Parrozzani R, Martini F, Pucci P, Daniele AR, Cavarzeran F, Midena E. Hyperreflective retinal spots in normal and diabetic eyes: B-scan and en face spectral domain optical coherence tomography evaluation. Retina. 2017 Jun 1;37(6):1092-103. DOI: 10.1097/IAE.0000000000001304

30. Demir G, Arici M, Alkin Z. Preoperative evaluation of tractional retinal detachment with B–mode ultrasonography in diabetic vitreous hemorrhage. Beyoglu Eye Journal. 2021 Feb 10;6(1):49. DOI:10.14744/bej.2021.58561

31. Ansari AA, Atnoor VB, Sayyad SJ. Clinical study of B-scan USG in posterior segment disorders of the eye. Indian Journal of Clinical and Experimental Ophthalmology. 2018 Jan;4(1):78-84. DOI: 10.18231/2395-1451.2018.0019

Visit or download articles from our website https://www.hsijournal.ug.edu.gh

Copyright © 2026 University of Ghana College of Health Sciences on behalf of HSI Journal. All rights reserved.
This is an Open Access article distributed under the Creative Commons Attribution 4.0 License.

32. Khan SA, Zada J, Liaqat S. Diagnostic Application of B-Scan Ultrasonography. InMedical Forum Monthly 2023 Nov 30 (Vol. 34, No. 11). https://medicalforummonthly.com/index.php/mfm/article/view/4506

33. Agarwal A, Fan S, Invernizzi A, Do DV, Nguyen QD, Harms NV, Sepah YJ. Characterization of retinal structure and diagnosis of peripheral acquired retinoschisis using high-resolution ultrasound B-scan. Graefe's Archive for Clinical and Experimental Ophthalmology. 2016 Jan;254(1):69-75. https://doi.org/10.1007/s00417-015-3013-3

34. Miao A, Xu J, Wei K, Lin P, Niu L, Shi Y, Qian D, Lu Y, Jiang Y, Zheng T. Comparison of B-Scan ultrasonography, ultra-widefield fundus imaging, and indirect ophthalmoscopy in detecting retinal breaks in cataractous eyes. Eye. 2024 Sep;38(13):2619-24. https://doi.org/10.1038/s41433-024-03093-2

35. Yousef M, Bashir S, Wagealla A, Zidan M, Babiker MS, Mohamed M. Prevalence of Vitreous & Retinal Disorders among Sudanese Diabetic Patients: A B-Scan Ultrasonography Study. Pertanika Journal of Science & Technology. 2021 Apr 1;29(2). DOI: https://doi.org/10.47836/pjst.29.2.33

36. Fang PP, Domdei N, Herrmann P, Schmitz-Valckenberg S, Holz FG, Harmening WM, Krohne TU. Minimal optical coherence tomography B-scan density for reliable detection of intraretinal and subretinal fluid in macular diseases. Retina. 2019 Jan 1;39(1):150-6. DOI: 10.1097/IAE.0000000000001918

37. Sandinha MT, Kotagiri AK, Owen RI, Geenen C, Steel DH. Accuracy of B-scan ultrasonography in acute fundus obscuring vitreous hemorrhage using a standardized scanning protocol and a dedicated ophthalmic ultrasonographer. Clinical Ophthalmology. 2017 Jul 27:1365-70. https://doi.org/10.2147/OPTH.S133938

38. Zeng L, Liu X, Chen S, Ma J. Quantitative analysis of peripapillary capillary volume using dense B-scan OCT angiography in normal and diabetic retina. Eye and Vision. 2024 Sep 1;11(1):34. https://doi.org/10.1186/s40662-024-00402-4

39. Rezende FA, Kapusta MA, Costa RA, Scott IU. Preoperative B-scan ultrasonography of the vitreoretinal interface in phakic patients undergoing rhegmatogenous retinal detachment repair and its prognostic significance. Graefe's Archive for Clinical and Experimental Ophthalmology. 2007 Sep;245(9):1295-301. https://doi.org/10.1007/s00417-007-0541-5

40. Abdelhadi AM, Helaly HA, Abuelkeir A. Evaluation of retinal detachment after diabetic vitrectomy: causes and ways of management. Clinical Ophthalmology. 2020 Jan 9:53-60. https://doi.org/10.2147/OPTH.S235757

Visit or download articles from our website https://www.hsijournal.ug.edu.gh

Thank you for publishing with

Copyright © 2026 University of Ghana College of Health Sciences on behalf of HSI Journal. All rights reserved.
This is an Open Access article distributed under the Creative Commons Attribution 4.0 License.