

Diabetic retinopathy screening in persons with mental illness: a literature review

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ABSTRACT

People living with severe mental illness (SMI) have an increased risk of developing diabetes and are less likely to spontaneously report physical health concerns; they may therefore derive greater benefit from attending screening to prevent diabetic retinopathy.

We conducted a literature review to consider the uptake of diabetic retinopathy screening (DRS) in people with mental illness.

People with a diagnosis of SMI and those with self-reported mental ill-health have reduced attendance at DRS, within the context of poorer compliance with general diabetic care. Anxiety and depression were noted as barriers in attending DRS.

People living with SMI require additional support to benefit from preventative health programmes such as DRS.

Further research could support a better understanding of barriers to attendance, allowing effective support systems to be developed.

INTRODUCTION

Severe mental illness (SMI) includes schizophrenia and its related conditions and bipolar disorder, along with depressive and anxiety disorders if associated with considerable functional impairment. People with schizophrenia and bipolar disorder face one of the greatest health inequality gaps in England, with their life expectancy being 10–20 years lower than the general population.¹ The rate of all-cause mortality in those with bipolar disorder is 1.77 times the general population's and in those with schizophrenia is 2.08 times greater.¹ Such findings are replicated within the UK.² These discrepancies are explained not only by increased rates of suicide, but also by natural causes including disorders of the circulatory, digestive, neurological, respiratory and endocrine systems.³

The worldwide adult prevalence of the endocrine disorder, diabetes, was estimated as 4% in 1995 and is predicted to rise to 5.4% by 2025.⁴ Schizophrenia is itself associated with high rates of insulin resistance, this being true for even antipsychotic-naïve patients.⁵ The prevalence of diabetes in people with schizophrenia is reported as 10.8% with a lifetime

prevalence of 14.9%.⁶ The additional risk of diabetes posed by antipsychotic treatment, in particular second generation antipsychotics, is widely acknowledged^{7–9}; olanzapine¹⁰ and clozapine¹¹ carrying particular risks. People with mood disorders are also at increased risk of developing diabetes^{12 13} and depression is itself associated with poorer glycaemic control in people with diabetes.¹⁴

In addition to an increased burden of physical morbidity, people with SMI are less likely to spontaneously report physical symptoms,¹⁵ have greater difficulties in accessing medical care¹⁶ and receive suboptimal levels of medical care in both psychiatric and medical settings.¹⁷

Individuals with SMI may therefore derive a greater benefit from attending preventative health programmes. Current UK adult population based screening programmes include breast, cervical and bowel cancer, abdominal aortic aneurysm and diabetic retinopathy (DR).¹⁸ However compliance with cancer screening in patients with SMI is suboptimal¹⁹; women with SMI are less likely to have a cervical smear test²⁰ and attend mammography.²¹

People with diabetes are at risk of developing the microvascular complication of sight-threatening DR, this is especially true for those with a long duration or poorly controlled diabetes.²² The overall prevalence of DR is estimated as 34.6%,²³ ranging from 11% to 77% in type 1, and 3.1%–68% in type 2 diabetes.²⁴ Associated with DR is significant morbidity, being the leading cause of blindness in England and Wales in 1999–2000, and the second in 2009–2010 (14.4% of blindness certifications).²⁵ This decline may be secondary to improved glycaemic control^{26 27} alongside national DRS programmes which support early detection and timely treatment of retinopathy and can prompt optimisation of glycaemic control.²²

The UK DRS programme was implemented in 2003 and was the first national programme

available to all people with diabetes over the age of 12,²⁷ who are not already receiving ophthalmology care and do not meet exclusion criteria such as being terminally ill.²⁸ Retinopathy screening in England is overseen by the National Health Service (NHS) Diabetic Eye Screening Programme (NDESP) and is delivered by a range of locally commissioned digital photography providers, in a variety of permanent and mobile centres. Screening results are generally sent to primary care providers within 6 weeks, with individuals being either recalled for annual screening, invited for more frequent surveillance or referred to hospital ophthalmology services depending on the results.²² The NDESP offered screening to 2 700 774 people with diabetes in England in 2017–2018, of whom 2 232 797 attended; an uptake rate of 82.7%.²⁹

Given the poorer utilisation of cancer screening programmes by people with SMI,^{19–21} we aimed to carry out a literature review of studies reporting on the utilisation of DRS among people with mental illness.

