

National Eye Health Committee
Ministry of National Health Services
Regulation and Coordination
Government of Pakistan



Prevention and Control of Diabetic Retinopathy in Pakistan

A Learning Review-2018



Sightsavers

Prevention and Control of Diabetic Retinopathy in Pakistan

A Learning Review - 2018

National Committee for Eye Health

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Acronyms

A-VEGF	Anti-Vascular Endothelial Growth Factor
AIDS	Acquired Immunodeficiency Syndrome
ARIAS	Automated DR image assessment systems
BHUs	Basic Health Units
bill	billion
BMGF	Bill and Melinda Gates Foundation
CHWs	Community Health Workers
CME	Continuing Medical Education
COAVS	College of Ophthalmology and Allied Vision Sciences
COPD	Chronic Obstructive Pulmonary Disease
CRDs	Chronic Respiratory Diseases
CSO	Civil Society Organisation
CVD	Cardiovascular Disease
DAC	Development Assistance Committee
DAH	Development Assistance for Health
DALYs	Disability Adjusted Life Years
DED	Diabetic Eye Disease
DEOs	Data entry operators
DES	Diabetic Eye Screening
DHDC	District Health Development Centre
DHO	District Health Officer
DHQHs	District Headquarter Hospitals
DKK	Danish Kroner
DME	Diabetic Macular Edema
DR	Diabetic Retinopathy
DR-Net	Diabetic Retinopathy Network
ECSAT	Eye Care Service Assessment Tool
EHP	Essential Health Package
EMR	Electronic Medical Reporting
ESRD	End-Stage Renal Disease
FRESH	Focusing Resources on Effective School Health
GBD	Global Burden of Disease
GCM/NCD	Global Coordination Mechanism on the Prevention and Control of Noncommunicable Diseases
GDM	Gestational Diabetes Mellitus
GPs	General Physicians
GSHRH	Global Strategy on Human Resources for Health
HISDU	Health Information and Service Delivery Unit
HIV	Human Immunodeficiency Virus
HRH	Human Resources for Health
ID	Identification

IDF	International Diabetes Federation
IDP	Iowa Detection Program
IFA	International Federation of Aging
IFPMA	International Federation of Pharmaceutical Manufacturers and Associations
IRMNCH	Integrated Reproductive, Maternal, Newborn & Child Health
KiDS	Kids and Diabetes in Schools
LCIF	Lions Clubs International Foundation
LHWs	Lady Health Workers
MH	Mental Health
mhGAP-IG	Mental Health Gap Action Programme Intervention Guide
mill	million
MO	Medical Officer
NCDs	Non-Communicable Diseases
NGOs	Non-Governmental Organisations
NHS	National Health Service
NPDR	Non-Proliferative Diabetic Retinopathy
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
PC-1	Planning Commission
PDR	Proliferative Diabetic Retinopathy
PEN	Package of essential non-communicable disease interventions
PHC	Primary Health Care
PITB	Punjab Information Technology Board
PKR	Pakistani Rupee
PMU	Project Management Unit
PPDR	Pre- Proliferative Diabetic Retinopathy
PRP	Panretinal photocoagulation
RAAB	Rapid Assessment of Avoidable Blindness
RHCs	Rural Health Centres
SDGs	Sustainable Development Goals
SH&NS	School Health and Nutrition Supervisor
SiB	Seeing is Believing
SIP	Strategic Integration Point
SMO	Senior Medical Officer
STDR	Sight Threatening Diabetic Retinopathy
STEPS	STEPwise approach to Surveillance
TADDs	Tool for the Assessment of Diabetic Retinopathy and Diabetes Management Systems
TB	Tuberculosis
THQHS	Tehsil Headquarter Hospitals
TVCs	Television commercials
UHC	Universal Health Coverage

UK	United Kingdom
UN	United Nations
USD	United States Dollar
WDF	World Diabetes Foundation
WHA	World Health Assembly
WHO	World Health Organization
YLDs	Years Lived with Disability

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Foreword by National Coordinator, Pakistan National Eye Health programme

The National Committee for Eye Health is pleased to present its 'Learning Review' on the prevention and control of diabetic retinopathy in Pakistan.

With the launch of the Sustainable Development Goals (SDGs) in 2015 and their adoption by the Government of Pakistan as its national development agenda, there is a renewed impetus to ensure equity in health care and achievement of universal health coverage.

Diabetes is one of the four leading non-communicable diseases (NCDs) and has a high prevalence in Pakistan. According to the Second National Diabetes Survey 2016-17¹, the prevalence of diabetes in Pakistan is a staggering 26.3%. About 27% of all diabetes is undiagnosed according to this survey. While diabetes is known to lead to multi-organ complications, its effects on the eyes (diabetic retinopathy) is one of the most dreaded as it can result in irreversible vision loss and blindness. It is estimated that about a third or more of all diabetics develop eye complications, and of these a third go on to develop irreversible vision loss if untreated. Considering the high prevalence of diabetes in Pakistan, the public health implications of vision loss from diabetes are grave.

The new National Health Vision 2016-2025² of Government of Pakistan has reaffirmed its commitment towards and alignment with the Sustainable Development Goal 3 on health and has identified prevention and control of NCDs as one of its health priorities. It has further emphasised the need for integration of vertical programmes. In this context, the Government of Punjab has established a Prevention and Control of NCDs unit under the Primary and Secondary Healthcare Department and has launched a programme for prevention and control of NCDs 2016-2021. Other provinces have nominated provincial focal persons for NCDs and have prioritised NCDs in their respective health sector strategies.

In collaboration with international eye care partners like Sightsavers and The Fred Hollows Foundation, the National Committee for Eye Health has piloted programme approaches for the control of diabetic retinopathy over the last decade.

In view of the national and provincial transitioning of health strategies and programmes towards the SDGs, and the recent initiatives by the provincial governments to intensify efforts to address the burgeoning challenge of NCDs in Pakistan, the National Committee for Eye Health commissioned a 'learning review' to document global, regional and national policy frameworks and institutional mechanisms and programmes for NCDs and diabetes, determine key learnings from the pilot demonstration approaches, and formulate SDG compliant strategies for integration of prevention and control of diabetic eye disease in health interventions.

It is hoped that this document will not only inform future programmes for diabetic retinopathy, but also prove useful to NCD and diabetes programmes and organisations involved in diabetes care. The National Committee for Eye Health is especially grateful to Sightsavers for sponsoring this review, and to other government representatives, international and national eye care partners, technical experts and consultants who jointly facilitated the documentation of this learning review.

Prof Asad Aslam Khan

National Coordinator, Pakistan National Eye Health Programme

Message by Chairman, National Task Force for Diabetic Retinopathy

Pakistan stands at the brink of a diabetes epidemic. Changing lifestyles and dietary patterns, reduced physical activity and increasing adiposity all contribute to a rising prevalence of diabetes and pre-diabetes in the country.

One of the consequences of untreated or poorly controlled diabetes is diabetic eye disease (DED) which includes cataract, glaucoma and diabetic retinopathy, all of which can lead to diabetes related blindness.

Over the last decade in Pakistan, several pilot and demonstration projects have been implemented in an attempt to test and develop a replicable programme approach for control of diabetic eye disease in general and diabetic retinopathy in particular. These projects have collected very rich data and provide a useful basis to develop future programme strategies. There is now a pressing need to develop a uniform policy on diabetic retinopathy as an integral component of national and provincial health policies and health sector strategies. This becomes even more important in view of the prioritisation of non-communicable diseases as one of the targets of the health goal of the Sustainable Development Goals.

Pakistan still faces many challenges to addressing the rising burden of diabetes in the country, not the least of which is lack of awareness among those who are diagnosed with diabetes or those who are at risk of having diabetes. This is further compounded by increasing health costs that pose a financial risk to affected individuals and their families especially if they are poor. This is one of the challenges that national health insurance schemes need to take into consideration and ensure that medical and surgical treatment of diabetic eye disease is covered by the schemes.

As Chairman of the National Task Force on Diabetic Retinopathy, I am most pleased that a programme review process was initiated by the National Committee for Eye Health with support of Sightsavers, which culminated in the production of this 'Learning Review' report. It distils the learning of the last decade and presents a unified and practical approach to address diabetic retinopathy and diabetic eye disease that is integrated in programmes and plans for prevention and control of non-communicable diseases especially diabetes. The report also appeals for the attention of political representatives, policy makers and health planners to ensure that the epidemic of diabetes and its complications is effectively addressed in health policies, sector plans and budgetary allocations.

Prof Muhammad Saleh Memon

Chairman

National Task Force on Diabetic Retinopathy

Message by Country Director Sightsavers

Sightsavers has a strong emphasis on building partnerships with government systems and like-minded organisations, committed to elimination of blindness due to all avoidable causes, including Diabetic Retinopathy (DR). In Pakistan, Sightsavers has developed demonstration approaches for controlling blindness due to DR that are replicable and scalable for wider impact. The overall aim of our interventions is integration of DR programmes into wider health systems. We are working with the Pakistan National Eye Health Programme to build local capacities to deliver good quality DR interventions (including awareness, screening and early treatment).

Sightsavers has been trying to develop an efficient and cost-effective DR prevention programme model since 2006 in partnership with Al-Ibrahim Eye Hospital in Karachi. Based on our learnings from 2006 to 2012, we designed a long-term DR project in partnership with public and private sector partners with the generous support of Standard Chartered Bank under the Seeing is Believing (SiB) Programme in three metropolitan cities of Pakistan (Karachi, Lahore and Rawalpindi). The key focus of this programme is to develop a referral system from primary to secondary and tertiary levels to ensure known diabetic patients are screened for DR at an early stage and a management plan is established. Sightsavers has learnt that adopting multi-disciplinary team approach and inter-departmental linkages for treatment of DR results in a strong referral system and screening/examination of DM patients by all relevant medical professionals, including diabetologist, nephrologist, medical specialist, optometrist, ophthalmologist, retina specialist, counsellor, diabetic foot clinic etc. Another key learning is that effective treatment compliance can be achieved through counselling and patients' data/tracking system, and introduction of a one-window operation at hospital level for facilitation of patients.

One of the key objectives of our DR related work in Pakistan is to establish more evidence and learning resources that can strengthen our evidence-based research and contribute towards informed decision making. In this regard, this learning review was conceived in consultation with the National Coordinator of the Pakistan National Eye Health Programme in November 2018. We engaged all relevant stakeholders for their inputs and insights and summarised the discussions and learnings in the form of this report. We hope that this report will be useful for the readers to build on the findings and learnings to implement their own strategic approaches for addressing the challenges of blindness and vision loss from diabetes.

On behalf of my entire team, I am thankful to Prof Asad Aslam Khan and the team at the College of Ophthalmology and Allied Vision Sciences (COAVS) for their continuous support and facilitation for co-hosting and conducting this learning review. I am also grateful to Dr Haroon Awan for synthesising all the discussions and information in a way that provides a comprehensive insight for our future planning and informed decision-making.

Munazza Gillani

Country Director

Sightsavers Pakistan Country Office

Executive Summary

Background

In view of the rising trend of diabetes and diabetic retinopathy (DR) in Pakistan, pilot projects on prevention and control of DR were implemented in different parts of the country over the last ten years in collaboration with national government and non-government partners and international eye care partners, mainly Sightsavers and the Fred Hollows Foundation.

An initiative was taken by Sightsavers in collaboration with the National Coordinator, Pakistan National Eye Health Programme, and the Chairperson for the National Task Force on Diabetic Retinopathy to conduct a learning review of programme approaches for DR and determine strategies for the future decade.

Non-communicable diseases and diabetes

Non-communicable diseases (NCDs) are the commonest cause of mortality globally. Since 1980, the occurrence and frequency of NCD conditions like cardiovascular diseases, cancers, diabetes mellitus, chronic pulmonary diseases, mental health and sensory organ diseases has become more widespread. As a response to the rising trend of NCDs, the 66th World Health Assembly endorsed the World Health Organization (WHO) Global Action Plan for the Prevention and Control of NCDs 2013-2020 (resolution WHA66.10).

More recently, in the development agenda 2030 enshrined in the Sustainable Development Goals (SDGs), one of the 17 SDGs focuses on health (SDG3), pledging governments to “ensure healthy lives and promote well-being for all at all ages”. To measure progress against this goal, there are 9 targets covering a range of global health priorities including maternal and child health, communicable diseases, universal health coverage, and NCDs.

The NCDs have received considerable attention in the Eastern Mediterranean Region (EMR). The WHO EMR has developed a ‘**Framework on Strengthening the Integration and Management of Noncommunicable Diseases in Primary Health Care**’. The Regional Framework builds on the global action plan for the prevention and control of non-communicable diseases 2013-2020.

Two other **regional frameworks** were also launched by the WHO Regional Office for the Eastern Mediterranean. These include the following:

- Framework for Action on Advancing Universal Health Coverage (UHC) in the Eastern Mediterranean Region
- The Framework for Action for Health Workforce Development in the Eastern Mediterranean Region 2017 - 2030

The Global Report on Diabetes 2016 indicates that globally the number of people affected by diabetes has risen from 108 million people in 1980 to 422 million in 2015 indicating an almost four-fold increase in the burden of disease. Furthermore, the rise in prevalence of diabetes is faster in low and middle-income countries. The most marked increase in diabetes is seen in the EMR, which has the highest prevalence of diabetes in the world and **half the diabetes epidemic**.

Financing trends

NCDs account for almost 50% of the disease burden and 72% of all causes of mortality but receive less than 2% of Development Assistance for Health (DAH). On analysis of main sources and channels of NCD funding, most of the funding went to mental health and anti-tobacco. The major proportion of NCD funding has come from private philanthropy and has been channelled through NGOs and Foundations.

At the 73rd United Nations General Assembly held in September 2018, world leaders adopted a political declaration which reaffirms to scale up commitments through ambitious multisectoral national responses and contribute to the overall implementation of the 2030 Agenda for Sustainable Development.

Currently, some examples of financing streams for diabetes (and some for diabetic retinopathy) include the following:

- World Diabetes Foundation
- International Diabetes Federation (more for advocacy)
- International Federation of Ageing (research for advocacy)
- Queen Elizabeth Diamond Jubilee Trust (although coming to an end in 2018, with possibility of a new phase from 2019)
- Seeing is Believing programme
- Lions Clubs International Foundation
- Novo Nordisk
- Access Accelerated
- Bloomberg Philanthropies
- Global Challenges Research Fund

Pakistan country context

The second national diabetes survey of Pakistan was conducted in 2016-2017. The survey used a multistage clustering technique in all four provinces of Pakistan. The survey revealed the following findings:

- Overall weighted prevalence of diabetes was 26.3%, of which 19.2% had known diabetes, and 7.1% were newly diagnosed people with diabetes

- Prevalence of diabetes in urban and rural areas was 28.3% and 25.3%, respectively
- Prevalence of pre-diabetes was 14.4% (15.5% in urban areas and 13.9% in rural areas)
- Age greater than or equal to 43 years, family history of diabetes, hypertension, obesity and dyslipidaemia were significant associated risk factors for diabetes

These findings suggest that diabetes has reached epidemic proportions and that there is an urgent need of national strategies for early diagnosis and effective management as well as a cost-effective diabetes primary prevention programme in Pakistan. These recent findings indicate a high magnitude of diabetics and pre-diabetics, which are likely to have grave implications for diabetic retinopathy services in the long run.

Pilot programmes for diabetic retinopathy in Pakistan

Pilot projects on prevention and control of DR have been implemented in Pakistan for over ten years with both government and non-government partners mainly in collaboration with Sightsavers and Fred Hollows Foundation. Both pilot projects had similar themes. These included components of primary screening, secondary screening and referral, tertiary screening for DR assessment and management, data management and advocacy.

Key programmatic learnings

The National Task Force on Diabetic Retinopathy and key stakeholders convened for a consultation workshop in November 2018 where programmatic approaches and ongoing government initiatives were discussed. The consultative process distilled key programmatic learnings that had implications for future programme strategy.

Lady Health Workers (LHWs) were identified as a vital link with the community who performed a more effective role as agents to convey health information and create awareness.

It was more practical to have doctors at Basic Health Units (BHUs) use an appropriate diabetes risk assessment form (rather than the LHWs), which did not involve any ophthalmic examination or ophthalmoscopy. The risk assessment screening process could include factors like family history, age, weight, waist circumference, and body mass index.

Secondary level screening for DR was best performed at a Rural Health Centre (RHC), or a sub-district or district hospital or a screening service at a tertiary hospital. The project approach of utilising optometrists to perform secondary level screening and identification of DR was considered a practical option.

Newer hand-held retinal cameras and screening cameras that utilise artificial intelligence are now available. Their role vis a vis non-mydratic fundus cameras should be evaluated for cost-effective screening at scale.

Laser application for pan-retinal photocoagulation remains the treatment of choice for severe pre-proliferative and proliferative DR. In the case of macular involvement with diabetic macular edema (DME), Anti-Vascular Endothelial Growth Factor (A-VEGF) is the preferred choice of treatment. Eye departments of district teaching hospitals attached to medical colleges had a greater likelihood of utilising lasers for DR.

The indiscriminate use of A-VEGF needs to be regulated by regulatory authorities and its administration should only be permitted if certain conditions are met.

The core team for a DR control programme are the following:

- Lady Health Workers – for health awareness in communities
- Primary Health Care facilities – medical officers/general physicians can play a vital role in risk assessment and referral for further ophthalmic assessment and DR management
- Outreach teams of static primary health care facilities – for health awareness and advising about life style changes
- Optometrists – secondary level screening and grading for DR at RHC or tehsil or district headquarter hospital level; and referral of DR patients to tertiary hospitals
- District Ophthalmologists – supportive supervision of optometrists in screening and grading of DR, and laser application where indicated and where laser facilities exist
- Medical Retina specialists – tertiary level management of DR
- Surgical Retina specialists – surgical treatment of DR complications
- Diabetic educator - the role of diabetic educator needs to be made mandatory in any DR programme

The one-stop approach which provides a package of services to patients with diabetes includes general diabetes care, biochemical tests, foot care, counselling and DR care is a novel approach in Pakistan. Where feasible, it should be the preferred option for service development.

The Government of Punjab launched a large-scale province-wide programme for prevention and control of NCDs and dental health in 2016. This programme is highly relevant to diabetes and has at least nine strategic integration points (SIPs) for DR.

