



# The Role of Public Health in Combating Diabetic Eye Disease (DED)

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## Abstract

Diabetic Eye Disease (DED) is a growing public health concern worldwide, with rising global diabetes prevalence, effective public health strategies are essential to combat DED. This paper discusses key strategies for the prevention and management of complications at a population level, including early detection through regular screenings, improving access to care, raising awareness, implementing robust policy frameworks, leveraging technological advancements, and involving communities. These approaches collectively aim to enhance early intervention, equitable care, and better management, thereby reducing the prevalence and impact of DED worldwide.

## Subject Areas

Diabetes & Endocrinology

## Keywords

Diabetes, Retinopathy, Maculopathy, Vision Loss, Public Health, Prevention

## 1. Introduction

Over the years and in different locations around the world, component diseases of DED have received tremendous attention, which has resulted in the development of effective public health strategies aimed at mitigating their prevalence, with considerable success [1]-[7]. Countries, continents, and international health and specialist organizations have developed uniform and evidence-based guidelines for the treatment and management of components diseases of DED [8]-[12]

which promise better prognosis for individuals with DED, especially when discovered at early stages. Despite best efforts, however, the prevalence of DED globally remains significant, especially in low- and middle-income countries [13]. Public health initiatives, through the underlisted tools, can play significant roles in combating the scourge of DED in the world, especially in underserved areas and in low- and middle-income countries.

## 2. Early Detection and Screening

One of the major factors that ensures a better prognosis for diseases is early detection, which provides immense benefits at individual and population levels. Early detection of diseases has been shown to ensure enhanced effectiveness of treatments and predict better outcomes, reduce mortality, and substantially reduce the physical, financial, social, and psychological impact of diseases [14]. Early detection of diabetes ensures the mitigation of consequences of the disease, including DED. This is because early detection of the disease necessitates the adjustment of lifestyle practices as well as allows for provision of the timely treatment that prevents associated complications [15] [16]. One of the methods of achieving early detection of diseases is screening. Screening performs the multiple functions of ensuring early detection/diagnosis of disease conditions, providing proper referral and initiating treatment/management interventions, as well as providing health education [4] [17], all of which are necessary for arresting the disease conditions before the onset of damages and complications.

The above is supported by studies that claim that up to 98% of visual impairment caused by diabetes is preventable by early detection and prompt treatment [18]. The subsequent reduction in blindness from diabetic retinopathy in Iceland, compared to neighboring countries, following the institution of nationwide screening in 1980 [19] supports this. Also, a reduction in the incidence of vision loss and other visual complications from diabetes following the introduction of screening has also been documented in England, Wales, and Finland [20] [21]. All of these lend credence to the positive effect of early detection through screening on the prognosis of diabetic eye disease and thus underscores its recommendation.

To combat DED, therefore, public health initiatives must emphasize the importance of early detection through regular eye screening, particularly among individuals with diabetes. Initiating and implementing affordable and accessible screening programs in collaboration with healthcare providers, especially in underserved areas, can help in the identification of DED at its earliest stages, enabling timely and holistic intervention to prevent irreversible damage. Public health initiatives that prioritize screening may contribute more to combating DED than other initiatives like leveraging technological advancements as the former has a greater likelihood, through its multiple functions, of averting vision loss and reducing the burden of the disease in the community. Efforts should also be made to ensure that people, especially at-risk individuals, attend screening programs.

This is crucial as non-attendance of screening for diabetic retinopathy and complications of diabetes is common among patients [22], which impedes the actualization of screening goals. This will include raising awareness, disseminating information, providing support to counter cultural, religious, social, and financial barriers. Therefore, for public health initiatives on screening to be effective and achieve desired goals, the initiatives must adopt the two-pronged approach of implementing screening programs on the one hand, and instituting measures to address barriers to uptake of screening programs on the other hand.

### **3. Access to Care and Treatment**

Individuals with DED require a range of treatment and care at different stages of the disease that includes surgical, pharmacological, and non-pharmacological therapies, [1] [23]. These interventions aim to arrest and/or mitigate the progression of the disease and preserve vision. However, access to and availability of these therapies remain limited, for several reasons, especially in underserved areas and in low- and middle-income countries [24] [25]. These inadequacies in access to care significantly impact prognosis for individuals with DED and may lead to worsening of conditions and development of comorbid complications. Without remedial action, these inadequacies to access will increase given the bleak projections of diabetes and component diseases of DED, like diabetic retinopathy, in the coming years [13] [26].

Efforts, therefore, should be made by public health initiatives to ensure equitable access to available eye care services and treatment modalities for individuals with DED. This includes enhancing the availability of screening facilities and instituting effective post-screening referral pathways, providing patient education on care and treatment, supporting telemedicine initiatives as well as providing robust follow-up systems, and fostering collaborations between public health agencies, healthcare providers, and community organizations to bridge gaps in access to care. An example of such an initiative is the establishment of on-site ophthalmological services at an internal medicine diabetes care location instituted as part of the protocols of intervention by researchers in Alabama [27]. Coordinators at this facility scheduled patients for appointments after screening and provided free or low-cost eye examinations. These resulted in a reduction in the reliance of patients on extended transportation to access specialist care while the cost encouraged patients to take up care and thus addressed some of the barriers to accessing care as elicited by their research [27]. Adopting the initiatives highlighted above will ensure that care is made available to in-need patients and will result in the reduction of cases of active DED in the community.

### **4. Raising Awareness**

While there is a relatively high awareness of diabetic eye disease among individuals with diabetes in most Western countries [28], the opposite is the case in some other parts of the world [29] [30]. Even among diabetics with awareness of DED

there is less awareness of treatment options available to them and how to obtain such interventions [31]. This trend is inimical to the fight against DED where loss of sight has been attributed more to lack of awareness and information, rather than an inability to treat the diseases [32]. This highlights the need for awareness creation among diabetics, at-risk individuals, and people with DED.