Materials and methods

A review of literature was conducted on the uptake of DRS in people with diabetes who also have a SMI (psychosis, bipolar disorder, along with depression and anxiety).

Inclusion criteria were published primary research studies, quantitative and qualitative, dating from 2003 (the inception of systematic DRS globally) to April 2019. The scope of the study was not restricted to mental illnesses meeting recognised diagnostic classification criterion. There were no language restrictions or restrictions placed on demographic characteristics or the type and duration of diabetes.

Excluded from this review was primary research relating to people with diabetes with mental disorders not considered an SMI, studies carried out prior to 2003 and unpublished research due to restricted resources.

We conducted searches of EMBASE, CINAHL, Medline, Psycinfo and PubMed electronic databases from 2003 until April 2019. We used the following keywords: ‘diabetic eye screening’ OR ‘diabetic retinopathy screening’ AND ‘mental illness’ OR psychiatr* OR depression OR mood OR anxiety OR SMI OR schizophrenia OR psychosis.

The electronic database search was supplemented by full-text searches of Google scholar, and hand searching of the journals: British Medical Journal, British Journal of Psychiatry and the British Journal of Ophthalmology. References of key articles were also searched.

Identified papers were assessed as to their meeting inclusion criteria independently by both authors. Studies were reviewed to extract data regarding the study’s aim and design, the setting and participants, methods, outcomes and limitations. See figure 1.

RESULTS

Four North American cross-sectional studies considered the uptake of DRS in people with diabetes and a comorbid mental health issue (table 1).

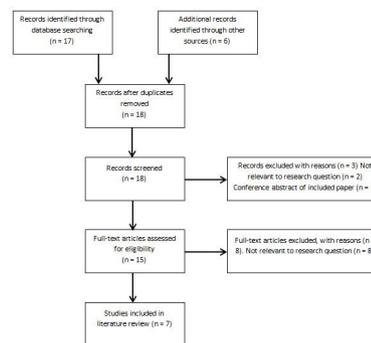


Figure 1 Diagram of study selection.

Paksin-Hall³⁰ *et al* considered variables that affect DRS attendance. Data analysed originated from a national random telephone survey, the Behavioural Risk Factors Surveillance System. Fifty-two thousand three hundred and eighty-six individuals with diabetes self-reported when they had last received DRS and whether they had experienced less than 14 or 14 or more ‘mentally unhealthy’ days in the past 30 days. Attendance at DRS within the last year was reported by 64% of those with 14 or more ‘mentally unhealthy’ days ($n=3203$) compared with 73.1% of those with less than 14 ($n=20436$). Individuals had significantly increased odds of undergoing DRS within the last year if they had less than 14 ‘mentally unhealthy’ days in the past 30 days (adjusted OR (AOR) of 1.22, 95% CI 1.04 to 1.41).

Goldberg *et al*³¹ conducted interviews with and reviewed medical notes of 300 people with type 2 diabetes, who were either attending an urban mental health centre or a closely located primary care centre. Of the 300 participants, 201 had an SMI (100 schizophrenia, 101 mood disorder) and 99 had no SMI (psychiatric treatment within the year being an exclusion criterion). Compliance with six diabetic care indicators within the last year was assessed: glycosylated haemoglobin, lipid profile, blood pressure, urine protein measurement, DRS and foot examination. The cohort with SMI were compliant with significantly less of all six diabetic care indicators, with only 56% of SMI patients meeting all six performance measures, compared with 77% in the cohort without SMI; DRS attendance rates were 80% and 94% respectively (AOR 0.26, p 0.008).