Recommendations

To the National Coordinator, National Eye Health Programme

- Request the Federal Minister for Health and Minister for Primary and Secondary Health Care Services Punjab to co-host a high-level meeting of federal and provincial health secretary's, director general's health, provincial focal persons for NCDs, provincial eye health coordinators, national and international eye care partners to:
 - Learn about the Government of Punjab programme for prevention and control of NCDs and determine how similar approaches can be fast-tracked in other provinces
 - Obtain conceptual approval to develop a roadmap to strengthen the capacity of the health system to respond to emerging DR care needs integrated in NCD services
- Request the Provincial Health Secretary for incorporation of DR/DED component in
 - the strategic framework being developed for NCDs
 - the NCD Electronic Medical Reporting (EMR)
 - future planned STEPs
 - key eye health messages in NCD patient counselling tools and integrated management guidelines
 - training and refresher training sessions of NCD master trainers, NCD focal persons and NCD doctors and primary health care staff
 - NCD weeks as a value addition to patient screening

To national and international eye care partners

- Accord consideration to the nine strategic integration points (SIPs) for DR/DED in the Punjab NCD programme when developing future collaborative DR initiatives:
 - SIP 1 - Integrate eye health messages and IEC material with the NCD health promotion plan
 - SIP 2 - Eye health as a stakeholder for the multi-sectoral plan on NCDs
 - SIP 3 - Advocate to incorporate DED in implementation guidelines
 - SIP 4 - Integrate DED component in training modules conducted by NCD programme
 - SIP 5 - Value addition of DED screening at district hospitals – linkage with NCD clinics
 - SIP 6 - Integration of DED in web app through unique NCD ID
 - SIP 7 - Integration of counselling of diabetics about DED in counselling tools and desk guides
 - SIP 8 - Incorporate DED screening component in STEPs
 - SIP 9 - Integration of digital space for DED integral to NCD (diabetes) data

Leadership and Governance

- Engage with NCD units to ensure that DR programming is aligned with and derives synergy from ongoing NCD programme strategies and initiatives
- Conduct orientation of district ophthalmologists in the working of an eye care team, the role of optometrists and how the scope of work especially for screening can be shared

- Strengthen capacities for DR laser treatment at eye units at district teaching hospitals attached to medical colleges
- Consider development of a zonal approach whereby a medical retina service in a tertiary eye department in a medical college provides supportive supervision to selected district eye units for DR screening and laser treatment

Service Delivery

- Work in a defined geographical area e.g. a priority district of the NCD programme
- Undertake a TADDs, (and ECSAT and RAAB-DR if resources permit) to identify available services and human resources and determine service gaps
- Adapt already available international clinical guidelines for DR for training and establishing standards
- Establish referral links of DR services with low vision and rehabilitation services
- Monitor quality and service outcomes
- First build capacity for DR care at the tertiary health care level; then develop screening and treatment capacity at the secondary level; then work towards building demand and undertake outreach
- Where feasible, prioritise and invest in a one-stop shop approach that provides a holistic approach to diabetes care including DR care
- Develop and establish medical retina services at tertiary and district teaching hospitals to enhance coverage and access for DR patients

Medical Products and Technology

- Develop laser services at tertiary centres and district teaching hospitals attached to medical colleges where there are staff who can be trained and can devote time to retinal examination and laser application
- Various image capture technology options are available – the most feasible and replicable option should be selected and tested before adoption on a large scale
- Automated screening and grading present a good option that needs to be tested in Pakistan
- Administer A-VEGF in units where medical retina expertise exists and quality and safety control protocols can be strictly followed

Health Workforce

- Utilise optometrists, where they exist, for secondary screening
- Incorporate deployment of diabetic educators as an essential cadre for DR services – posts for diabetic educators would need to be created in government tertiary hospitals and district teaching hospitals providing DR care
- Collaborate with NCD units to incorporate sections of DR/DED in NCD modules and their capacity building programme

- Ensure elements of training are properly institutionalised (curriculum, trainers, learning resources)

Health Information

- Align and adapt DR programme indicators with NCD strategic plan indicators so that they contribute towards national outcomes, and ensure that they are reflected in NCD monitoring reports
- Integrate DR reporting in existing information pathways like the NCD EMR and District Health Information System (DHIS)

Health Financing

- Work with NCD teams and diabetic associations to incrementally increase public sector financing for components of DR care
- Demonstrate improved health outcomes, disease prevention, health promotion and universal health coverage for policy advocacy for incremental investment

Background

Globally, non-communicable diseases (NCDs), which include conditions like cardiovascular diseases, cancers, diabetes mellitus, chronic pulmonary diseases, mental health and sensory organ diseases, as a group are the single most common cause of mortality. The importance of NCDs has been recognised through adoption of various World Health Assembly resolutions, development of a global action plan on NCDs, and formulation of regional strategies and frameworks to address the rising trend of NCDs as a public health problem. More recently, the launch of the Sustainable Development Goals (SDGs) has drawn global attention to NCDs by including its control and reduction as one of the health goal (SDG3) priorities and targets to be achieved by 2030.

Diabetes has reached epidemic proportions in Pakistan. Some of the risk factors contributing to this rising trend include inadequate physical activity, unhealthy diets, increasing adiposity, and an obesogenic environment that is also resulting in childhood obesity. One of the complications of long-standing and uncontrolled diabetes is diabetic retinopathy (DR). If untreated, DR can lead to loss of vision.

Over the last two decades, successive national eye health plans have focussed on developing district comprehensive eye care services. In the last ten years, tertiary ophthalmic services have also been developed. This has ushered in a phase of sub-specialty development in ophthalmology. This has led to development of sub-specialty services for retina which include treatment for DR.

In developed countries, DR is one of the major causes of vision impairment. In developing countries, common conditions of vision impairment include cataract, uncorrected refractive errors and glaucoma. However, in the last decade, the frequency of patients being diagnosed with diabetes has increased incrementally and today it is estimated that the prevalence of diabetes in Pakistan³ is 26.3%, of which 19.2% are those with known diabetes, and 7.1% newly diagnosed people with diabetes. Furthermore, the prevalence of pre-diabetes is 14.4%. These are worrisome statistics and they indicate trends that DR will be one of the most important causes of vision impairment and blindness in the next ten years.

In order to address this growing trend of diabetes and DR, pilot projects were implemented in different parts of the country over the last ten years in collaboration with international eye care partners, mainly Sightsavers and the Fred Hollows Foundation.

An initiative was taken by Sightsavers in collaboration with the National Coordinator, Pakistan Eye Health Programme, and the Chairperson for the National Task Force on Diabetic Retinopathy to conduct a learning review of programme approaches and determine strategies for the future decade.

The learning review consisted of a desk review of global and regional context of NCDs and diabetes, global and regional strategies and policy frameworks for NCDs and diabetes, and the institutional context of NCDs and diabetes in Pakistan. In addition, financing trends for NCDs, diabetes and DR were reviewed. Desk research included a review of global and health system perspectives on prevention and control of DR.

A learning review workshop was convened for members of the National Task Force on Diabetic Retinopathy, international eye care partners and other key stakeholders from the NCD Unit of Primary and Secondary Health Care Services Department Punjab, District Health Information System and Integrated Reproductive, Maternal, Newborn Child Health and Nutrition Programme.

The workshop reviewed programme approaches for DR and ongoing NCD initiatives in the country, and derived key learnings and implications for future DR programme strategy.

This Learning Review Report is divided into six parts. They are designed to help the reader understand the policy, strategy and institutional context within which a DR programme operates, value the rationale and reasoning that has led to the learnings and identify potential areas for strategic integration in NCD programmes for long term impact.

- Part 1 – Non-Communicable Diseases and Diabetes – Global and Regional Context
- Part 2 – Financing Trends for Non-Communicable Diseases and Diabetes
- Part 3 – Pakistan Country Context of Diabetes
- Part 4 – Control of Diabetic Retinopathy: Global and Health System Perspectives
- Part 5 – Pilot Programmes for Control of Diabetic Retinopathy in Pakistan
- Part 6 – Learnings and Recommendations

PART 1 - NON-COMMUNICABLE DISEASES AND DIABETES – GLOBAL AND REGIONAL CONTEXT

Non-Communicable Diseases

Non-Communicable Diseases (NCDs) comprise largely of cardiovascular diseases, cancers, diabetes mellitus and chronic pulmonary diseases. They also include categories like mental health and sensory organ diseases. As a group of the major four diseases, they are the leading cause of mortality globally. NCDs were responsible for 38 million (68%) of the world's 56 million deaths in 2012⁴. More than 40% of them (16 million) were premature deaths under age 70 years. Almost three quarters of all NCD deaths (28 million), and the majority of premature deaths (82%), occur in low- and middle-income countries.

The Global Status Report on NCDs⁵ also found that the prevalence of obesity had nearly doubled since 1980. By 2014, 11% of men and 15% of women aged 18 years and older were obese. More than 42 million children under the age of 5 years were overweight in 2013. The global prevalence of diabetes in 2014 was estimated to be 9%. Obesity is known to increase the likelihood of diabetes, hypertension, coronary heart disease, stroke and certain types of cancer.

NCDs have attracted global attention as a public health priority. NCDs act as key barriers to poverty alleviation and sustainable development. Further, investment in health systems is critical for improving NCD outcomes. In order to adequately address the rising burden of NCDs, institutional and human resource capacities and financial resources for NCD prevention and control require strengthening.

As a response to the rising trend of NCDs, the 66th World Health Assembly endorsed the World Health Organization (WHO) Global Action Plan for the Prevention and Control of NCDs 2013-2020 (resolution WHA66.10)⁶.

The **Global Action Plan for the Prevention and Control of NCDs 2013-2020** identified 25 indicators and 9 voluntary targets to monitor the progress of the plan. Targets and Indicators of relevance to diabetic retinopathy are presented in **Table 1** below:

More recently, in the development agenda 2030 enshrined in the Sustainable Development Goals (SDGs), one of the 17 SDGs focuses on health (SDG3), pledging governments to “ensure healthy lives and promote well-being for all at all ages”. To measure progress against this goal, there are 9 targets covering a range of global health priorities including maternal and child health, communicable diseases, universal health coverage, and NCDs.

Three of the 9 health targets focus on NCD-related issues indicating global prioritisation of NCDs. Target 3.4 is to “reduce by one third premature mortality from NCDs through prevention and treatment, and promote mental health and wellbeing”.

Table 1 – Comprehensive global monitoring framework for NCDs

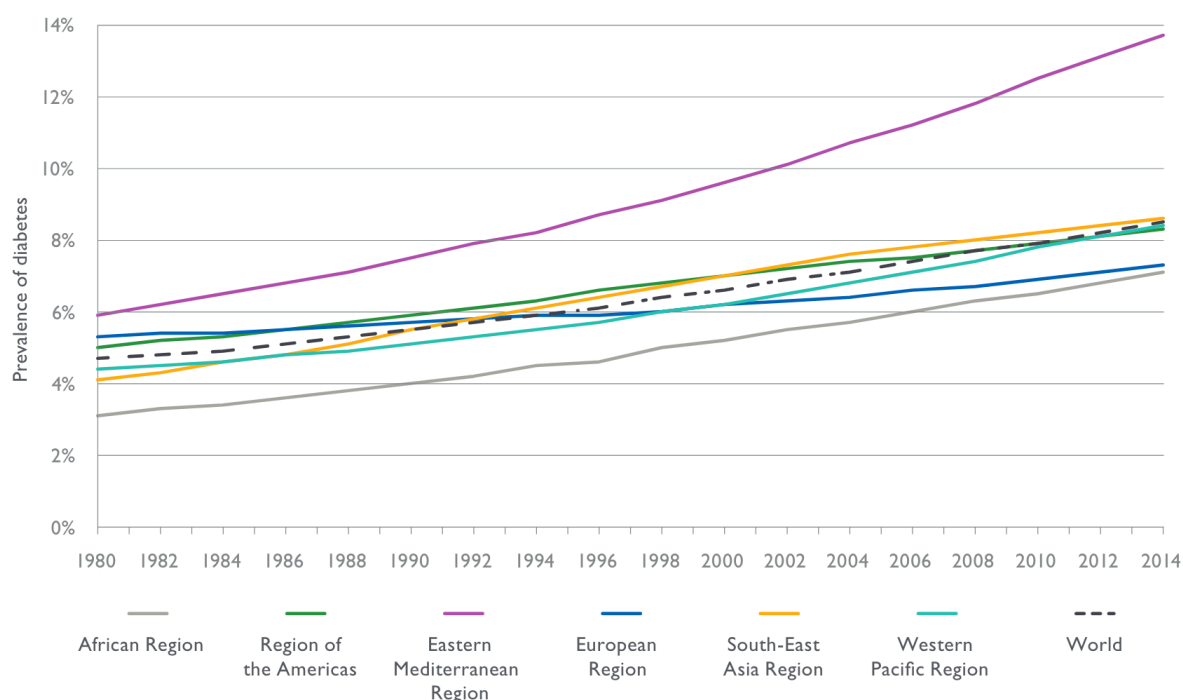
Framework Element	Voluntary Targets	Indicator
Physical inactivity	A 10% relative reduction in prevalence of insufficient physical activity	<ul style="list-style-type: none"> Prevalence of insufficiently physically active adolescents, defined as less than 60 minutes of moderate to vigorous intensity activity daily Age-standardised prevalence of insufficiently physically active persons aged 18+ years (defined as less than 150 minutes of moderate-intensity activity per week, or equivalent)
Diabetes and Obesity	Halt the rise in diabetes and obesity	<ul style="list-style-type: none"> Age-standardised prevalence of raised blood glucose/diabetes among persons aged 18+ years (defined as fasting plasma glucose concentration ≥ 7.0 mmol/l (126 mg/dl) or on medication for raised blood glucose) Prevalence of overweight and obesity in adolescents (defined according to the WHO growth reference for school-aged children and adolescents, overweight – one standard deviation body mass index for age and sex, and obese – two standard deviations body mass index for age and sex) Age-standardised prevalence of overweight and obesity in persons aged 18+ years (defined as body mass index ≥ 25 kg/m² for overweight and body mass index ≥ 30 kg/m² for obesity)
Essential non-communicable disease medicines and basic technologies to treat major non-communicable diseases	An 80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major non-communicable diseases in both public and private facilities	<ul style="list-style-type: none"> Availability and affordability of quality, safe and efficacious essential non-communicable disease medicines, including generics, and basic technologies in both public and private facilities

(Source: Adapted from 66th World Health Assembly WHA66.10. http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R10-en.pdf?ua=1)

Recent reports indicate that the Eastern Mediterranean Region (EMR) has the fastest rate of increase in the prevalence in diabetes mellitus (**Fig 1**), which rose from just under 6% in 1980 to almost 14% by 2014⁷.

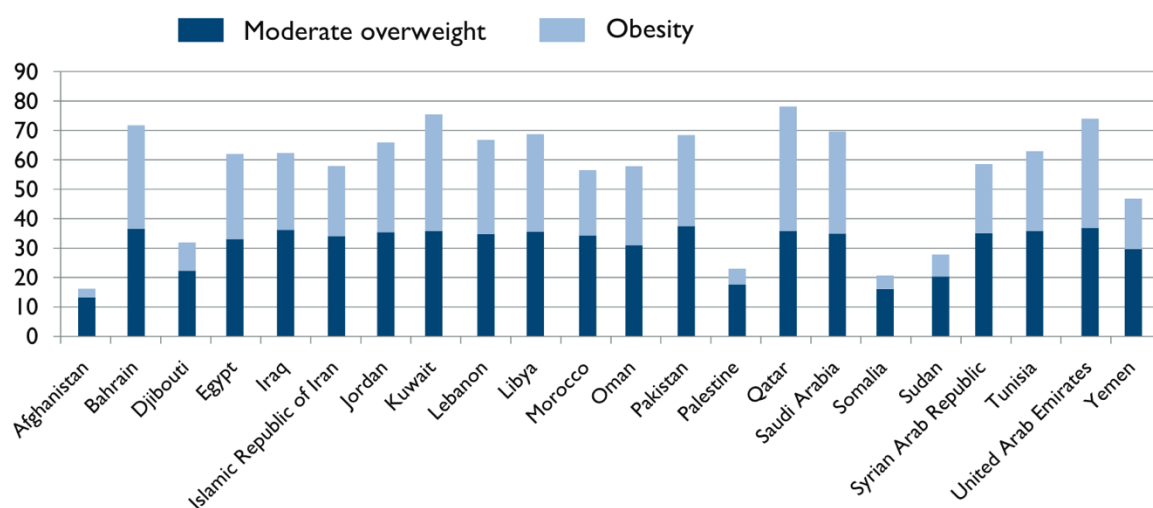
More recently, there has been a growing interest in **obesity and the emerging childhood obesity** as high-risk factors for diabetes (**Fig 2**). The increasing burden of diabetes in EMR is partly driven by increasing adiposity. Adolescent overweight and obesity are a rapidly growing phenomena both globally and in the EMR, and a significant risk factor for diabetes.

Figure 1 – Regional trends of the prevalence of diabetes 1980-2014



(Source: Proposed policy priorities for preventing obesity and diabetes in the Eastern Mediterranean Region. WHO Regional Office for the Eastern Mediterranean, 2017)

Figure 2 – Prevalence of overweight and obesity (%) in EMR countries



(Source: Proposed policy priorities for preventing obesity and diabetes in the Eastern Mediterranean Region. WHO Regional Office for the Eastern Mediterranean, 2017)

In response to the rising trend of non-communicable diseases, the 57th World Health Assembly (WHA) endorsed the **WHO Global Strategy on Diet, Physical Activity and Health**⁸. The strategy addresses two of the main risk factors for non-communicable diseases, namely, diet and physical activity, both of which are prevention measures not only for diabetes but also other NCDs.

Further, in support of the WHO Global Strategy on Diet, Physical Activity and Health, a **School Policy Framework**⁹ was developed for implementation of the strategy at school.

Recently, the Commission on Childhood Obesity found that the number of children who are overweight or obese has increased rapidly since 1990¹⁰. They live in an obesogenic environment and pose a high risk of developing type-2 diabetes.

Global Burden of Disease 2015

The Global Burden of Disease (GBD) study¹¹ has revealed specific trends in health. An analysis of burden of disease from 1990-2015 has highlighted the following findings:

- The world is in the midst of an epidemiological transition. As countries increase their levels of development, their communicable disease burdens are declining, and their life expectancies are rising. This transition is affecting disease burden, disability burden, and health risk factor exposure in complicated ways
- The burden of communicable diseases declined from 1990 to 2015, with the bulk of that achievement being driven by reductions in the burden of malaria and HIV/AIDS since 2005
- Overall, the magnitude of the burden of non-communicable causes of disease and injury is rising. The burden of some non-communicable diseases has declined, but generally not quickly enough to overtake rates of population growth
- Exposure to several risk factors linked to development increased markedly – placing them among the most pressing targets for intervention – from 1990 to 2015. These include obesity/overweight, high blood sugar, ambient air pollution, and drug use

Global Burden of Disease 2016

In September 2017, the Global Burden of Disease 2016 study reported the following:

- Deaths¹² from **NCDs represented 72.3% of deaths** in 2016 with 19.3% of deaths in that year occurring from communicable, maternal, neonatal, and nutritional diseases and a further 8.43% from injuries
- Overall, there was **an increase of 23.6% of Years Lived with Disability (YLDs)** for diabetes mellitus¹³ between 2006 and 2016
- Overall, there was an increase of 20.4% of YLDs for vision loss¹⁴ between 2006 and 2016
- Cataract¹⁵ increased by **31.0% in YLDs** between 2006 and 2016

- Glaucoma¹⁶ increased by **35.7% in YLDs** between 2006 and 2016
- Macular degeneration¹⁷ increased by **37.5% in YLDs** between 2006 and 2016
- Refraction and accommodation disorders¹⁸ increased by **14.9% in YLDs** between 2006 and 2016
- Other vision loss¹⁹ increased by 26.1% in YLDs between 2006 and 2016
- There was a **24.4% increase in Disability Adjusted Life Years (DALYs)**²⁰ due to diabetes mellitus from 46 million DALYs in 2006 to 57 million DALYs in 2016

The trends from the GBD study 2016 indicate that while diabetes increased by almost a fourth between 2006-2016, at the same time cataract, glaucoma and macular degeneration increased by almost a third, and refraction and accommodation disorders by about 15%. These findings suggest that proportionately DR, whose prevalence is expected to increase with the rising prevalence of diabetes, is still considerably less than cataract, glaucoma, macular degeneration and refraction and accommodation disorders. This suggests a need for a comprehensive approach to eye health.