Therefore, public health initiatives geared towards raising awareness about the link between diabetes and eye health are warranted and are crucial in promoting early detection and intervention uptake and preventing DED and the physical, psychological, financial, and social toll it takes on individuals. Public health campaigns, educational programs, and community outreach initiatives can, through various media, disseminate information about DED, the importance of regular eye examinations, lifestyle modifications, and the role of diabetes management in preserving eye health. In their study, for example, Beaser and colleagues showed the effectiveness of online patient activities aimed at empowering patients and enhancing self-efficacy in raising awareness and building knowledge that motivated action in diabetic retinopathy self-care [1].

These programs and initiatives can include information about current treatment options and support groups for DED and where they can be obtained. Furthermore, educational programs conducted to raise awareness should consider the education and literacy level of the target population and thus tailor such programs, including materials and language used in them, to their capacity. This is because poor health literacy is independently associated with higher rates of DED, specifically retinopathy, in diabetics [33].

## 5. Policy Frameworks

A significant portion of the success of the fight against diseases in the community is attributable to policy frameworks [34]. These policies, among other things, ensure integration of health services, address health inequalities, help in overcoming barriers to access to care, as well as ensure the prevention of diseases and availability of interventions. Therefore, to combat diabetic eye disease in the community, government and health authorities should see to the formulation and implementation of innovative, robust, and ambitious policy frameworks, regulatory measures and legislations aimed at prioritizing the integration of diabetic eye care into existing healthcare systems and the creation of new systems dedicated to diabetic eye care. These policies should, among other things, address resource allocation, workforce training, and the establishment of specialty clinics.

Data from research is important in the formulation and implementation of effective health policies [35]. Therefore, public health initiatives centered around policy should include conducting requisite studies on different facets of DED in the community on an on-going basis to generate current and representative data that will better inform effective formulation and implementation of these policies. Participation of the community is important in the formulation and implementation of public health policies, specifically in addressing inequalities and in promoting

public and community health through increased control over their health [36]. Also, involvement of stakeholders from other sectors is crucial in effective policy formulation and implementation. This is because health and wellbeing are significantly impacted by decisions made in sectors other than public health and healthcare, such as education, criminal justice, and transportation [34]. As such, initiatives aimed at using policies to effect positive change in the fight against DED must involve the community and stakeholders from other sectors, at different stages of such policies, if they are to be effective.

## 6. Leveraging Technological Advancements

Technological advancements have resulted in easier and more effective ways of doing things in every human endeavor, including healthcare. Recent advancements in healthcare delivery have led to the provision of advanced personalized healthcare to patients, and this has resulted in better prognosis and improved wellbeing [37]. Notably, smart technologies and advanced equipment (such as wearable and smart wireless sensors) have allowed for rapid monitoring and control of patients' conditions through timely access and ongoing evaluation of patients' vital signs [38]. This is particularly useful in diabetes care, where monitoring blood sugar levels is essential to the prevention and arrest of DED and other complications. In eye care, advances in digital retinal imaging technology, for example, including current models of digital fundus photography [39], while addressing shortcomings in the functionality of current methods, promise significant improvements in volume of diagnosis and interpretation, speed, and sensitivity for large cohorts in screening programs.

In combating DED, therefore, public health initiatives can leverage these technologies as well as the various healthcare applications of such innovations as machine learning, Internet of Things, Artificial Intelligence (AI), and big data to not only aid in diagnosis and interpretation, but also enhance health systems and support strategies that are beneficial in prevention and provision of interventions. Application of innovations in information technology in telemedicine, specifically teleophthalmology, can be employed in providing person-centered and effective care to individuals with diabetes and/or DED, bridging gaps in access to eye care service, and ensuring timely intervention while lessening the burden on available human resources.

## 7. Community Involvement

As noted earlier, community involvement is essential for the formulation and implementation of effective health policies. In the fight against DED, however, community involvement does more than that. Without community support or involvement, there is no public health [40]. This is seen in the significant roles that the community plays in decision-making and policy planning, improving social justice, reducing inequalities, sharing responsibility towards public health, governance, reducing inequalities, and delivery of services [41]. Involving the

community in public health initiatives for DED ensures the availability of local knowledge and support networks, which are essential for planning and implementing culturally sensitive and comprehensive screening programs and for instituting interventions that require community support.

Involving the community helps in the identification of community-specific barriers to access and uptake of care and such programs as screening, as well as allowing for the collection of local data that is essential to policy, decision-making, targeted intervention, and surveillance. Community involvement provides valuable insights into the demographics of the people that make up that community and the characteristic features that may impact the success or otherwise of public health initiatives. Given the multifaceted benefits that accrue from involving the community in public health endeavors, initiatives to combat DED must therefore involve the community at various stages of such initiatives if they are to realize intended objectives.

## 8. Conclusion

Combating Diabetic Eye Disease (DED) requires the application of different strategies and approaches. Emphasizing early detection through regular eye screenings and improving access to care, especially in underserved areas, can significantly enhance outcomes. Raising awareness through public health campaigns and educational programs is crucial for early intervention and effective management. Robust policy frameworks integrating diabetic eye care into existing healthcare systems are needed to address health inequalities. Leveraging technological advancements, such as telemedicine and digital retinal imaging, can improve diagnosis and treatment. Lastly, community involvement ensures culturally sensitive planning and implementation of public health initiatives. These strategies collectively offer a comprehensive approach to reducing the prevalence and impact of DED globally.

## Conflicts of Interest

The authors declare no conflicts of interest.

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