Two national studies of North American veterans were reviewed. Kilbourne *et al*³² conducted a study of 7514 non-institutionalised veterans who had a International Statistical Classification of Diseases and Related Health Problems 9th revision (ICD-9) based SMI diagnosis on the Veterans Affairs National Psychosis Registry, were subject to an annual external review process of medical care and whose care facility had submitted data for the Veterans Affairs Mental Health Programme Survey; a service organisation review with colocated care being defined as occurring within the mental health clinic itself. Attendance at DRS within the last year was 83% ($n=814$). Patients with diabetes in colocated services were less likely to attend DRS, although this was not statistically

Table 1 Overview of DRS attendance in people with mental health issues

Study	Study design	Mental health issue	DRS attendance	N	Age (years)	Ethnicity	OR (95% CI)	Country
Paksin-Hall <i>et al</i> ³⁰	Observational/cross sectional	14 or more 'mentally unhealthy' days in past 30 days	64% in cohort with 14 or more mentally unhealthy days	52 386	18–34 1.8% 35–54 20% 55–64 28.2% >65 50%	White 55.8% Black/African-American 9.8% Asian 5.9% Other 28.6%	Of attending DRS if <14 mentally unhealthy days—adjusted 1.22 (1.04 to 1.41)	North America
Goldberg <i>et al</i> ³¹	Observational/cross sectional	SMI (schizophrenia or major mood disorder)	80% in SMI cohort	300	50.1 (mean)—in SMI cohort	White 49% Other 51% In SMI cohort	Of attending DRS if SMI present—adjusted 0.26 (0.09 to 0.7)	North America
Kilbourne <i>et al</i> ³²	Observational/cross sectional	SMI (ICD-9)	83% in this SMI cohort	7514	56.4 (mean)	African-American 28% Other 72%	Of attending DRS if comorbid anxiety/PTSD—1.34 (1.01 to 1.77)	North America
Frayne <i>et al</i> ³³	Observational/cross sectional	Mental health condition (DSM IV/ICD-9)	57.8% in MHC cohort	313 586	<55 36.9% 55–64 20.9% 65–74 26.6% >75 15.6%—in MHC cohort	White 73.4% African-American 17.6% Other 6.8% In MHC cohort	Of not attending DRS if MHC present—adjusted 1.07 (1.05 to 1.08)	North America

DRS, diabetic retinopathy screening; MHC, mental health conditions; PTSD, post-traumatic stress disorder; SMI, severe mental illness.

significant (OR 0.77, CI 0.54 to 1.11). Having a comorbid diagnosis of anxiety or post-traumatic stress disorder significantly increased the likelihood of people with SMI attending DRS (OR 1.34, $p < 0.05$).

Frayne *et al*³³ conducted a study of 313 586 non-institutionalised Veteran Health Administration patients with diabetes, whose health facility transmitted data to a central diabetes database. Mental health and primary care experts categorised mental health conditions (MHC) into 10 categories based on Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM IV) and ICD-9 criteria. An MHC was present in 24.5% ($n = 76 799$) with the most common diagnoses being depression (15.5%), anxiety (12%), substance misuse (5.8%) and psychosis (5.3%). Failure rates to attend DRS were greater in the MHC group with 42.2% lacking DRS (compared with 41% in those without a MHC), this was true for other diabetic performance measures. Patients with diabetes and an MHC were significantly more likely

not to meet care standards for DRS (AOR 1.07, CI 1.05 to 1.08), glycosylated haemoglobin testing (AOR of 1.23, CI 1.21 to 1.26) and lipid testing (AOR 1.25, CI 1.23 to 1.28). Disparities were magnified in patients with psychotic, manic, substance-misuse and personality disorders. The percentage not meeting diabetic care standards was found to increase as the number of MHCs increased from zero to six, demonstrating a dose-response effect.

Three studies reported on mental health related barriers to attending DRS (table 2).