Diabetes complications, co-morbidities and integrated management

Diabetes results in multiple complications and co-morbidities²¹.

Loss of vision

Diabetic Eye Disease (DED) includes DR, cataract and glaucoma – a DR programme should be part of a comprehensive eye health programme that caters for cataract and glaucoma care. Further, diabetics with vision impairment often require low vision care as well.

End-stage renal disease

About 80% of cases of end-stage renal disease (ESRD) are caused by diabetes, hypertension or a combination of the two. The incidence of **ESRD is up to 10 times as high in adults with diabetes** as those without. Good glycaemic control is essential to maintain renal health and requires periodic monitoring of renal functions.

Cardiovascular events

Adults with diabetes historically have a **two- or three-times higher rate of cardiovascular disease** (CVD) than adults without diabetes. Further, CVD, diabetes and hypertension have common risk factors (overweight, obesity, low physical activity). Hypertension is associated with a higher incidence and increased progression of diabetic retinopathy. In general terms, **every 10 mmHg increase in blood pressure is associated with a 10% risk of progression to early retinopathy and 15% risk of progression to proliferative retinopathy**²². Tight blood pressure control can reduce the need for laser treatment by one-third in patients with type-2 diabetes. Therefore, a prevention and health promotion programme would be beneficial for all 3 diseases.

Lower extremity amputations

Diabetes dramatically increases the risk of lower extremity amputation because of infected, non-healing foot ulcers. Rates of amputation in populations with diagnosed diabetes are typically **10- to 20-times** those of non-diabetic populations, and over the past decade have ranged from 1.5 to 3.5 events per 1000 persons per year in populations with diagnosed diabetes. Foot care (podiatry) is an essential component of management of diabetes.

Depression

In addition to cardiovascular diseases, ageing-related conditions such as cognitive decline and physical disability have emerged as frequent comorbid conditions with diabetes. The prevalence of depression in diabetics is twice that of found in nondiabetics²³.

People with comorbidities of diabetes and depression have higher levels of: disability and chronicity; mortality; and health care utilisation and health care expenditure. Patients with

major depression and diabetes have a **36% higher risk** of developing advanced microvascular complications, such as ESRD or blindness, and a **25% higher risk** of developing advanced macrovascular complications, such as myocardial infarction or stroke, compared with diabetic patients without depression²⁴. Risk factors that have been shown to predict a depressive illness in those with diabetes include vision-threatening diabetic retinopathy; moderate to severe vision impairment; and those with a previous history of depression²⁵.

Recognising that mental health shares comorbidity with the NCDs, WHO has developed a global mental health action plan²⁶ that is in synergy with strategies and programmes for control of NCDs/diabetes.

Most cases of depression can be managed in the primary and community care setting. WHO has developed the **Mental Health Gap Action Programme Intervention Guide**²⁷ (mhGAP-IG) for mental, neurological and substance use disorders in non-specialised health settings. The mhGAP-IG includes guidance on evidence-based interventions to identify and manage priority mental health conditions, including depression.

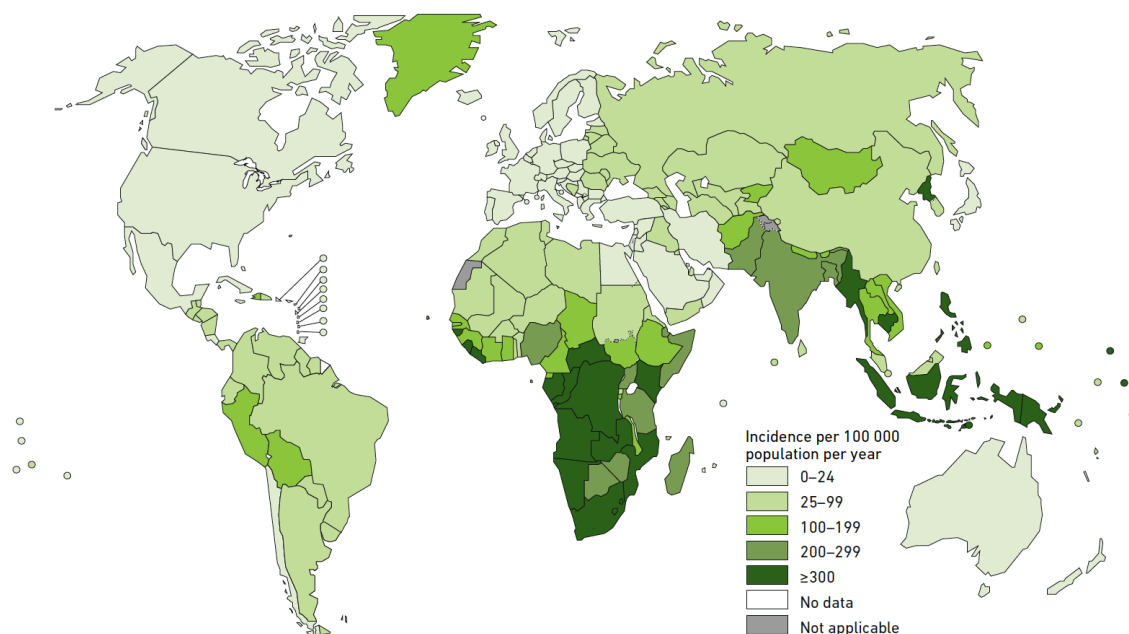
Tuberculosis

Diabetes is a known risk factor for tuberculosis (TB) and is associated with poorer tuberculosis outcomes, while tuberculosis is associated with worsening glycaemic control. Since a number of countries have both a high and increasing diabetes prevalence and a substantial burden of tuberculosis, this interaction has significant implications for management of both diseases.

The WHO and the International Union Against Tuberculosis and Lung Disease²⁸ have developed a **collaborative framework**²⁹ to guide national programmes, clinicians and others engaged in care of patients and prevention and control of diabetes and TB on how to establish a coordinated response to both diseases, at organisational and clinical levels. It responds to a growing concern about what collaborative activities should be implemented and under what circumstances. The framework is complementary to and in synergy with the established core activities of prevention and care programmes for both diseases. It provides guidelines to establish mechanisms of collaboration, including joint coordination, **bi-directional surveillance and screening of tuberculosis and type 2 diabetes**, and guidelines for detection and management of diabetes in tuberculosis patients (and vice versa).

Most of the focus countries are also high burden countries for TB³⁰. Of three high burden country lists for TB compiled by WHO, Pakistan is found in the list of high-burden countries³¹ (**Fig 3**).

Figure 3 – Estimated new cases of TB per 100,000 population per year



(Source: Global tuberculosis report. World Health Organization 2018)

Women's, children's and adolescents' health

Global data shows that about 28% of maternal mortality results from non-obstetric causes such as malaria, HIV, diabetes, cardiovascular disease and obesity³². Further, IDF³³ has found that:

- Two out of every five women with diabetes are of reproductive age, accounting for over 60 million women worldwide
- IDF estimates that 20.9 million or 16.2% of live births to women in 2015 had some form of hyperglycaemia in pregnancy. An estimated 85.1% were due to gestational diabetes, 7.4% due to other types of diabetes first detected in pregnancy and 7.5% due to diabetes detected prior to pregnancy
- One in seven births is affected by gestational diabetes

The Global Strategy for Women's, Children's and Adolescents' Health (2016-2030)³⁴ has recommended the following key actions (with respect to diabetes) to safeguard health of mothers during antenatal care:

- Management of chronic medical conditions (e.g. hypertension, pre-existing diabetes mellitus)
- Prevention, screening and treatment of gestational diabetes, eclampsia and pre-eclampsia (including timely delivery)

Integrated management of diabetes and other chronic health conditions

Diabetes management can be integrated with management of other NCDs; women, children and adolescent health; mental health; and in some settings tuberculosis and HIV/AIDS; to improve equity, efficiency and outcomes. This has implications for DR care, which by consequence is an integral part of diabetes care.

In 2016, the 69th Session of the World Health Assembly passed a resolution³⁵ to adopt a **framework on integrated, people-centred health services**.

The Framework³⁶ has five interdependent strategies. These are:

- empowering and engaging people and communities
- strengthening governance and accountability
- reorienting the model of care
- coordinating services within and across sectors
- creating an enabling environment

Attainment of these five strategies cumulatively will help to build more effective health services; lack of progress in one area will potentially undermine progress in other areas. An interim report³⁷ is available on how the strategy for people-centred and integrated health services can be implemented at country level.

One-Stop Care for Diabetes

According to the WHO³⁸, integrated service delivery is “the organisation and management of health services so that people get the care they need, when they need it, in ways that are user-friendly, achieve the desired results and provide value for money”. Integrated health services can be cost-effective, client-oriented, equitable and locally owned. The “cost” part of cost-effectiveness is based on the idea that it is more economically efficient to share resources (particularly human resources) than have them devoted to one particular disease.

A Technical Brief on integration of health services³⁹ identified four key learnings:

- Supporting integrated services does not mean that everything has to be integrated into one package, or necessarily delivered in one place. It does mean arranging services so that they are not disjointed and are easy for the user to navigate
- Integration isn’t a cure for inadequate resources. Integrating two separate programmes may provide some savings but integrating new activities into an existing system can’t continue indefinitely without the system as a whole being better resourced. Quality of care can also be affected by integration and, hence, needs to be regularly monitored

- It involves a mix of political, technical and administrative action. Activities at the operational level often rely too heavily on training alone and need to be complemented by changes at the management level
- There is a need to look for good "entry points" where change is feasible and judged necessary to improve services and make better use of resources

“Integrated” is frequently used to refer to a **package of preventive and curative health interventions** for a particular population group. The aim of this form of integration is for individuals in the target group to receive all appropriate interventions, ideally from the client’s perspective at a “one-stop shop”⁴⁰.

There is a growing realisation that diabetes care needs to be provided as an integrated service, and where feasible to use a ‘one-stop shop’ approach. The ‘one-stop shop’ approach has the following features:

- Control of diabetes can be assessed and managed
- Signs of potential long-term complications can be identified early (e.g. eyes, kidneys, feet) and preventive measures instituted, and treatment can be provided when it is still effective
- Provide health promotion, and educate patients on disease prevention
- Provide assessment and basic medical services for comorbidities like CVD, TB and depression
- Provide foot care

Several examples of one-stop shop approaches to diabetes care are being implemented in different parts of the world and provide useful learning for DR prevention and control programmes in Pakistan^{41, 42, 43, 44, 45}.

Disability

The UN Convention on the Rights of Persons with Disability⁴⁶ (UNCRPD) was adopted in 2006 and came into force in 2008. The Convention outlines the civil, cultural, political, social and economic rights of people with disabilities. Member States which have signed the Convention agree to promote, protect and ensure the full and equal enjoyment of the human rights and fundamental freedoms of people with disabilities and prompt respect for their inherent dignity.

This was followed by the World Report on Disability⁴⁷ in 2011 which highlighted the high prevalence of disabilities and urged a strategic response. The report noted that the increase in diabetes, cardiovascular diseases (heart disease and stroke), mental disorders, cancer, and respiratory illnesses, observed in all parts of the world, will have a profound effect on

disability. They are estimated to account for 66.5% of all years lived with disability in low-income and middle-income countries.

Subsequently, in response to UNCRPD and the World Disability Report, the WHO developed a global disability action plan 2014-2021⁴⁸.

The low vision and blindness agenda cross-cuts all three of the objectives of the global disability action plan:

- Removing barriers (**objective 1**) is of critical importance to ensuring people with low vision or blindness can access not only treatment services, but health promotion and prevention initiatives as well.
- Strengthening and extending rehabilitation and assistive technology (**objective 2**) is a priority area of work and is gaining attention both in the organisation and externally. In February 2017, WHO held a global multi-stakeholder meeting to call for action to scale up rehabilitation services. This event launched a new initiative called 'Rehabilitation 2030'⁴⁹, and has drawn visibility and generated fresh momentum for action amongst the health and rehabilitation communities. Improved access to quality rehabilitation services will benefit all people in need of rehabilitation, including people with low vision, for whom rehabilitation can have a profound impact on independence and quality of life. 'Rehabilitation 2030' noted that rehabilitation is extremely important for people with stroke, cancer, diabetes, eye health issues, hearing issues, and injuries and violence
- Strengthening the collection of data (**objective 3**) is also a significant area of work that guides policy development, monitoring and evaluation and advocacy. WHO is supporting countries to collect disability data across populations in several countries through the Model Disability Survey⁵⁰ (MDS). The MDS collects information on health conditions, including NCDs and those associated with visual impairment, and environmental factors, producing rich data that can effectively guide policy formation

Disability and Rehabilitation have now been brought into the context of Sustainable Development Goal 3. This new context strengthens the rehabilitation narrative in particular, highlighting it as a health strategy relevant to the whole population and integral to achieving universal health coverage (target 8 of SDG 3). While rehabilitation has long been included in the definition of universal health coverage, to date it has been neglected in government funded packages of care. This can present a major problem for those with uncontrolled diabetes and associated impairments who can experience significant limitations in functioning.

It is important to strengthen health systems to integrate and deliver quality rehabilitation services across all levels of care, and to collect and meaningfully use disability data.

Regional context of non-communicable diseases

The NCDs have received considerable attention in the EMR. The WHO EMR has developed a **'Framework on Strengthening the Integration and Management of Noncommunicable Diseases in Primary Health Care'**⁵¹. The Regional Framework builds on the global action plan for the prevention and control of non-communicable diseases 2013-2020⁵².

The Regional Framework provides guidance to Member States on the integration of essential NCD interventions in primary health care (PHC) in order to scale up early detection, diagnosis and treatment. The Framework encompasses some key principles, which include: government leadership; universal health coverage; evidence-based approaches and cost-effective interventions; patient-centred and community-based approaches; simple tools; collaboration between the public and private sectors.

One of the key tools developed by WHO for this purpose is the **'Package of essential non-communicable (PEN) disease interventions for primary health care in low-resource settings'**⁵³. Member States are urged to adapt the use of this tool for national and sub-national programmes on NCDs.

Two other **regional frameworks** were also launched by the WHO Regional Office for the Eastern Mediterranean. These include the following:

- Framework for Action on Advancing Universal Health Coverage (UHC) in the Eastern Mediterranean Region⁵⁴
- The Framework for Action for Health Workforce Development in the Eastern Mediterranean Region 2017 - 2030⁵⁵

In addition to the Regional Framework on NCDs alluded to earlier, both these frameworks are also of particular relevance to developing programmes for control of diabetic retinopathy.

The **Framework for Action on Advancing Universal Health Coverage** presents the approach Member States need to consider in order to strengthen and re-align their health systems to ensure that they are able to achieve their health development goals. The Framework's proposed priority actions emphasise the need to ensure the availability and coverage of health and related services, increase the population protected from financial risk, enhance health security, improve client satisfaction and address interventions targeted at other SDGs that impact on health.

The **Framework for Action for Health Workforce Development** helps align human resources for health (HRH) strategies in EMR with the Global Strategy on Human Resources for Health: Workforce 2030⁵⁶ (GSHRH). GSHRH aims at ensuring equitable access to qualified health

workers to help Member States accelerate progress towards achieving universal health coverage (UHC) and Sustainable Development Goal 3. Its objectives are to:

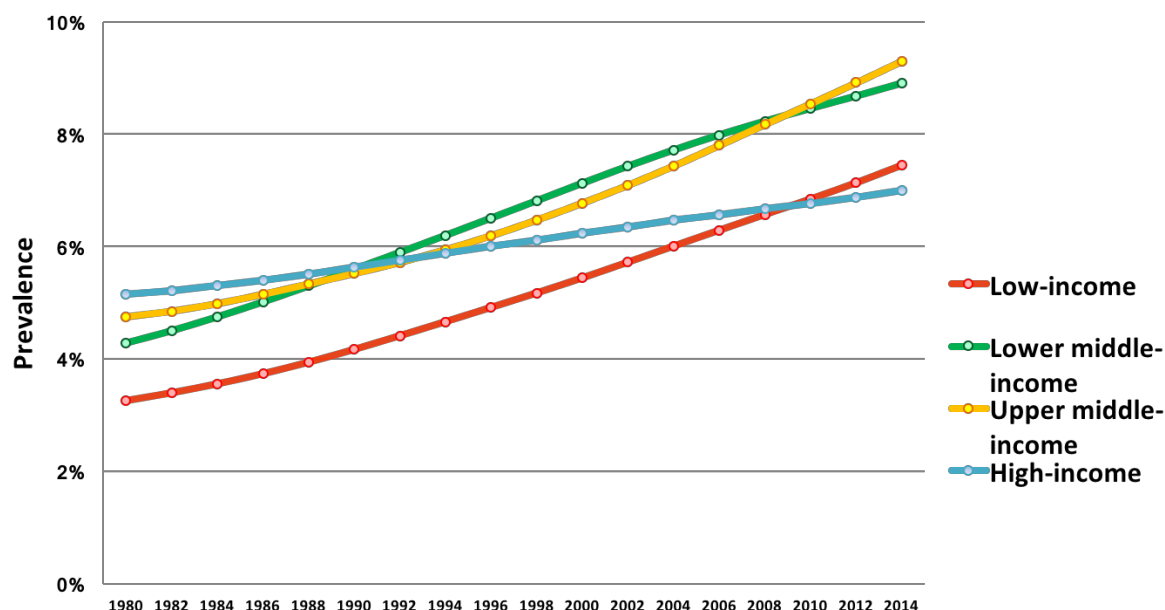
- a) Optimise the performance, quality and impact of the health workforce to accelerate progress towards UHC and SDGs
- b) Align investment in HRH with the current and future needs of the population and health systems to maximise job creation and economic growth
- c) Strengthen the capacity of institutions at regional and national levels for effective public policy stewardship, leadership and governance on HRH
- d) Strengthen data and information systems on HRH for monitoring and ensuring accountability for the implementation of national and regional strategies

While there has been an obvious increase in the burden of disease due to NCDs, the response by governments to develop NCD strategies and action plans has been relatively slow. More emphasis has been placed on communicable diseases. The recent report of the Non-Communicable Diseases Progress Monitor 2017⁵⁷ and the NCD country profile⁵⁸ indicate that Pakistan did not have a National integrated NCD policy/strategy/action plan.

Regional context of diabetes mellitus

The Global Report on Diabetes 2016⁵⁹ indicates that globally the number of people affected by diabetes has risen from 108 million people in 1980 to 422 million in 2015 indicating an almost four-fold increase in the burden of disease. Furthermore, the rise in prevalence of diabetes is faster in low and middle-income countries (Fig 4).