Lu *et al*'s³⁴ cross-sectional survey was administered to a convenience sample of 110 adults with diabetes attending a North American urban health centre, along with staff ($n = 55$). While 93% of patients were aware of the potential for significant visual impairment secondary to diabetes, only 55% had received DRS in the last year. No barriers were encountered in 31%, 26% reported one barrier and 44% reported two or more. The most common self-reported barriers were financial problems

Table 2 Overview of mental health related barriers to attending DRS

Study	Study design	DRS attendance	N	Age (years)	Ethnicity	Mental health related barriers to attending DRS	Country
Lu <i>et al</i> ³⁴	Observational/cross sectional	55%	165	54 (mean)	Hispanic 70% African-American 27% Other 3%	Depression (22%)	North America
Liu <i>et al</i> ³⁵	Qualitative (semi structured interview)	Not stated	29	67 (mean)	White 100%	Anxiety, negative self-perception, lack of self-efficacy	North America
Strutton <i>et al</i> ³⁷	Qualitative (unstructured interview)	84%	296	12–34 12.8% 35–54 31% 55–74 39.9% >75 15.9%	White 36.4% Black/black British 5.8% Asian/Asian British 19% Mixed 1.6% Unknown 37.2%	Anxiety	UK

DRS, diabetic retinopathy screening.



(26%) and depression (22%). There was no association found between the number of reported barriers and attendance rates, with those reporting no barriers failing to show increased screening attendance; no statistical significance was reported. A statistically significant divergence was found between the barriers perceived by patients and staff, with staff rating financial problems and depression as less important.

Liu *et al*³⁵ conducted a qualitative study with purposive sampling of individuals who had previously expressed an interest in research. This resulted in the recruitment of 20 adults with type 2 diabetes to whom a semi-structured interview was administered, nine primary care providers were also interviewed. The sample size was noted to be sufficient to reach informational redundancy. The interviews were audiotaped, transcribed verbatim and emerging themes from transcript analysis were verified by multiple members of the research team. Environmental, social and individual factors were identified. Environmental factors included long distances to obtain healthcare. Social factors included perceived judgement from others and a lack of trust in health practitioners. Individual factors included that limited 'time, energy and resources' led to the prioritisation of acute rather than preventative medical care, along with cost of services and limited health literacy/education. The effect of emotional states on attendance was variable with anxiety related to visual loss prompting attendance in one patient, while another avoided screening due to fear of receiving bad news. Negative self-perception and a lack of self-efficacy were found to impact negatively on attendance.

Strutton *et al*³⁶ considered reasons for non-attendance at DRS in the UK population. This was a service evaluation of an urban DRS programme with an uptake rate of 84%. Non-attenders (n=296) were defined as having 'never' attended eye screening despite being registered with the screening database for at least 18 months. Members of the screening programme contacted non-attending patients an unlimited number of times by phone. Findings were triangulated with clinical notes and by contacting primary care providers. A thematic framework analysis categorised explanations into patient and system level factors. Patient level factors included being anxious (most commonly of mydriatic eye drops), generalised disengagement with their diabetic care, misinformation about screening and having other commitments. System-level factors included miscommunication about patients' residences and practical problems in attending.

DISCUSSION

A literature review was conducted to allow both quantitative and qualitative studies to be considered, these being complementary in identifying and attempting to explain variance in DRS attendance in persons with and without mental illness. The seven eligible studies involved 84 313 individuals with a mental illness meeting ICD-9 diagnostic criteria, 201 individuals with an otherwise confirmed mental illness and 52 653 individuals with subjectively

defined mental health symptoms. Five studies were quantitative and two were qualitative in design, all the former being cross-sectional surveys. Study size ranged from 29 to 3 135 86 participants, and settings ranged from single centres to national surveys. The studies included national, rural and urban populations. All but one was conducted in North America and two North American studies were limited to veterans.

DRS in individuals with a recognised mental health diagnosis, compared with those without, was considered in two studies,^{31 33} both reporting reduced compliance with retinopathy screening in the context of reduced levels of compliance with overall diabetic care indicators. The disparity was greater in those with psychotic and manic disorders, and a correlation was observed between the number of MHCs present and failure in meeting diabetic care standards.³³ One study identified similar discrepancies in DRS attendance between individuals with and without subjectively defined mental ill-health.³⁰