Figure 4 –Rising trend in the prevalence of diabetes

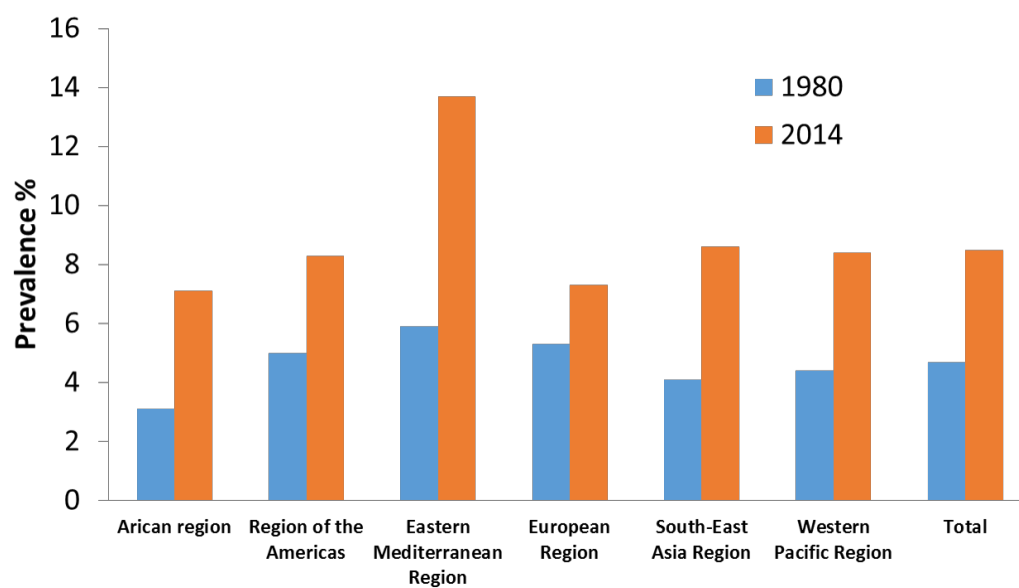


(Source: Global Report on Diabetes. World Health Organization, 2016)

Furthermore, the increase in prevalence of diabetes is found universally in all regions. However, the most marked increase in diabetes is seen in the Eastern Mediterranean Region, which has the highest prevalence of diabetes in the world and **half the diabetes epidemic**⁶⁰ (Fig 5).

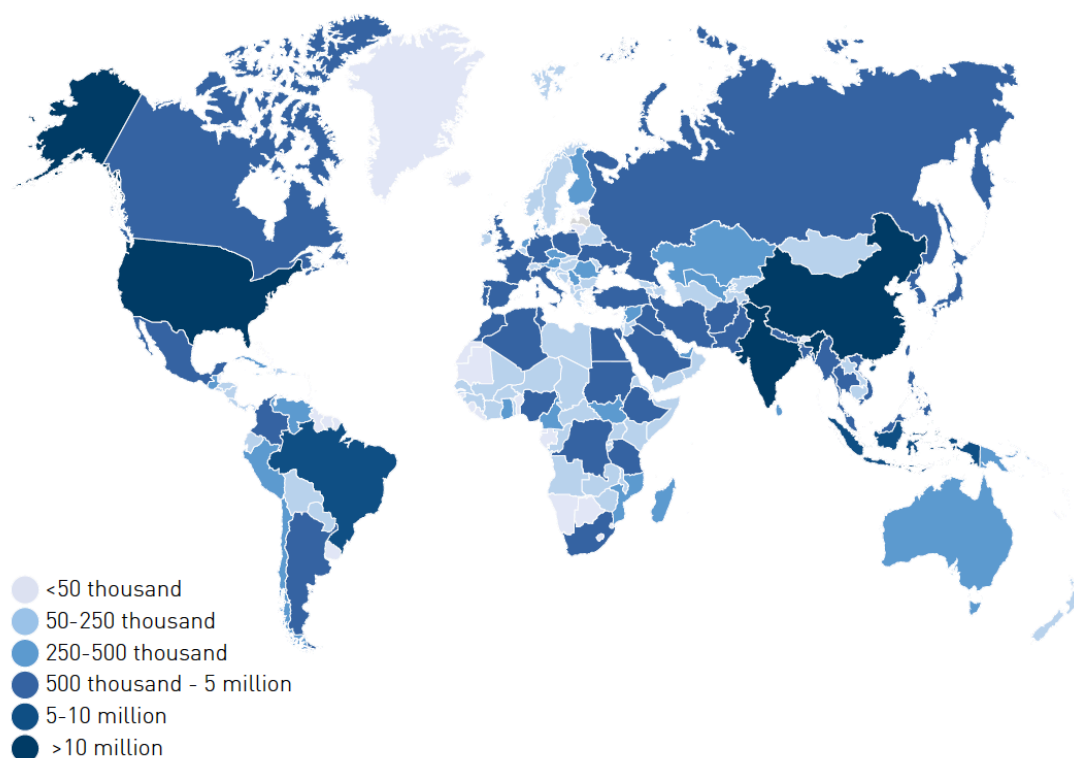
It is estimated that about 38.7 (27.1-51.4) million people or 9.6% of adults aged 20-79 have diabetes in the EMR. In the EMR region, about 49% of people with diabetes are unaware they have the disease⁶¹ (Fig 6).

Figure 5 – Regional level increase in diabetes



(Source: Global Report on Diabetes. World Health Organization, 2016)

Figure 6 – Number of people (20-79 years) with undiagnosed diabetes in 2017



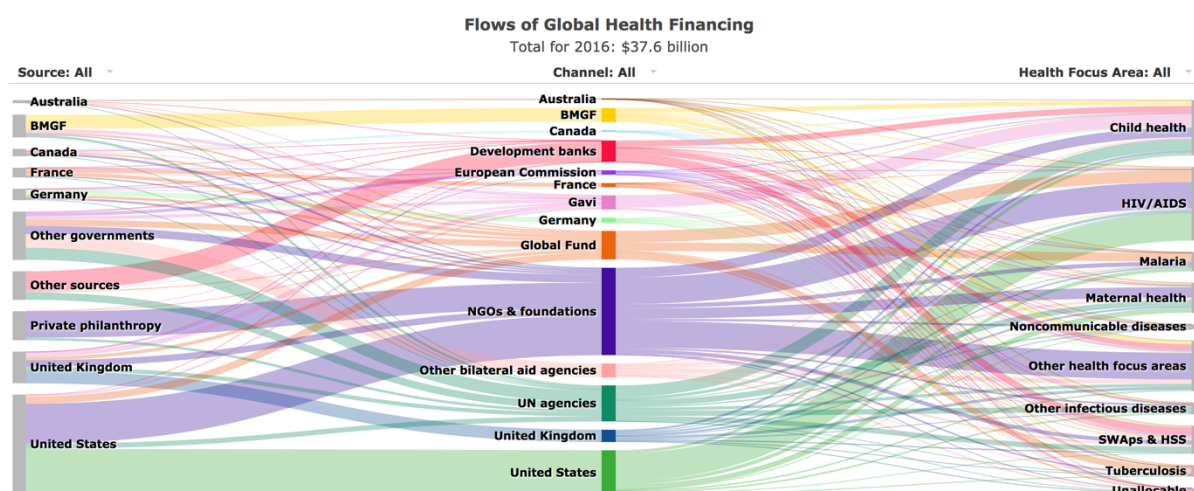
(Source: IDF Diabetes Atlas, 8th Edition 2017. International Diabetes Federation)

PART 2 - FINANCING TRENDS FOR NON-COMMUNICABLE DISEASES AND DIABETES

Development Assistance in Health

Non-Communicable Diseases (NCDs) account for almost 50% of the disease burden and 72%⁶² of all causes of mortality but receive less than 2% of Development Assistance for Health (DAH). **Figure 7** illustrates that for a total global health financing of USD 37.6 billion in 2016, NCDs received only USD 640 million or 1.71% of total spending.

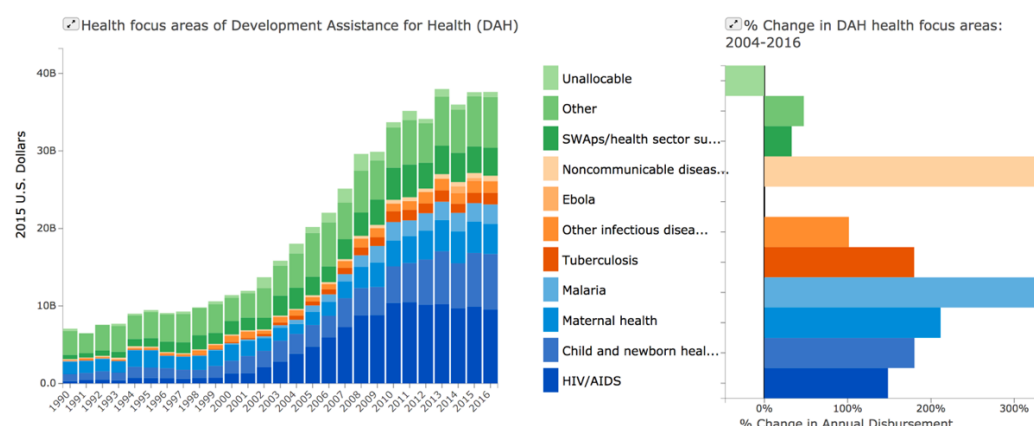
Figure 7 – Flows of global health financing



(Source: Institute for Health Metrics and Evaluation)

Figure 8 shows that there has been an increase in DAH in almost all health focus areas between 2004 and 2016. While the growth has primarily been for HIV/AIDS, child and newborn health, maternal health and infectious diseases, there has also been an over three-fold increase in annual disbursements for NCDs.

Figure 8 – Global financing trends in Development Assistance for Health

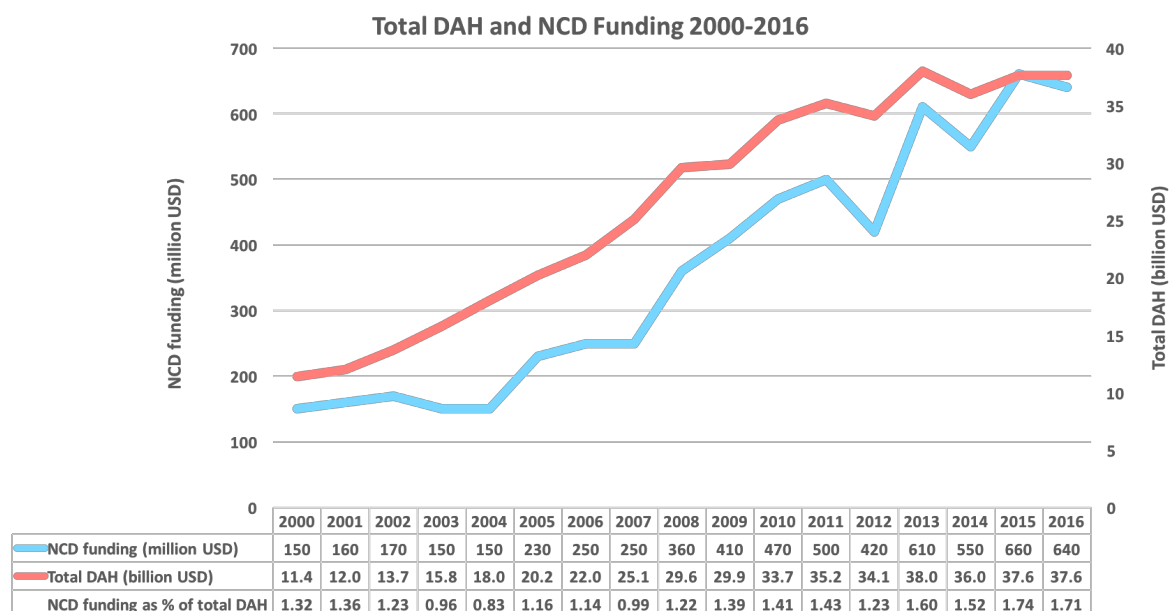


(Source: Institute for Health Metrics and Evaluation)

However, when one looks at the overall increase in DAH, the proportionate increase in funding for NCDs is very small. **Figure 9** illustrates this disproportionately low increase in NCD

funding despite having a very large disease burden. While funding for NCDs increased from USD 150 million in 2000 to USD 640 million in 2016, the overall proportion of DAH still remains less than 2%.

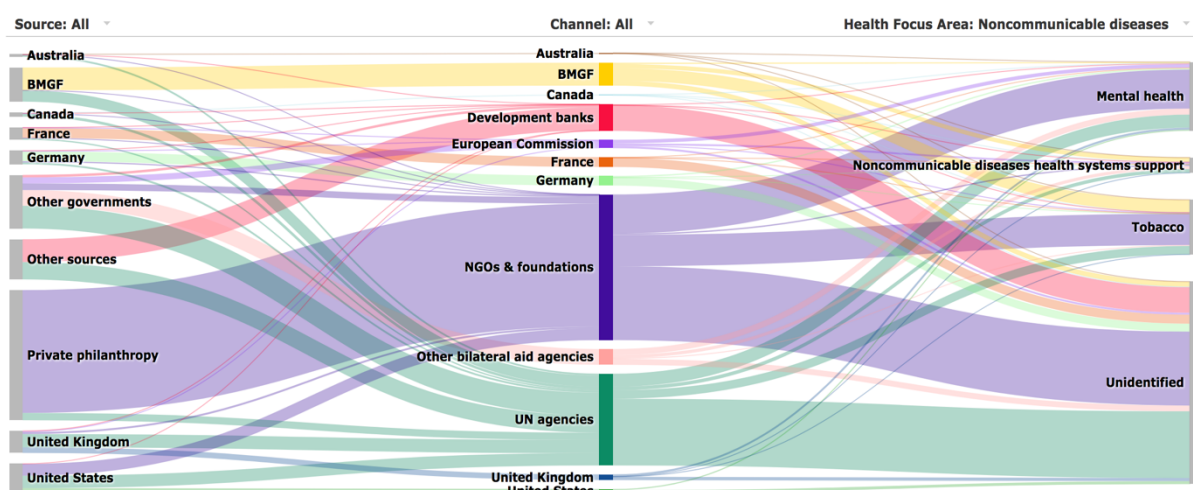
Figure 9 – Total DAH and NCD funding 2000-2016



(Source: Computed from data from Institute for Health Metrics and Evaluation)

On analysis of main sources and channels of NCD funding, **Fig 10** highlights that most of the funding went to mental health and anti-tobacco. The major proportion of NCD funding has come from private philanthropy and has been channelled through NGOs and Foundations.

Figure 10 – NCD funding flows

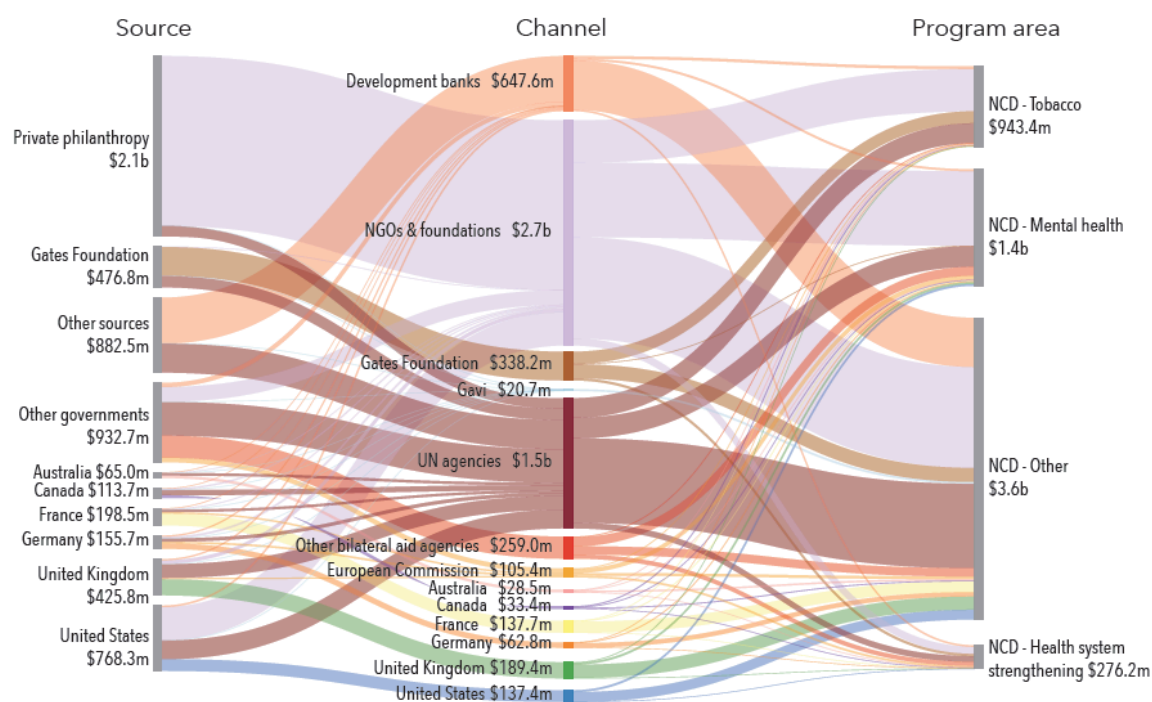


(Source: Institute for Health Metrics and Evaluation)

Figure 11 illustrates the flows of NCDs DAH from source to channel to programme area for 2000–2016. Private philanthropy provided the bulk of funds in this area, channelled through

NGOs and foundations and, to a lesser extent, UN agencies. About USD 3.6 billion was directed towards ‘NCD Other’. Tracking of DAH for NCDs has been a challenge and it is not clear which programme area these funds were directed to.

Figure 11 – Flows of NCDs DAH from source to channel to programme area 2000-2016



(Source: Institute for Health Metrics and Evaluation (IHME). Financing Global Health 2016)

The channels of main funding flows for NCDs in 2016 are presented in **Table 2**.

Table 2 – Channels for DAH in NCDs in 2016

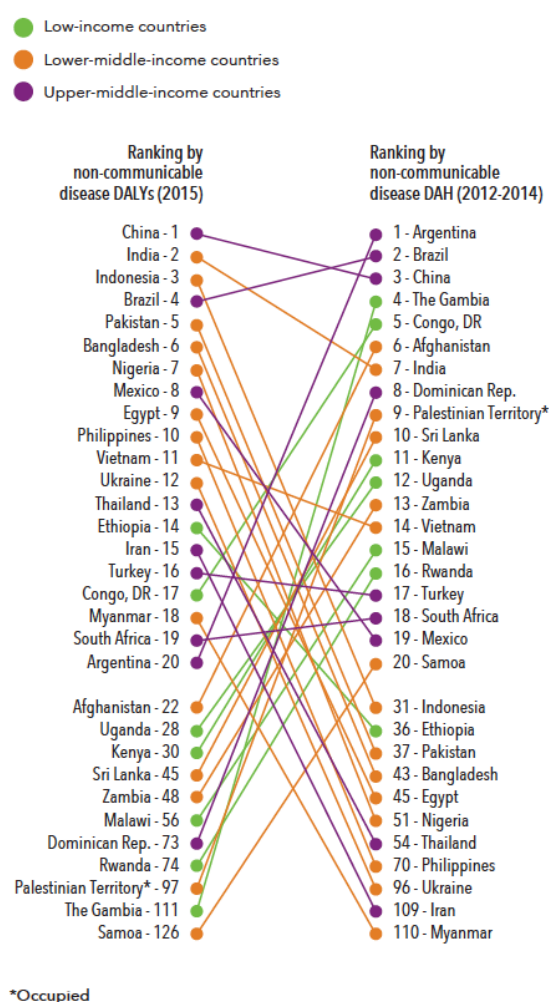
Channel	Spending in NCDs – USD million	Percentage of total DAH spending
Australia	1.45	0.0039
Canada	1.70	0.0045
France	18.5	0.049
Germany	18.3	0.049
United Kingdom	10.6	0.028
United States	7.6	0.020
Bill and Melinda Gates Foundation (BMGF)	43.0	0.11
Development Banks	50.0	0.13
European Commission	15.7	0.042
NGOs and Foundations	270	0.73
Other bilateral aid agencies	29.6	0.079
UN agencies	170	0.46

(Source: Institute for Health Metrics and Evaluation)

Figure 12 indicates the top 20 countries by 2015 NCD burden of disease versus average DAH allocated for 2012–2014. There is little alignment in this area and only a very few countries with high NCD DALYs are among the top 20 recipients of NCD DAH.

‘Despite being historically more prevalent in high-income countries, NCDs like cardiovascular and lung disease, obesity, and diabetes are affecting more and more low- and middle-income countries as diet and lifestyle habits have changed. The argument against increased funds for NCDs revolves around there not being a risk of contagion; these are diseases that, even while at or approaching epidemic levels, are not transmissible and therefore do not pose a risk of spreading between nations’⁶³.

Figure 12 – Top 20 countries by 2015 NCD burden of disease versus average 2012-2014 DAH



(Source: Institute for Health Metrics and Evaluation (IHME). Financing Global Health 2016)

Figure 12 also shows that Pakistan had a ranking of 5 by NCDs DALYs. However, in terms of ranking by NCDs DAH, it was ranked 37 indicating low prioritisation to NCDs.

A meeting of the WHO Global Coordination Mechanism on the Prevention and Control of Noncommunicable Diseases (GCM/NCD) was held in 2015⁶⁴ on financing national NCD responses in the post-2015 era. The key recommendations that emerged were as follows:

- Mobilise and allocate significant resources to attain the NCD-related targets included in the Sustainable Development Goals by 2030, and the nine global voluntary NCD targets included in the WHO Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020 by 2025
- Effectively and efficiently utilise and expand domestic public resources to implement national NCD responses, including by making greater use of revenue from tobacco and other health-related taxes to achieve national health objectives
- Complement domestic resources for NCDs with official development assistance (ODA) and catalyse additional resources from other sources to increase health expenditure on the prevention and control of NCDs, consistent with country priorities
- Promote and incentivise financing and engagement from the private sector to address NCDs, consistent with country priorities on NCDs
- Enhance policy coherence across sectors in order to ensure that the expected outcomes of national NCD policy are achieved, including by assessing the health impact of policies beyond the health sector

The current trends indicate that low income countries must begin making provisions for a future characterised by a growing NCD burden coupled with increasing international emphasis on domestic financing. The success of the global NCD response will be largely dependent on the competence of poorly resourced countries in managing increasingly complex blends of funding streams⁶⁵.

A WHO global conference on NCDs was held in Montevideo in October 2017⁶⁶. This high-level meeting resulted in an outcome document (Montevideo NCD Roadmap 2018-2030⁶⁷) which served as an input into the preparatory process leading to the Third High-level Meeting of the UN General Assembly on NCDs in September 2018. At this UN High-Level Meeting on NCDs held at the 73rd United Nations General Assembly, world leaders adopted a political declaration which reaffirms to scale up the commitments made in 2011 and 2014 through ambitious multisectoral national responses and contribute to the overall implementation of the 2030 Agenda for Sustainable Development⁶⁸.

The political declaration welcomed the World Health Organization Independent High-level Commission on Non-communicable Diseases report entitled “**Time to Deliver**”⁶⁹ and took note of its recommendations.

With support from Bloomberg Philanthropies, WHO has developed a “global business case” (i.e. global investment framework) in its recently released report ‘**Saving lives, spending less: a strategic response to noncommunicable diseases**’⁷⁰. This report includes:

- An estimate of how many lives can be saved if target 3.4 on NCDs is met by 2030
- An updated cost of action vs inaction covering the period 2016-2030
- Return on investment for each of the WHO best buys⁷¹

The report states that ‘**Every US\$ 1 invested in the WHO Best Buys will yield a return of at least US\$ 7 by 2030**’.

Development Assistance Committee and ODA Performance

Table 3 – Profile of development co-operation providers

Country	ODA (in USD)	% as bilateral ODA	% bilateral ODA to and through CSOs	% bilateral ODA to South and Central Asia	Pakistan in top 20 recipients or priority countries	% bilateral ODA to health and population policies	% bilateral ODA with gender equality as significant objective	Resource mobilisation potential for NCD (DED)
Australia	3.0 bill	69.9	13.8	9	Pakistan	8	72.0	Yes
Austria	1.2 bill	60.5	6.9	3	-	4	44.8	No
Belgium	2.2 bill	62.7	18.9	1	-	9	51.0	No
Canada	4.3 bill	68.0	28.9	9	Pakistan	20	68.9	Yes
Czech Republic	272 mill	27.4	24.3	11	-	4	17.6	No
Denmark	2.4 bill	70.8	21.1	6	-	1	33.9	No
European Union Institutions	16.5 bill	98.4	11.0	9	-	4	44.9	No
Finland	1.1 bill	60.3	18.3	14	-	4	53.2	No
France	11.4 bill	63.2	2.8	5	-	2	28.5	No
Germany	24.7 bill	81.0	6	8	-	3	40.5	No
Greece	317 mill	43.2	0.04	0	-	0	25.0	No
Hungary	149 mill	27.5	2.4	11	-	1	-	No
Iceland	69 mill	81.2	12.0	1	-	4	85.7	No
Ireland	808 mill	53.2	42.6	2	-	16	84	No
Italy	5.7 bill	48.3	7.7	3	Pakistan	3	38.5	Yes
Japan	11.5 bill	80.0	2.0	30	Pakistan	3	33.5	Yes
Korea	2.2 bill	69.9	2.4	15	-	10	15.4	No
Luxembourg	424 mill	70.4	29.9	5	-	13	33.5	No
Netherlands	5.0 bill	64.8	26.3	3	-	16	60.6	No
New Zealand	436 mill	80.7	14.6	4	-	4	47.7	No
Norway	4.1 bill	78.9	22.3	6	-	3	32.3	No
Poland	674 mill	25.3	8.2	2	-	1	2.6	No
Portugal	378 mill	44.4	8	1	-	8	26.5	No
Slovak Republic	113 mill	24.3	26.6	3	-	5	34.9	No
Slovenia	76 mill	34.3	6.8	0	-	1	18.2	No
Spain	2.4 bill	63	11.2	0	-	2	41.4	No
Sweden	5.5 bill	71.2	26.8	6	-	8	87.6	No
Switzerland	3.1 bill	77.9	28.8	10	-	3	25.8	No
United Kingdom	17.9 bill	64.1	18.5	15	Pakistan	13	45.5	Yes
United States	35.3 bill	83.3	24.8	11	Pakistan	30	23.9	Yes

(Source: Adapted and computed from OECD (2018), Development Co-operation Report 2018: Joining forces to leave no one behind)

Legend: bill – billion; mill – million; ODA – Official Development Assistance; USD – United States Dollar; CSO – Civil Society Organisation; NCD – Non-communicable Diseases; DED – Diabetic Eye Disease

Table 3 summarises the profile of the OECD Development Assistance Committee (DAC) members and highlights their performance against selected indicators⁷².

Official Development Assistance (ODA)

The largest donor countries of relevance to Pakistan and by volume were the United States, United Kingdom, Germany, Japan, Italy, Canada and Australia.

ODA allocations to and through civil society organisations

In 2016, DAC countries channelled USD 18 billion in official development assistance to and through civil society organisations (CSOs). This represented 15% of total bilateral aid. The OECD report indicates that in 2016 and 2017, majority of DAC members channelled their CSO funding to and through organisations registered in their own country. Australia, Denmark and the Netherlands channel significant volumes through non-governmental organisations based in developing countries, with this channel increasing in significance for Denmark.

Development co-operation for gender equality and women's empowerment

Gender equality is widely recognised as an important end in its own right and a prerequisite for sustainable development. The DAC Gender Equality Marker is a statistical instrument to measure aid that is focused on achieving gender equality and women's empowerment. Activities are classified as "principal" when gender equality is a primary objective, "significant" when gender equality is an important but secondary objective, or "not targeted". All DAC members screen their activities against the DAC Gender Equality Marker. The marker is an important tool for strengthening accountability and transparency in DAC provider financing for gender equality and women's rights. The DAC country average for the share of development co-operation that had a gender equality and women's empowerment objective was 32% in 2016.

Resource mobilisation potential for NCDs

The last column is self-computed and is an assessment of whether it is useful to pursue funding options from various DAC members. The mechanism for applying for grants from the respective DAC members is beyond the scope of this report. However, the analysis indicates countries who have high rates of channelling ODA to and through CSOs. Furthermore, the presence of Pakistan in the list of priority countries is also indicated which enhances the potential opportunity for engagement with the respective DAC members. This is not meant as a confirmation for NCD funding but provides direction for more in-depth fund-raising analysis.

World Diabetes Foundation

The World Diabetes Foundation⁷³ (WDF) is an independent trust dedicated to the prevention and treatment of diabetes in the developing world. From 2002 to September 2017, the World Diabetes Foundation provided USD 130 million in funding to 512 projects in 115 countries. For every dollar spent, the Foundation raises approximately 2 dollars in cash or as in-kind donations from other sources.

The scope and purpose of WDF's interventions are to i) stimulate access to care; ii) prevention; and iii) advocacy and stakeholder engagement. These are delivered through six focus areas:

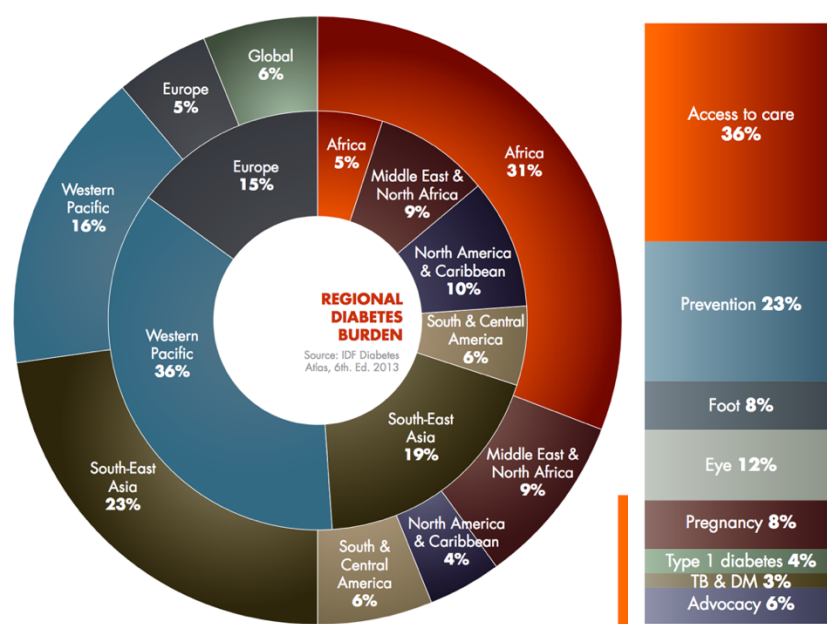
- Type 2 diabetes
- Diabetes foot care
- Diabetes eye care
- Pregnancy and diabetes
- Type 1 diabetes
- TB and diabetes

Under the programme focus of diabetes eye care⁷⁴, WDF has supported programmes in 25 countries that facilitate the training of health care professionals in proper screening of diabetic retinopathy and eye care to prevent blindness among poorer population groups. It has also developed a diabetes eye care toolbox⁷⁵ with useful resources for planners and programmers.

A summary of their distribution of funding to regions is shown in **Fig 13**.

The distribution of funding to different focus areas is summarised in **Fig 13**. About 12% funding is dedicated to eye care.

Figure 13 – Distribution of WDF funding to regions and focus areas 2002-2014



(Source: World Diabetes Federation)

Table 4 – Financial overview - WDF 2013-2016

Income (DKK '000)	2013	2014	2015	2016
Donation from Novo Nordisk	64,105	65,574	84,800	85,128
Fundraising	1,221	902	918	753
Financial income	1,211	987	408	871
Expenses (DKK '000)				
Distribution to projects	56,754	61,011	69,779	88,050
Project expenses	9,663	9,644	11,224	11,017
Administration expenses	5,842	5,769	6,232	5,633
Target segmentation				
Health care systems	57%	56%	69%	68%
Patients	14%	17%	15%	13%
General public	29%	27%	16%	19%
Geographical segmentation				
Middle East and North Africa	6%	8%	7%	11%
Focus area - Eye	12.8%	12%	12%	12%

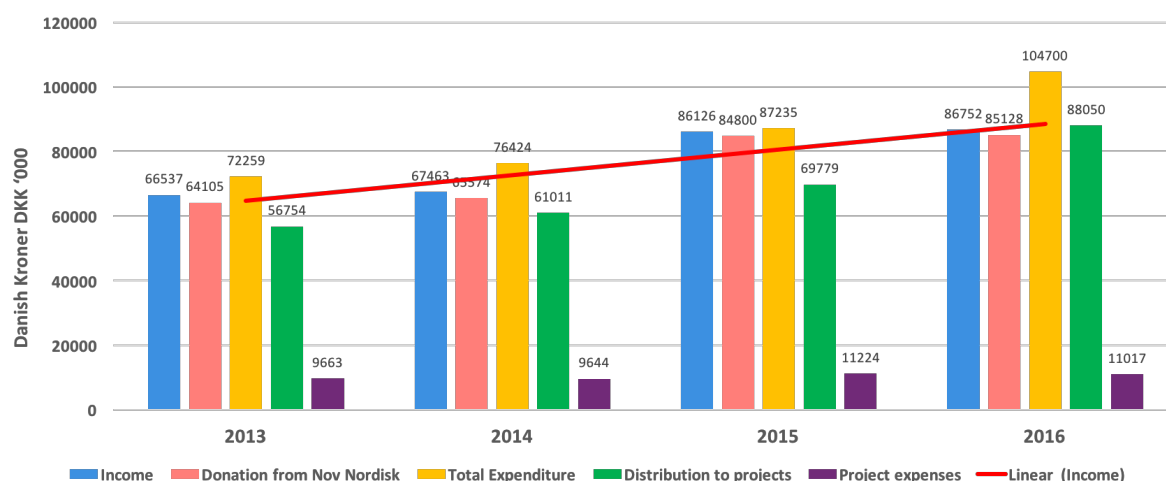
(Source: Computed from WDF Annual Reviews 2013⁷⁶, 2014⁷⁷, 2015⁷⁸ and 2016⁷⁹) DKK – Danish Kroner

Table 4 indicates that in the period 2013-2016, there has been a 33% increase in donations from Novo Nordisk from DKK 64 million in 2013 to DKK 84 million in 2016. In the same period, there has been an increase of 55% in distribution to projects from DKK 57 million in 2013 to DKK 88 million in 2016. There is a visible trend of the organisation investing more in health care systems (68%). The geographical segmentation to Middle East and North Africa has

increased from 6% in 2013 to 11% in 2016. Focus area segmentation for eye care remains constant at about 12%.

Figure 14 indicates that there is a positive growth trajectory of the organisation suggesting the need to explore the potential for long term partnership and collaboration with WDF.

Figure 14 – WDF income and expenditure trends 2013-2016



(Source: Computed from WDF Annual Reviews 2013, 2014, 2015 and 2016)

At present, there are no ongoing projects supported by WDF in Pakistan.

International Diabetes Federation

The International Diabetes Federation (IDF) is an umbrella organisation to 230 national diabetic associations in 170 countries.

Its main work is in advocacy. Its policy work comprises of three main components:

- Education
- Epidemiology and public health
- Access and care

One of its flagship achievements is the Diabetes Atlas⁸⁰ which is now in its 8th edition.

Some of its recent accomplishments with regards to eye health include the following:

- Diabetes Eye Health⁸¹ – a guide developed in collaboration with The Fred Hollows Foundation
- Diabetic Retinopathy Barometer⁸² (DR Barometer) project in collaboration with the International Federation of Aging and the International Agency for the Prevention of Blindness

Some of IDF's activities relevant to prevention and control of diabetic eye disease include:

- IDF Education Toolkit for Gestational Diabetes Mellitus (GDM)⁸³
- KiDS and Diabetes in Schools⁸⁴ – improving the life of children with diabetes
- IDF School of Diabetes⁸⁵, which runs three online courses:
 - Certified course for primary care physicians
 - Certified course for specialists
 - Certified course for diabetic educators

Recently in 2016, IDF conducted a 2-year research project that resulted in a report summarising the different programmes available for primary prevention of type 2 diabetes, highlighting their costs and benefits.

The key findings of the report⁸⁶ included:

- Comprehensive lifestyle programmes generally designed to achieve and maintain a reduction of 5-7% body weight, and a minimum of 150 minutes of moderate to intense physical activity per week are highly cost-effective
- Programmes for people at high risk of developing type 2 diabetes are more cost-effective than those for people at low risk

- Metformin, an inexpensive drug for the management of type 2 diabetes, is a cost-effective strategy for primary prevention, especially when administered in conjunction with comprehensive lifestyle programmes
- Public health measures to promote healthier diets, such as a tax on sugar sweetened beverages, show promising results regarding cost-effectiveness for primary prevention of type 2 diabetes

Financial analysis

It was not clear from the Annual Reports as to what proportion of the organisational income was directed towards eye health. Analysis of the Annual Reports of 2015 and 2016 indicate that the income of the organisation has dropped by almost 75% between 2015 and 2016. The main areas of reduction were in corporate partnership, congress income, and other income (**Table 5**). It is likely to be challenging for IDF to support new DR projects until their financial situation improves. However, they still have an important collaborative role to play to foster linkages with national diabetic associations.

Table 5 – Financial status of IDF

Profit and Loss €	2015 €	2016 €
Capital and Reserves	6,305,807	4,605,624
Turnover	11,580,827	2,998,174
Membership Fees	273,727	229,400
Corporate Partnership	1,401,633	511,968
Projects	2,660,219	2,158,434
Congress	6,785,555	98,372
Other Income	535,233	29,193
Total Income	11,656,367	3,027,367

(Source: Computed from IDF Annual Reports for 2015⁸⁷ and 2016⁸⁸)

International Federation of Ageing

The International Federation of Ageing⁸⁹ (IFA) is a global platform for advocacy about aging issues. Some of the vision/diabetic eye disease related work that the IFA has supported includes the following:

- DR Barometer Reports⁹⁰ – these include 41 country reports and 1 global report
- Global Ageing and Vision Advocacy Summit Report, Barcelona 2013⁹¹ – highlights various vision related issues in the elderly including health and vision impacts of diabetic retinopathy
- The high cost of low vision: The evidence on ageing and the loss of sight⁹² – addresses leading vision loss conditions in relation to ageing, including diabetic retinopathy and their impact on disability

The main focus of IFA's support to diabetic eye disease is through policy advocacy and supporting generation of evidence for advocacy. They do not appear to provide direct support to service delivery or training projects.