Mental health related barriers to screening were noted in three studies. Anxiety appeared to have a variable effect on DRS attendance. It was perceived as a barrier in both a white rural North American cohort who were engaged with health services and had expressed an interest in research,³⁵ and within an urban British mixed-ethnic cohort of DRS non-attenders.³⁷ The anxiety described was not identifiable as a mental health diagnosis but was linked to health and screening issues for example in relation to dilating eye drops³⁷ and coping with bad news.³⁵ However anxiety had the opposite effect in other individuals, with anxiety related to visual loss prompting adherence.³⁵ Kilbourne *et al* noted that a comorbid ICD-9 anxiety disorder diagnosis within the context of a single provider funded system supported DRS attendance.³² Self-reported depression was reported as the second most common barrier in a cohort of health centre attenders.³⁴ Cognitions associated with depression such as a lack of self-efficacy were also reported as barriers.³⁵ Individuals meeting the diagnostic criteria for a depressive disorder may potentially experience their burden of symptoms as an even greater barrier. No evidence was found for a dose response relationship between the numbers of barriers reported and non-attendance at screening.³⁴ However while the survey was derived from available literature and pilot tested, the absence of this expected relationship raises the potential for the presence of additional unknown barriers.

Limitations included the small number of identified studies and that the broad inclusion criteria resulted in heterogeneous studies which were not easily comparable. Some studies may not have been identified due to chosen search keywords and relevant unpublished studies would have been overlooked. The primary research itself posed some limitations. Most of the studies were conducted in North America impacting on the generalisability of findings to the UK population; it is possible that DRS uptake may be greater in the UK where it is offered free at the point of delivery. It is possible that studies

of veterans^{32 33} may be more relevant to the UK population as the Veteran Health Administration is a single provider funded system, as is the NHS. While the demographic characteristics of cohorts varied from being 100% white³⁵ to 97% black and minority ethnic,³⁴ overall the samples represented a broad range of individuals which may enhance the generalisability of the findings. Selection bias may exist where participants are actively engaged with receiving health care,^{31 32 34 35} express an interest in research³⁵ or are recruited via telephone land lines.^{30 37} Positively two study samples included patients disengaged with receiving health care^{33 37} which may better represent the population of interest. Potential recall bias due to self-reporting of non-defined mental health symptoms was noted.^{30 34 35 37} Low response rates (57%) may introduce responder bias. However, in view of the nature of this sample a low response rate would be expected.³⁷ Interviews conducted by DRS staff may have introduced interviewer bias, especially as responses were not recorded verbatim.³⁷ Provider bias was considered when healthcare provider's response rates were not stated.³⁷ Recognised criteria were used for mental health diagnosis in two studies^{32 33}; while increasing validity and reliability this may be at the expense of under-detecting mental health issues with true variations being diluted.

In conclusion the SMI population is at a greater risk of diabetes and hence its complications.^{5 9 14} While national DRS programmes reduce avoidable visual loss,²⁵ patient attendance is imperative in this process. A key finding of this review is that, people with diabetes who also have a formally diagnosed SMI or self-reported mental ill-health have reduced attendance at DRS within the context of poorer compliance with general diabetic care. This remains true in diverse populations.

The review has provided a tentative understanding of the impact that mood and anxiety can have on individuals accessing DRS. The correlation between the number of MHCs present and DRS non-attendance³³ suggests that additional mental health symptoms have a cumulative effect and bring potentially different barriers. It seems clear that a prerequisite for DRS attendance is an individual having trust in both healthcare processes and practitioners, and that suspiciousness related to psychosis may contribute to individuals not seeking medical care.³⁶ Limited insight associated with schizophrenia also impacts negatively on engagement with health professionals.³⁸ Another prerequisite for preventative healthcare attendance is an individual having sufficient hope for their future and a sense of self-efficacy, these being challenging domains in a range of mental illnesses. Cognitive impairment also contributes to people with SMI not seeking medical care,³⁶ with both schizophrenia^{39 40} and bipolar disorder⁴¹ being associated with cognitive impairment and impaired executive function throughout the course of the illness.

Further quantitative and qualitative research, in particular within the UK population, would support a greater understanding of DRS attendance and barriers to

attendance in those with mental illness. Anxiety is often a poorly defined concept in research to date, and its role as both a barrier and facilitator of DRS requires further consideration in particular. This would allow solutions, which are perceived as helpful by individuals with mental illness, to support their accessing DRS and other preventative health strategies.

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