Queen Elizabeth Diamond Jubilee Trust

The Queen Elizabeth Diamond Jubilee Trust⁹³ is a charitable foundation established in 2012 to mark and celebrate Her Majesty The Queen's sixty-year contribution to the Commonwealth.

The Trust works to enrich the lives of people from all backgrounds within the Commonwealth, by eliminating avoidable blindness and empowering a new generation of young leaders.

The Trust has five major programme areas:

- Blinding Trachoma
- Diabetic Retinopathy
- Fellowships, Research and Technology
- Retinopathy of Prematurity
- The Queen's Young Leaders

Diabetic Retinopathy

The Trust supports projects on diabetic retinopathy in 11 countries across the Commonwealth. The projects involve piloting different methods of screening, treatment and awareness raising to come up with the most effective solution to the issue.

In the projects, tens of thousands of people with diabetes are screened, and provided vital laser surgery for thousands at risk of going blind. The goal of the Trust is to create practical, effective and replicable models of care that can be used to prevent diabetic retinopathy throughout the Commonwealth.

The achievements so far include:

- **Research** – nation-wide research projects in India and Bangladesh to establish what current services are available for people with diabetic retinopathy
- **People** – trained Community Health Workers in the Pacific and Bangladesh to identify and refer people at risk of diabetic retinopathy. Further, eye health consultants were also trained in Bangladesh and the Caribbean to treat people with sight-threatening diabetic retinopathy. Helped to establish a National Diabetic Retinopathy Taskforce in India
- **Knowledge** – supported the development of guidelines and training modules for diabetes physicians in India and the Pacific, to ensure that eye care is incorporated into their care. Funded public education programmes and materials on the prevention and control of diabetes in the Pacific, Bangladesh and in India
- **Treatment** – begun developing screening and treatment programmes for people at risk of diabetic retinopathy in India, the Caribbean and the Pacific. Provided laser equipment

in the Pacific and the Caribbean to treat people with sight threatening diabetic retinopathy. Helped to set up fixed and mobile diabetic retinopathy clinics across the Caribbean

The Trust has also helped establish the **Commonwealth Eye Health Consortium**⁹⁴ that aims to deliver a programme of fellowships research and technology to strengthen eye care throughout the Commonwealth. Furthermore, the Trust has developed a **diabetic retinopathy network (DRNet)**⁹⁵ of hospital-based training LINKS between overseas and UK partners. Part of the VISION 2020 LINKS Programme⁹⁶, the network enables Commonwealth eye health professionals to share their experiences and knowledge. The participating LINKS partners are mainly in Africa.

Diabetic Retinopathy Initiative

Funding from the Trust supports the following eight areas of work⁹⁷:

- Advocacy, public awareness and influencing as part of the strategy to build changes into Government health systems
- Improving the capacity of physicians to improve the control of diabetes by developing clinical guidelines and training modules
- Improving the capacity of people with diabetes to control their disease
- Implementing and evaluating district models for diabetic retinopathy control in selected States that are integrated into health systems. This is a key focus of the regional plan
- Disseminating the findings of the situation analysis and evaluation of results
- Research and evidence on the implementation and undertake health economics analysis as appropriate to ensure cost-effectiveness
- Monitoring and evaluation of results to enable independent scrutiny of the work, and share lessons with Commonwealth countries
- Developing a website for dissemination of information to a variety of audiences, including professionals and the public

This fund is coming to an end in 2018. However, the Queen Elizabeth Diamond Jubilee Trust has plans to establish a US\$ 1 billion Vision Catalyst Fund from 2019 onwards.

Seeing is Believing Programme

‘Seeing is Believing’⁹⁸ (SiB) is Standard Chartered’s global charitable initiative to tackle avoidable blindness run in partnership with the International Agency for Prevention of Blindness (IAPB). It is one of the biggest corporate contributors seeking to eliminate avoidable blindness.

Standard Chartered is committed to raising USD 100 million for SiB between 2003 and 2020, with the bank matching every dollar. As of the end of 2016, through fundraising and bank matching, Standard Chartered had raised USD 92.8 million, well on track to meet its 2020 target.

The key accomplishments of SiB include the following:

- 184 projects in 37 countries
- 318,833 health workers trained in eye care
- 167 million people impacted
- 1.3 million pairs of spectacles dispensed

Seeing is Believing Innovation Fund

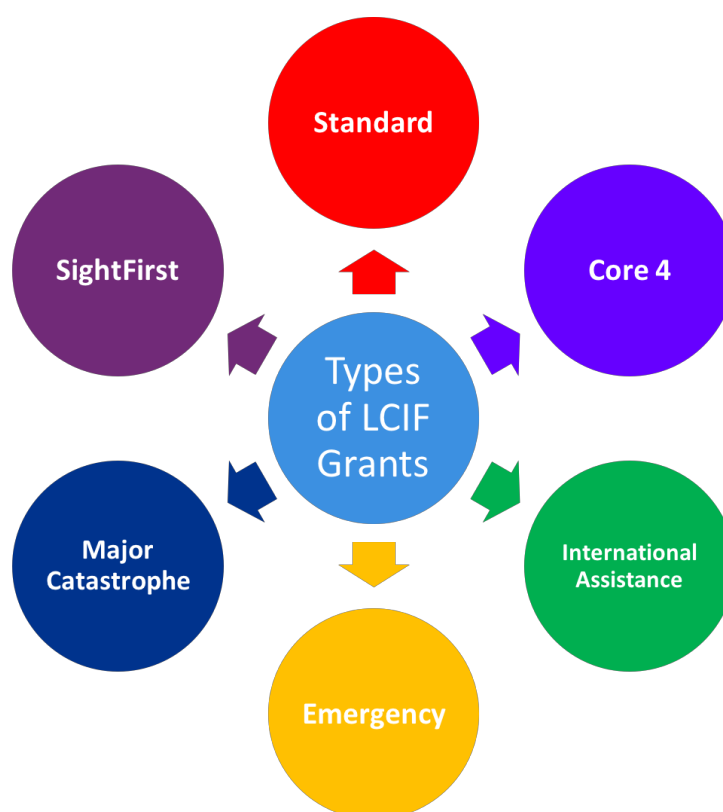
Initially launched in 2013, the Innovation Fund encourages innovators to develop pioneering ideas that have the potential to significantly impact how eye care is delivered in low- and middle-income countries. The fund recently in July 2017 launched its third phase, providing grants totalling more than USD 1 million to 10 projects. Of these, 2 projects focus on DR⁹⁹:

- Gloucestershire Hospitals NHS Foundation Trust: creating an online application to support practical skills training in retinal laser treatment
- Gloucestershire Hospitals NHS Foundation Trust in partnership with Lifeline Express: developing online training to improve diabetic retinopathy screening and practical laser treatment skills training in China

Lions Clubs International Foundation

The Lions Clubs International Foundation (LCIF) is the official foundation of Lions Clubs International. It provides grant support for large-scale service-oriented projects unable to be funded locally. There are various types of LCIF grants (Fig 15).

Figure 15 – Types of LCIF grants



(Source: Lions Clubs International Foundation. LCIF's Diabetes and Diabetic Retinopathy Programming. September 2014)

Diabetic retinopathy is one of the programme areas of LCIF. LCIF assists Lions in fighting diabetes through two grant programmes: SightFirst grant funding to support diabetic retinopathy programmes¹⁰⁰ and Core 4 funding support for diabetes programmes.

SightFirst

Since 1995, SightFirst has approved USD 2.8 million for 22 diabetic retinopathy projects in 11 countries where diabetic retinopathy is a significant public health concern: Algeria, Bahrain, Brazil, Chile, Fiji, India, Pakistan, Peru, Samoa, Spain and Venezuela. The projects have been comprehensive in nature with activities ranging from public education and professional training, to screening, treatment and low vision services. SightFirst's diabetic retinopathy accomplishments include:

- Educating more than 1.5 million people
- Training more than 2,000 professionals

- Conducting more than 23,000 surgeries
- Screening more than 140,000 patients

Priorities for projects include i) identifying appropriate project sites; ii) diabetes care integration; iii) high quality programming; iv) sustainable programming; and v) Lions engagement.

Core 4

This programme¹⁰¹ awards multi-year grants (up to USD 75,000 for Lions single districts or up to USD 200,000 for multiple districts) for large-scale Lions efforts to support the expansion and enhancement of diabetes education, prevention and treatment programmes. LCIF has provided more than US\$1.5 million for Core 4 Diabetes projects around the world. Typical items supported include the printing and translation of awareness materials, development of self-management courses for diabetics, diabetes and diabetic retinopathy testing equipment, human resource trainings, community awareness and promotion.

Diabetic retinopathy projects and success factors

According to the SightFirst DR project evaluations and SightFirst policy paper, the following factors were identified as key elements of success¹⁰²:

- Community-based patient awareness campaigns in partnership with national or state organisations concerned with diabetes
- Community-based diabetic retinopathy screening programmes, in collaboration with established diabetes or eye care clinics
- Availability of eye care infrastructure with professionals trained in diabetic retinopathy detection, diagnosis and treatment
- Provision of basic equipment and treatment facilities as add-ons to an established clinic
- A good monitoring system for patient outcomes, tracking and follow-up
- Linkages to tertiary care centres with fully developed vitreo-retinal department to provide technical assistance and treatment
- Projects should take place in areas where DR is a leading cause of blindness and especially target underserved populations
- Significant local Lions involvement

Novo Nordisk

Novo Nordisk has been at the forefront of collaboration in diabetes care working especially with the World Diabetes Foundation and the International Diabetes Federation.

One of its key innovative programmes is 'Changing Diabetes® in Children'¹⁰³. This programme has the following focus areas¹⁰⁴:

- Improving infrastructure and equipment by establishing diabetes centres for children
- Training and education of healthcare professionals to build healthcare capacity to treat and support children with diabetes
- Free insulin, equipment and supplies including blood sugar testing and treatment
- Patient education through locally-adapted education materials for children and their families, including diabetes training camps
- Diabetes registry, monitoring and control by enabling systematic data collection and continued monitoring
- Insights and outcome by sharing knowledge in order to strengthen healthcare systems in low- and middle-income countries

By 2016, the programme had achieved the following:

- 13,000 children enrolled by July 2016 (ambition to enrol 20,000 children by 2020)
- 108 clinics have been established
- 7,000 healthcare professionals have been trained in diabetes care

The programme is currently running in nine countries – Bangladesh, Democratic Republic of Congo and Uganda (2009), Cameroon, Guinea and Tanzania (2010), Ethiopia and India (2011), and Kenya (2012). Five new countries are planned to be included in 2017 – Cambodia, Ivory Coast, Myanmar, Senegal and Sudan.

Access Accelerated

At the World Economic Forum in 2017¹⁰⁵, twenty-two leading biopharmaceutical companies launched **Access Accelerated**¹⁰⁶, a global initiative to advance access to non-communicable disease prevention and care in low and lower-middle income countries.

Contributing companies include: Almirall, Astellas, Bayer, Bristol-Myers Squibb, Celgene, Chugai, Daiichi Sankyo, Eisai, Eli Lilly and Company, EFPIA, GlaxoSmithKline, The International Federation of Pharmaceutical Manufacturers and Associations (IFPMA), Johnson & Johnson, JPMA, Menarini, Merck, MSD, Novartis, Pfizer, PhRMA, Roche, Sanofi, Shionogi, Sumitomo Dainippon, Takeda and UCB. IFPMA will act as the Secretariat for Access Accelerated.

Access Accelerated

- Global, multi-stakeholder collaboration, called Access Accelerated, to be delivered in partnership with World Bank Group and Union for International Cancer Control
- Initial three-year commitment will catalyse, develop, measure and replicate sustainable programs in low and lower-middle income countries
- Collective funding of USD 50 million and increased individual company programme commitments to address NCDs

Examples of some of the programmes related to diabetes supported by Access Accelerated include the following:

- **Collaboration to Strengthen Health Systems and Improve Capacity in Sub-Saharan Africa**¹⁰⁷ - This programme focuses on sustaining quality healthcare services in the treatment of cancer, diabetes, and hypertension throughout sub-Saharan Africa by improving the capability of health professionals and institutions, establishing patient awareness programs, and ensuring patients adhere to treatments
- **Mobile Access to Chronic Care Programme**¹⁰⁸ - Distance to healthcare facilities from rural areas, lack of capacity and the necessary equipment and medicine all lead to poor results in the treatment of NCDs in Kenya. This programme includes screening for diabetes and hypertension in selected counties in Kenya, a holistic medical care package, and collection of valuable data on the prevalence of these NCDs
- **Kids and Diabetes in Schools (Kids)**¹⁰⁹ – Sanofi co-created the Kids and Diabetes in School (KiDS) project with the International Diabetes Federation (IDF) and the International Society for Paediatric and Adolescent Diabetes (ISPAD). The KiDS project is an educational programme around the Global “KiDS” Toolkit, which is primarily targeted at teachers, school nurses and other staff, school children (6–14 years old) and their parents, and aims to:
 - support children with type 1 diabetes manage their disease and avoid their discrimination in a school setting

- raise awareness of the benefits of healthy diets and physical activity among school children
- **Expanding Global Access to Healthcare**¹¹⁰ - this new five-year, USD 90 million investment in the Lilly Global Health Partnership will improve access to treatment for diabetes, cancer and tuberculosis and contribute to a company-wide effort to reach 30 million people annually by 2030 (known as the Lilly 30×30)

Bloomberg Philanthropies

Bloomberg Philanthropies¹¹¹ supports development work in 120 countries in a variety of sectors. One of its main programmatic themes is public. The key components of the public health theme include:

- Drowning Prevention Programme
- Maternal and Reproductive Health
- Road Safety
- Obesity Prevention
- Tobacco Control
- Data for Health

The approach of Bloomberg Philanthropies is based on the following:

- Focus on cities to drive progress
- Look for unmet needs that can be addressed with proven solutions
- Rely on data and continually measure progress
- Lead from the front and do not hesitate to address controversial issues

The founder of Bloomberg Philanthropies, Mike Bloomberg, has been appointed as the WHO's first global ambassador for NCDs.

Bloomberg Philanthropies has pledged USD 800 million over the next six years to fight NCDs^{112, 113}. Together with the WHO, Bloomberg Philanthropies will be launching a new global network of cities, called the 'Partnership for Healthy Cities', aimed at implementing policies and interventions to prevent deaths caused by NCDs and injuries.

Global Challenges Research Fund

The Global Challenges Research Fund¹¹⁴ is a major initiative of the Government of UK to ensure that UK science takes the lead in addressing the challenges faced by developing countries, whilst developing UK's own ability to deliver cutting-edge research.

Under NCDs, the GCRF has launched Phase I – The Foundation Call in Global Health Science – Beyond Infection. The aim is to support new research in any area of health. The research opportunities under this strategy¹¹⁵ include the following:

- Cardiovascular and metabolic research
- Cancers of high prevalence in LMICs
- Mental health and neurocognitive development
- Adolescent, maternal and childhood health
- Impacts of demographic/behavioural changes across the life course (including food and nutrition, malnutrition, obesity and physical activity) and cultural factors, with a focus on maintaining health
- Environmental change – urbanisation, rural change, climate change, environmental degradation
- Technologies, designs and methods suited to LMICs – including opportunities for informatics, user-led service design in research and health policy support; biomedical technologies; new forms of data; research tools and methods

Most of these areas are potentially suitable for DR related research.

PART 3 – PAKISTAN COUNTRY CONTEXT OF DIABETES

Status of Diabetes Mellitus and country context

Diabetes mellitus trends in selected regional countries

According to the International Diabetes Federation (IDF) in its IDF Diabetes Atlas 8th Edition 2017¹¹⁶, the health care expenditures for people with diabetes are on average two-fold higher than people without diabetes. **Table 6** indicates the situation of diabetes mellitus in selected regional countries. **Table 6** indicates that Pakistan has about 7.5 million people (aged 20-79 years) with diagnosed diabetes and 4.6 million people (aged 20-79 years) with undiagnosed diabetes.

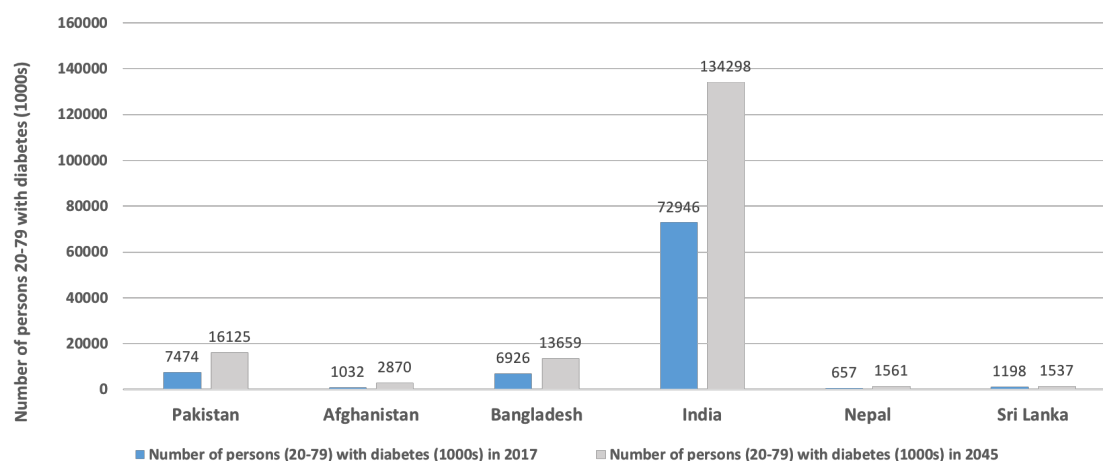
Table 6 – Status of diabetes mellitus in selected regional countries

Country	Diabetes Mellitus (20-79) national prevalence %	Diabetes Mellitus (20-79) age adjusted prevalence %	Adults with Diabetes (20 - 79) in 1000s	Adults with undiagnosed Diabetes (20 – 79) in 1000s	Mean diabetes-related expenditure per person with diabetes (USD)
Pakistan	6.9	8.3	7,474	4,594	62.0
Afghanistan	6.7	9.6	1,032	718	112.0
Bangladesh	6.9	8.4	6,926	3,878	51.0
India	8.8	10.4	72,946	42,210	119.0
Nepal	4.0	7.3	657	532	71.0
Sri Lanka	8.6	10.7	1,198	428	185.0

(Source: Adapted from IDF Diabetes Atlas 8th Edition 2017. International Diabetes Federation)

Data from the IDF Diabetes Atlas illustrates that there are likely significant increases expected in numbers of persons (20-79) with diabetes by 2045 compared to baseline numbers in 2017. **Figure 16** illustrates that there is a projected doubling of the numbers of people (20 – 79) with diabetes in most of the selected countries in South Asia.

Figure 16 – Diabetes mellitus trends in selected regional countries



(Source: Adapted from IDF Diabetes Atlas 8th Edition 2017. International Diabetes Federation)

Diabetes mellitus in Pakistan

Recent research reports indicate that the prevalence of diabetes is significantly higher than that estimated by the IDF Diabetes Atlas 8th Edition 2017.

The second national diabetes survey¹¹⁷ of Pakistan was conducted in 2016-2017. The survey used a multistage clustering technique in all four provinces of Pakistan. Of the estimated sample size of 10 800, an 87% response rate was achieved. The clinical and anthropometric measurements included height, weight, blood pressure, waist circumference and waist-to-hip ratio while the blood tests included Oral Glucose Tolerance Test (OGTT), haemoglobin A1c and fasting lipid profiles. WHO criteria were used for the diagnosis of diabetes and prediabetes. Pakistani nationals aged 20 years or more were included in the survey, whereas pregnant women and those not residents of the selected households were excluded.

The survey revealed the following findings:

- Overall weighted prevalence of diabetes was 26.3%, of which 19.2% had known diabetes, and 7.1% were newly diagnosed people with diabetes
- Prevalence of diabetes in urban and rural areas was 28.3% and 25.3%, respectively
- Prevalence of pre-diabetes was 14.4% (15.5% in urban areas and 13.9% in rural areas)
- Age greater than or equal to 43 years, family history of diabetes, hypertension, obesity and dyslipidaemia were significant associated risk factors for diabetes

The authors concluded that diabetes had reached epidemic proportions and that there was an urgent need of national strategies for early diagnosis and effective management as well as a cost-effective diabetes primary prevention programme in Pakistan.

These recent findings indicate a high magnitude of diabetics and pre-diabetics, which would have grave implications for diabetic retinopathy services in the long run.

Institutional context of diabetes mellitus in Pakistan

On a review of the institutional/policy context of non-communicable diseases (NCDs) and the respective health sector strategies in Pakistan, it is evident that the federal and provincial governments have recognised the public health importance of diabetes, but few have strategies in place to control and prevent the disease.

The findings are summarised in [Table 7](#).

Table 7 – Health sector strategies and diabetes

Country	Health Sector Strategy	NCD strategy
Federal	<p>Developed a National Health Vision 2016-2025¹¹⁸. Recognises the importance of diabetes as one of the priority NCDs.</p> <p>The Pakistan Health Profile 2015¹¹⁹ jointly published document of Ministry of National Health Services, Regulations and Coordination and WHO EMR has recommended the establishment of a noncommunicable diseases and mental health unit at provincial level.</p> <p>The Pakistan Health Research Council conducted an NCD Risk Factor Surveillance Survey¹²⁰ in 2016 using the WHO STEPs methodology. Only STEP1 (questionnaire) and STEP2 (physical measurement) were used. STEP3 (biochemical measurement) was not done. Further, the survey was only conducted in Punjab and Sindh.</p>	The Government developed a National NCD Action Plan in 2004. This was not implemented
Balochistan	Has a Balochistan Comprehensive Development Strategy (BCDS) 2013-2020 ¹²¹ , which recognises the importance of diabetes as a priority NCD. The BCDS is currently being updated to 2018-2024.	No specific NCD strategy at present
Khyber Pakhtunkhwa	Has a Health Sector Strategy 2010-2017 ¹²² that has identified NCDs as a health objective. This is currently undergoing revision	It recommends inclusion of treatment and management of NCDs in the Minimum Health Services Package for secondary hospitals
Punjab	Has a Health Sector Strategy 2012-2020 ¹²³ that has specified a health objective to strengthen prevention and management of non-communicable diseases as part of the Essential Package of Health Services	<p>Punjab has established a Provincial NCD Unit and allocated dedicated funds for prevention and control of NCDs in the province.</p> <p>Punjab Public Health Agency (PPHA) is working with the NCD Programme team towards development of a Provincial Action Plan for Prevention and Control of Non-Communicable Diseases and Health Promotion in Punjab that addresses the four major NCDs: cardiovascular diseases, cancer, diabetes and chronic respiratory diseases, and the four modifiable risk factors: tobacco use, the harmful use of alcohol, unhealthy diet and physical inactivity</p>
Sindh	Has a Health Sector Strategy 2012-2020 ¹²⁴ which incorporates strategies for control of NCDs	Recommends the establishment of a Provincial Commission on NCDs to guide strategy and planning

PART 4 – CONTROL OF DIABETIC RETINOPATHY: GLOBAL AND HEALTH SYSTEM PERSPECTIVES

Prevention and control of DR – Global and Health System perspectives

This chapter presents global best practices for control of diabetic retinopathy. The practices are presented as themes combined with a health systems framework.

Service Delivery

The service delivery approach for DR services is complex as it involves diverse health care providers who are not traditionally part of eye care services. One of the vital aspects to consider is access to quality services. WHO has defined the elements of accessible health services¹²⁵. These can be applied to DR services within the context of eye health services.

- Physically accessible
 - Good quality health services available within reasonable reach of those who need them
 - Services organised and delivered allowing people to obtain the services when they need them
- Financially affordable when
 - Within people's ability to pay for services
 - Includes the price of services, indirect and opportunity costs
- Acceptable when
 - People are willing to seek services
 - All patients and their families treated with dignity and respect
 - Perceived as good quality services

An integrated service delivery model is proposed in **Table 8**.

Table 8 – Integrated service delivery model for diabetic retinopathy

Health Promotion	Health Awareness	Health Management	Health Screening	Health Governance
<ul style="list-style-type: none"> ▪ Involves promotion of healthy lifestyles, healthy diets, increase in physical activity 	<ul style="list-style-type: none"> ▪ Involves patient education about diabetes and its complications ▪ Importance of using prescribed medications regularly ▪ Need for health screening and early treatment of complications 	<ul style="list-style-type: none"> ▪ Involves good glycaemic control by the patient ▪ Effective treatment and integrated management of co-morbidities like hypertension and cardio-vascular disease, depression, tuberculosis 	<ul style="list-style-type: none"> ▪ Effective and regular screening for complications of diabetes ▪ Detection and timely referral for diagnosis and treatment of complications 	<ul style="list-style-type: none"> ▪ Developing an effective primary health care service that is responsive to needs of diabetic patients ▪ Establish an effective referral pathway and back-referral system ▪ Capacitate an appropriate health workforce to provide the services at various tiers of health care

Clinical care

The scope and extent of clinical services depends on the resource setting. For instance, resource rich countries are able to develop more sophisticated approaches to DR services, while resource-limited countries often face challenges establishing general ophthalmic services. However, epidemiological studies have shown the classic risk factors for developing DR are diabetes duration, blood glucose and blood pressure. These factors are similar regardless of setting. It is vital to focus efforts on awareness and strategies to improve diabetes control.

Approaches to clinical care for DR may vary according to the resource setting. These are presented in **Table 9**.

Table 9 – Clinical approaches in different resource settings

High resource setting	Low resource setting
<ul style="list-style-type: none">▪ Goals of treatment have now transitioned from treatment of PDR to DME▪ Aim now is to improve vision rather than just preserve it▪ Availability of medical therapies (A-VEGF) and other therapeutics provide alternative treatments to laser	<ul style="list-style-type: none">▪ Goal of treatment is to prevent vision loss▪ Laser still remains a cost-effective and appropriate first line treatment▪ Role of medical therapies still unclear due to cost, availability and capacity issues▪ Awareness about the disease and its complications still presents a challenge as more than two-thirds of diabetics are undiagnosed

Clinical guidelines

A global study was conducted on DR¹²⁶. One of the issues that was highlighted was the lack of clinical guidelines and treatment protocols. So far, several country reports have been developed as well.

Several clinical guidelines and protocols are available that can be adapted for local use:

- International Council of Ophthalmology Guidelines for Diabetic Eye Care (updated 2017)¹²⁷
- American Academy of Ophthalmology Preferred Practice Pattern – Diabetic Retinopathy (updated 2016)¹²⁸
- International Diabetes Federation and The Fred Hollows Foundation. Diabetes eye health: A guide for health care professionals, 2015¹²⁹
- Royal College of Ophthalmologists Diabetic Retinopathy Guidelines 2012 (updated 2013)¹³⁰
- Diabetes Retinal Screening, Grading and Management Guidelines for use in Pacific Island Nations 2010¹³¹

Retinal Screening

This is an essential component of a DR screening and grading service. The type of screening modality varies with the level of health services and resource settings. The clinical guidelines and protocols alluded to earlier provide useful suggestions about technology.

The basic principles behind a screening and grading system are as follows:

- Primary screening is usually conducted either at a health facility like a PHC centre or during community screenings. It can be done by primary health care personnel or non-medical staff trained in screening and primary grading for DR
- Secondary screening and grading are usually done at the health facility that has an eye unit, like at a district hospital. This screening and grading can be done by an eye health professional like an optometrist, ophthalmic clinical officer or ophthalmic nurse trained in screening and grading for DR
- Tertiary screening and grading are best done by an ophthalmologist or medical retina specialist trained for this purpose
- A technical database has to be operationalised that can receive images from various screening devices, have them reviewed by the secondary or tertiary level grader, and a decision communicated to the person sending the images as to the intervention required

National Health Service – Diabetic Eye Screening programme

The UK National Health Service (NHS) Diabetic Eye Screening (DES) programme¹³² is one of the most comprehensive nationwide DR screening programmes in the world. The principle elements and learnings from DES can be adapted in countries where health systems and resource settings make this feasible.

A global review¹³³ of diabetic retinopathy screening programmes concluded that while direct and indirect ophthalmoscopy is still used, but digital photography of the retina seems to be the most efficient, objective and cost-effective.

A study¹³⁴ was conducted on planning and services for DR in Sub Saharan Africa. Some of the findings are summarised below. **Table 10** presents the strengths and limitations of vertical versus integrated programmes, while **Table 11** highlights the strengths and limitations of static versus outreach methods of service delivery.

Table 10 – Strengths and limitations of vertical versus integrated programmes

	Vertical	Integrated into diabetes care	Integrated into ophthalmology care
Strengths	<ul style="list-style-type: none"> ▪ Higher commitment to DR prevention objectives ▪ Staff roles and responsibilities clearly defined ▪ Fewer staff need training 	<ul style="list-style-type: none"> ▪ Part of a one-stop service for diabetic complications ▪ Easy access to target population so less need for a call/recall system ▪ Easy access to diabetic register 	<ul style="list-style-type: none"> ▪ On-site referrals if screen positive ▪ Other causes of vision loss can be explored ▪ Screening equipment can be used for other clinical requirements
Limitations	<ul style="list-style-type: none"> ▪ Higher cost for health system as no sharing of facilities or equipment ▪ Logistical burden to the client for screening and referrals 	<ul style="list-style-type: none"> ▪ New staff will be required ▪ Patients to travel to referral appointment ▪ Blurry vision for other appointments on this day due to dilation drops 	<ul style="list-style-type: none"> ▪ May excessively increase workload ▪ Patients may only present upon deterioration of vision ▪ Competing priorities (prevention seen as less urgent than treatment) ▪ Have to specifically travel to screening appointment

(Source: Sophie Poore, Allen Foster, Marcia Zondervan, Karl Blanchet. Planning and developing services for diabetic retinopathy in Sub-Saharan Africa. *Int J Health Policy Manag* 2015, 4(1), 19–28)

The study highlighted the following points:

- There may be benefits of implementing vertical services at the start of a programme and later aim towards integration. Limited staff are trained in the early days of a programme, however, as the programme matures, a greater number of skilled and experienced staff will enable the transition towards integrated services
- Chances of success are increased by initially limiting the geographical scope of a new screening service to a well-defined area, with later expansion to other regions as resources permit
- Information from situation analyses can assist in mapping the areas of greatest need and identifying facilities with the greatest readiness to commence programmes. Urban and peri-urban areas of Sub Saharan Africa suffer the greatest prevalence of diabetes, and therefore represent areas of greatest need for DR prevention services
- Screening services may evolve in various formats including:
 - Expansion of geographical area
 - Shortening of the screening interval
 - Progression from an opportunistic to systematic service
 - Integration of the service into the healthcare system

Table 11 – Strengths and limitations of static versus outreach methods of service delivery

	Static	Outreach
Strengths	<ul style="list-style-type: none"> ▪ Easy to book and attend referral appointments if screening held in eye department ▪ If poor view of fundus is obtained by screening test, alternative equipment may be available to achieve a better view ▪ Screening is convenient for patient if held in diabetic clinic 	<ul style="list-style-type: none"> ▪ Higher coverage as screening is taken to the patient ▪ Raises awareness amongst the community
Limitations	<ul style="list-style-type: none"> ▪ Patients not attending diabetic clinic may not benefit from service ▪ On-going efforts required to promote services and provide transport to static service ▪ Patients may only travel for screening if vision is already impaired 	<ul style="list-style-type: none"> ▪ Patients without the means to travel to treatment facilities will be screened, resulting in a poor treatment uptake rate ▪ Field conditions and lighting may be inadequate for accurate grading ▪ Image transfer systems may be required ▪ Fundus cameras may break if taken over rough terrain ▪ Cost and time for mobile team ▪ Requires intensive planning

(Source: Sophie Poore, Allen Foster, Marcia Zondervan, Karl Blanchet. Planning and developing services for diabetic retinopathy in Sub-Saharan Africa. *Int J Health Policy Manag* 2015, 4(1), 19–28)

A study¹³⁵ from South Africa highlighted the successful combination of static and outreach services for DR through screening at a primary health care setting. They used a mobile van equipped with laser. Patients were screened at the primary level setting and those who required laser were provided on the spot, while some had to be referred to the tertiary hospital.

Medical Products and Technology

Medical products

There has been considerable interest generated in the use of Anti Vascular Endothelial Growth Factor (A-VEGF) therapy, especially for treatment of diabetic macular edema (DME). Some common A-VEGF medicines include Aflibercept, Bevacizumab, and Ranibizumab. These agents have to be injected intravitreally (inside the eye) to be effective, and usually require multiple injections. Recent research studies have published the effectiveness of various agents, and with or without laser^{136, 137, 138}. Others have compared use of the intravitreal agent to standard laser treatment¹³⁹.

A WHO global technical consultation meeting on DR in 2016¹⁴⁰ noted the following:

- Panretinal photocoagulation (PRP) is still an effective therapy for proliferative diabetic retinopathy (PDR). However, treatment with PRP has some disadvantages, which include peripheral visual field and night vision loss. PRP treatment also has the following advantages:

- The therapy can usually be completed in one or two visits
- The effect of PRP is often long-lasting and further treatment is required. However, some studies suggest that about half of those treated with PRP may require additional laser
- In low resource settings, PRP may be a more cost-effective option than A-VEGF injections
- PRP does not have the risk of causing any infection (endophthalmitis) in the eye or any systemic effects that may result due to use of A-VEGF therapy
- Where patients have co-existing DME when initiating treatment of PDR:
 - Presence of DME may influence the relative benefit of use of A-VEGF over PRP
 - When DME is present and treatment with an A-VEGF agent is planned, PRP may be unnecessary in most cases if the patient is expected to be compliant with follow-up
 - When DME is not present, A-VEGF is more effective than PRP in preserving central and peripheral visual function, on average, but cost, follow-up compliance, and patient preference needs to be considered

There are other instances where use of intravitreal A-VEGF injections is useful. In patients with PDR who require vitreo-retinal surgery, use of pre-operative adjuvant A-VEGF (Bevacizumab) prior to vitrectomy is found to significantly ease the procedure, diminish intraoperative complications, and reduce early postoperative haemorrhage without increasing the risk of vision-threatening complications¹⁴¹. There is merit in considering this option in ophthalmology departments that have established vitreo-retinal units (surgical retina).

Fenofibrate - Two independent randomised clinical trials (the Fenofibrate Intervention and Event Lowering in Diabetes (FIELD)¹⁴² and Action to Control Cardiovascular Risk in Diabetes (ACCORD) Eye Study¹⁴³), have demonstrated that oral therapy with Fenofibrate (a lipid lowering agent) significantly retards the rate of DR progression in adults with Type 2 diabetes and extant diabetic retinopathy, including macular oedema. The potential role, risks and cost-effectiveness of this drug in reducing the burden of DR in Pakistan still need to be evaluated.

Technology for screening for DR

The gold standard is a non-mydriatic fundus camera which can be used for screening and imaging in both non-dilated and dilated pupil states. These are usually best suited for tertiary centres, and in secondary centres where there are well established eye care services with ophthalmologists, optometrists and ophthalmic paramedics. However, their main limitation is the cost and periodic calibration of the equipment.

Various cost-effective hand-held options are now available but are still costly for programmes in low resource settings. Recently, cheaper but high-quality versions of non-mydriatic hand-

held fundus cameras with high definition imaging, USB and WIFI are becoming available from China^{144, 145}.

There are also newer and cheaper options using smartphone technology that are becoming increasingly available. These include, among several others, the following:

- Vula eye app¹⁴⁶
- Peek Retina¹⁴⁷

One of the concerns about use of smartphone retinal imaging apps is that the quality of the retinal image may not be of sufficient resolution for effective and accurate grading. It is certainly useful as a primary screening device, but more standard technology for retinal imaging like non-mydratic fundus cameras is likely to be required at secondary screening level. If the secondary eye unit has the capacity to be equipped with and operate a slit-lamp and autorefractor or pulse tonometer, then a non-mydratic fundus camera would be a useful equipment to upgrade the services provided by the eye unit.

Automated Retinal Image Analysis for Detection of Diabetic Retinopathy

In view of the growing prevalence of diabetes mellitus, there is an increasing workload of DR especially on those personnel who have expertise in grading retinal images. Various trials are under way to assess the safety and reliability of automated analysis of retinal images in screening services and its applicability on a larger scale.

A study¹⁴⁸ was conducted to compare the Iowa Detection Program (IDP) ability to detect diabetic eye diseases (DED) to human grading carried out at Moorfields Reading Centre on the population of Nakuru Study from Kenya. The study found that the IDP had a high sensitivity of 91.0% (95% CI, 88.0-93.4%) to detect DED as by the human grading. It showed a negative predictive value of 98%. The IDP missed no vision threatening retinopathy in any patients and none of the false negative cases met criteria for treatment. Similar results were also found by other researchers using Retmarker and EyeArt systems as Automated DR image assessment systems (ARIAS)¹⁴⁹.

A recent exciting development is use of a fully data-driven artificial intelligence–based grading deep learning algorithm for DR¹⁵⁰. The study found that the technology achieved high sensitivity and specificity rates of 94% and 98% respectively. Automated retinal imaging offers hope for use of even non-medical screeners and graders in DR screening programmes, which would greatly enhance the scope and scale of screening for DR especially in developing countries globally.

A comprehensive review of screening technology is available for reference¹⁵¹.

Health Workforce

Table 12 – Strengths and limitations of selected cadres for DR screening/grading

	Ophthalmic Technician	Ophthalmic Nurse	Optometrist	Ophthalmologist
Strengths	<ul style="list-style-type: none"> ▪ Good geographical coverage ▪ Able to maintain equipment ▪ Fewer competing clinical demands 	<ul style="list-style-type: none"> ▪ Good geographical coverage ▪ Good counselling skills ▪ If camera breaks, can use ophthalmoscope 	<ul style="list-style-type: none"> ▪ Experienced in use of various ophthalmic equipment 	<ul style="list-style-type: none"> ▪ Can give immediate feedback of screening test result ▪ Can screen and treat during same appointment ▪ Equipped with skills and facilities to visualise ‘ungradable’ images ▪ May be appropriate as a quality control grader
Limitations	<ul style="list-style-type: none"> ▪ Require training in grading ▪ Immediate feedback of screening test result may not be possible unless further grading and communication competencies achieved ▪ Quality assurance system may be needed 	<ul style="list-style-type: none"> ▪ Require training in grading and screening test ▪ Quality assurance system may be needed 	<ul style="list-style-type: none"> ▪ Poor geographical coverage, but situated in cities (where diabetes predominates) ▪ Quality assurance system may be needed 	<ul style="list-style-type: none"> ▪ Poor geographical coverage, but situated in cities (where diabetes predominates) ▪ Expensive resource ▪ Ophthalmology Residents can function as reliable graders but may require financial incentives

(Source: Adapted from Sophie Poore, Allen Foster, Marcia Zondervan, Karl Blanchet. Planning and developing services for diabetic retinopathy in Sub-Saharan Africa. *Int J Health Policy Manag* 2015, 4(1), 19–28)

Depending on the country context and resources available, different cadres of health or non-health personnel participate in a DR screening programme. In Pakistan, where there is a shortage of health workers, identifying a suitable cadre to undertake screening/grading can be challenging.

Table 12 presents a summary of the strengths and limitations of four cadres with regards to screening and grading for DR. These four cadres are found in Pakistan in different proportions and numbers depending on availability, and normally constitute the eye care team.

Ophthalmologists

Ophthalmologists are a critical cadre in the referral chain. Modules on DR core competencies can be included in the ophthalmology residency curriculum with rotations in medical retina clinics for hands-on posterior segment training.

There is great need for the eye care sub-sector to work with the diabetes sub-sector. Cross-learning would be advantageous. For instance, training of ophthalmologists and ophthalmology residents in basics of metabolic control and overall diabetes care, while

diabetologists and endocrinologists can be trained in the basics of DR screening and management.

One of the growing needs of a DR screening programme is the medical retina specialist or equivalent who can attend to the patients referred for laser or further treatment, or provide supervisory support down the referral chain. DR programmes would need to ensure that there is training of medical retina specialists and equipping of medical retina units with requisite equipment for assessment and laser.

As a medical retina service matures, there will be need for surgical retina specialists to cater for surgeries in diabetic patients with complications of PDR like retinal detachment and vitreous haemorrhage¹⁵². However, the overarching aim is for prevention of retinal blindness through diabetes prevention, health promotion, good glycaemic control and treatment of co-morbidities, and DR screening to detect and treat advancing DR before it reaches a stage requiring surgical intervention.

Optometrists

In Pakistan, there is a gradually increasing pool of optometrists. Collaboration with optometry training programmes is essential to incorporate modules on DR core competencies in the optometry residency curriculum. Furthermore, optometrists can play a major role in both secondary and tertiary level screening and grading.

Online DR grading course

The Centre for Eye Research Australia has developed an Online Self-Directed Diabetic Retinopathy Grading Course¹⁵³. Candidates can enrol in the course and be certified on successful completion of its modules and a competency-based exam. It is available in several languages.

Health Information

One of the major challenges is to determine the burden of disease and to assess the status of eye health services when planning a control programme for DR. Three useful tools are presented below that help develop a baseline. Furthermore, the results from these surveys can be used for consensus building with multi-stakeholders in-country to develop strategic actions to address DR in the broader domain of diabetes prevention, health promotion and curative and rehabilitative care.

Eye Care Service Assessment Tool

In order to facilitate collection of information on the provision of and access to eye health services, and the development of evidence-based interventions for their further improvement, WHO developed the ‘**Eye Care Service Assessment Tool**’ (ECSAT)¹⁵⁴. ECSAT is also intended to assist implementation of the selected evidence-based interventions, as

periodic completion of the questionnaire can provide data and information for assessing the impact of interventions and identify trends and newly emerging needs. These findings should be included in refining and updating national plans for continuous activities. ECSAT is a more comprehensive tool that serves a wider eye health need and not just DR services.

Tool for the Assessment of Diabetic Retinopathy and Diabetes Management Systems (TADDS)

Diabetes mellitus constitutes one of the emerging threats to public health all over the world. The onset of diabetic retinopathy is the result of long-lasting diabetes. The most critical role of health systems in managing diabetes and preventing irreversible blindness from the disease is cooperation between those responsible for diabetes management and those concerned with diabetic retinopathy.

In order to assess both management of diabetes and diabetic retinopathy in countries and to estimate the level of cooperation and synergy between these two branches of health care, WHO has designed an assessment tool called '**Tool for the Assessment of Diabetic Retinopathy and Diabetes Management Systems**' (TADDS)¹⁵⁵. The tool makes it possible to carry out situation analysis, define service provision levels, and identify the gaps to be addressed in ensuring universal access to diabetes care and to effective prevention and treatment of diabetic retinopathy. The survey items in TADDS are organised according to the health systems building blocks.

Rapid Assessment of Avoidable Blindness (RAAB)

Rapid assessment of avoidable blindness (RAAB)¹⁵⁶ is a rapid survey methodology. It is a population-based survey of visual impairment including blindness and eye health services among people aged 50 years and over. RAAB can provide the prevalence of blindness and severe and moderate visual impairment, their main causes, the output and quality of eye health services, barriers, cataract surgical coverage and other indicators of eye health services in a specific geographical area.

RAAB is not a detailed epidemiological survey. It provides an estimate of the prevalence of blindness and low vision, and the proportion that is avoidable in the studied geographic area. RAAB does not measure posterior segment disease in detail. **RAAB 5**¹⁵⁷ provides data on uncorrected refractive errors, spectacle coverage and uncorrected presbyopia in people aged 50 years and over. There is a RAAB software package for the entry and analysis of data recorded on those individuals who have been examined. There are currently two versions of the RAAB package – RAAB 5 and RAAB 6. Features in RAAB 5 include:

- Summary reports on key outputs
- Optional Diabetic Retinopathy module plus supporting materials
- Improved survey and Inter-Observer Variation forms

- Tables on Functional Low Vision - people aged 50+ with best corrected VA<6/18 to PL+ in the better eye

RAAB 6 has all the functions of RAAB 5, with an additional option to include those individuals with the visual acuity less than 6/12. More recently, a **RAAB 7** has been developed and incorporates a section on disability.

When developing indicators for DR, it is useful to consult national health strategic plans and national NCD strategies as they often have indicators for diabetes. DR indicators can be adapted to meet health sector and NCD reporting needs.

Depending on the state of development of health services and facilities, and resource settings, collaborate with the national diabetic association to help establish a national diabetes registry. Interestingly, in the Copperbelt in Zambia, a DR screening programme identified diabetics through pharmacy registers and invited them for DR screening^{158, 159}.

Health Financing

Table 13 – Availability of medicines, basic technologies and procedures in the public sector

	Afghanistan	Bangladesh	India	Nepal	Pakistan	Sri Lanka
Medicines in primary care						
<i>Insulin</i>	○	○	●	○	○	○
<i>Metformin</i>	○	○	●	●	●	●
<i>Sulphonylurea</i>	DK	○	●	○	●	●
Procedures						
<i>Retinal laser</i>	○	○	○	○	○	●
<i>Renal dialysis</i>	○	○	○	○	○	●
<i>Renal transplant</i>	○	○	○	●	○	●
Basic technologies in primary care						
<i>Blood glucose measurement</i>	○	●	●	○	○	●
<i>Oral glucose tolerance test</i>	DK	○	○	○	○	○
<i>HBA1c test</i>	DK	○	○	○	○	○
<i>Dilated fundus examination</i>	DK	○	○	○	○	○
<i>Foot vibration perception by tuning fork</i>	DK	○	●	○	○	○
<i>Foot vascular status by Doppler</i>	DK	○	○	○	○	○
<i>Urine strips for glucose and ketone measurement</i>	○	●	○	●	○	○

Key: ○ - Not generally available ● - Generally available DK – Don't know

(Source: Diabetes Country profiles 2016. World Health Organization)

Financing for DR services needs to be reviewed in the context of financing for NCDs and diabetes. The Diabetes Country profiles¹⁶⁰ developed by WHO indicate that only India and Sri Lanka have some degree of services and facilities to manage diabetes and its complications (**Table 13**).

Financing for DR services may not be prioritised by policy makers and health planners when basic diabetic care services first need to be established. Pilot projects for DR screening and medical retina services would most likely need to be established initially with support from international partners. Sustained advocacy would be required with the health authorities and diabetes associations to define the 'care package' for diabetes management including eye care, and to add elements of DR care incrementally through funding of integrated diabetes care programmes and opportunistically through National Eye Health programmes.

Leadership and Governance

From the foregoing chapters, there are several issues that impact on leadership and governance.

First, DR has to be prioritised in the respective national and sub-national eye health plans so that it is highlighted in national forums and in engagement with the health authorities.

Second, the national and sub-national eye health committees/forums supported by their international partners need to engage with the NCD units so that common grounds of collaboration are established for DR programmes as part of NCD strategic plans and NCD/diabetes control initiatives e.g. in designated pilot areas, and to incorporate elements of WHOPEN¹⁶¹ and School Policy Framework¹⁶² in DR control initiatives.

Third, the national and sub-national eye health committees/forums supported by their international partners need to engage with the national diabetic associations to present a unified consortium for both advocacy and resource mobilisation.

Fourth, the national and sub-national eye health committees/forums supported by their international partners need to engage with the health system component leaders and co-morbidity programmes e.g.

- health information for harmonising DR indicators with NCD/diabetes/eye health needs
- with health authorities to find solutions to challenges in medicines, technology and procedures
- with health workforce planning units to identify and project capacity needs for DR as part of both eye health and NCD/diabetes care development

- with TB control programmes to identify options for synergy for joint TB-Diabetes screening and control, ensuring that DR is incorporated in these
- with Mental Health programmes to identify options for synergy for joint Mental Health-Diabetes-DR care

Fifth, the national and sub-national eye health committees/forums supported by their international partners need to build the evidence profile for mobilising support from health authorities and diabetic associations by employing WHO tools like ECSAT and TADDS under the auspices of the NCD units, and advocating for inclusion of DR and eye care in STEPS¹⁶³.

Sixth, there is need for representation of eye health on the multi-sectoral task forces being set up for NCDs in respective countries.

Depending on the support forthcoming from respective health authorities, consideration may be given to learning from the experience in India where a special DR Task Force has been established by the Ministry of Health¹⁶⁴.

Advocacy

Integrated care for diabetes and eye health

Pursuant to the Commonwealth DR symposium of 2016, in 2017, a group of international organisations from across the eye health and diabetes sectors agreed to form a partnership to spearhead Diabetic Eye Disease: a Global Advocacy Initiative. The Initiative's Leadership Group includes: The Fred Hollows Foundation; Helen Keller International; the International Agency for the Prevention of Blindness; The International Diabetes Federation; Lions Clubs International; Orbis International; Sightsavers; Queen Elizabeth Diamond Jubilee Trust; and in association with the WHO.

The Group recently published a report '**Integrated care for diabetes and eye health: A global compendium of good practice**'¹⁶⁵. This report is a collection of good practices from around the world and a useful resource for programme learning and advocacy.

Terminology - the Initiative has suggested using a range of terminology including 'diabetic retinopathy', 'diabetic eye disease', 'diabetic eye care' and 'diabetic blindness' depending on the context and audience.

The Silver Book: Diabetic Retinopathy

The Silver Book¹⁶⁶ is an excellent advocacy resource published by the Alliance for Aging Research. It provides the top line advocacy needs for DR.

PART 5 – PILOT PROGRAMMES FOR CONTROL OF DIABETIC RETINOPATHY IN PAKISTAN

Approaches to control of diabetic retinopathy in Pakistan

Pilot projects on prevention and control of DR have been implemented in Pakistan for over ten years with both government and non-government partners in collaboration with Sightsavers and Fred Hollows Foundation. The experience gained from these projects informed the design of longer-term five-year projects by both Sightsavers and the Fred Hollows Foundation.

In the last five years, both organisations have supported DR projects. The project objectives and key programme approach is summarised in **Table 14** below. Both projects were preceded by earlier pilot projects that informed their respective approaches.

Table 14 – Programmatic overview of two pilot approaches for control of DR

Theme	Sightsavers	Fred Hollows Foundation
Duration	2014 - 2019	2016 - 2018
Project partners	<ul style="list-style-type: none"> Al-Ibrahim Eye Hospital (Karachi) Holy Family Hospital (Rawalpindi) College of Ophthalmology and Allied Vision Sciences (Lahore) 	<ul style="list-style-type: none"> Lahore General Hospital (Lahore) Gurkhi Trust Teaching Hospital (Lahore) Sindh Institute of Ophthalmology and Vision Sciences (Hyderabad)
Title	Strengthening Pakistan's response to diabetic retinopathy	Integrated model of care (IMOC) for diabetic retinopathy within the health system of Pakistan
Project location	<ul style="list-style-type: none"> Karachi District (Gadap Town and Bin Qasim Town) Rawalpindi District (Satellite Town) Lahore District (Datta Gunj Buksh) 	<ul style="list-style-type: none"> Lahore District (Nishtar Town) Hyderabad District (City) Matiari District (Hala Taluka)
Goal	Contribute to the reduction of avoidable blindness due to STDR (sight threatening diabetic retinopathy) in three districts of Pakistan	Avoid Blindness in people at risk of vision loss due to diabetes, by strengthening the health system
Scope and purpose	Prevent visual impairment due to DR (diabetic retinopathy) through early detection, regular follow up and appropriate management of STDR amongst known diabetics in three districts of Pakistan	Establish linkages and information flow along the referral pathway, generate demand and optimise the prevention and early detection components of service delivery and the capacity of human resources, equipment and technology to meet the increased demand for DR services.
Objectives	<ol style="list-style-type: none"> Men and women, who are known diabetics, are diagnosed with DR and treated for STDR in three districts of Pakistan Hospitals in three districts in Pakistan have a referral system in place to ensure known diabetic 	<ol style="list-style-type: none"> Increase the proportion of people with diabetes accessing eye care services and presenting in the earlier stages of diabetic retinopathy Develop and implement an equitable, comprehensive and

	<p>patients are screened for DR and a management plan is established</p> <p>3. Hospitals in three districts in Pakistan have a functioning tracking system that records referrals, screening, treatment and follow-up of known diabetic patients</p> <p>4. A sustainability plan to transfer ownership of the DR services from Sightsavers to hospitals in three districts in Pakistan has been achieved</p>	<p>integrated model of care for people at risk of vision loss due to diabetes within the health system</p> <p>3. Assess the extent to which components or approaches within the model of care are most appropriate and effective, to inform scalability across Pakistan</p>
Programme strategy	<ul style="list-style-type: none"> ▪ Community awareness and mobilisation approach – the project trained Lady Health Workers to sensitise the local community about diabetes and DR and convey key eye health messages. Furthermore, the project oriented general physicians to advise high risk patients with diabetes to have an eye examination at the partner DR clinic ▪ Initial retinal screening – by optometrists of patients with diabetes referred from project location. Optometrists used non-mydriatic fundus cameras for retinal screening and referral of patients with DR to the retina specialist in the hospital ▪ Patient counselling – use of patient counsellors at the diabetic clinics to advise patients ▪ Bi-directional referral system – between diabetic clinics and DR clinics in the same hospitals ▪ Data management – utilise data entry operators to input DR patient data into customised information system and establish a tracking system 	<ul style="list-style-type: none"> ▪ Community awareness and identification and referral of persons with diabetes – the project trained Lady health Workers to sensitise the local community about diabetes and DR and convey through health promotion. In addition, they were trained in the use of a non-invasive diabetes risk assessment (DRA) form to identify and refer known persons with diabetes or those identified to be at risk using the form. The referrals were to the nearest BHU. ▪ Initial screening – this was done by medical officers at BHUs who clustered persons with diabetes for a visit by a screening team. The screening team had an optometrist who performed ophthalmoscopy and referred patients with DR to the partner tertiary centre. ▪ Referral system – patients referred by the LHWs to the BHUs were registered by the visiting screening team. The referral data was communicated to the partner DR centre where uptake of referral was reviewed. ▪ Cooperation between diabetic and eye care for DR – the patients referred to the tertiary centre were either coming to the diabetic clinic where they were reviewed again by an optometrist using image technology and then referring to the partner tertiary centre (SIOVS),

		<p>or coming directly to the eye clinic for DR assessment (LGH, GTTH)</p> <ul style="list-style-type: none"> ▪ Data management – a custom designed software for managing data (of patients with diabetes referred to the BHU, and then those with DR referred to the tertiary centre) was developed as an online version outsourced to a private company
Programme outcome	A functional integrated approach linking diabetic clinics with DR screening and treatments in the three districts	Eye health services are integrated within diabetes management to offer comprehensive care for people at risk of vision loss due to diabetes
Key outputs	<ul style="list-style-type: none"> ▪ Master trainers trained ▪ LHWs and Medical Technicians trained ▪ General physicians oriented ▪ Training of ophthalmologists in laser treatment ▪ Training of vitreo-retinal surgeons ▪ Patients screened for DR ▪ Patients identified with DR ▪ Patients received laser treatment and vitreo-retinal surgery ▪ Screening, referral and treatment guideline developed ▪ People reached with eye health information material 	<ul style="list-style-type: none"> ▪ LHWs and PHC staff trained ▪ Patients referred to BHUs through the DRA form ▪ Patients screened for diabetes at BHUs ▪ Patients with DR referred from BHUs to tertiary hospital ▪ Uptake of referrals ▪ Patients identified with DR ▪ Patients received laser treatment and vitreo-retinal surgery ▪ Guideline for IMOC developed ▪ Evidence generated from project for policy advocacy
Advocacy	Project implemented under the auspices of the National DR Task Force, which is one of the task forces constituted under the National Committee for Eye Health. The intention was for the DR Task Force to act as a lobbying platform to use the evidence from the project to advocate for change in government policy for DR	Advocacy strategy is developed and implemented with the aim to ensure that the evidence generated through this project influences broader scale up of diabetic retinopathy within Pakistan, by targeting specific policymakers / decision makers at the divisional and national level

Common themes

Both pilot projects had similar themes. These included components of primary screening, secondary screening and referral, tertiary screening for DR assessment and management, data management and advocacy.

Primary screening at primary health care level

The common theme was the use of LHWs as a means for health awareness, conveying key eye health messages and referring patients with or suspected to have diabetes to the nearest Basic Health Unit (BHU). One approach added the use of a diabetes risk assessment form for use by LHWs.

The second link in the approach was the medical officer/general physician at the BHU who confirmed the diagnosis of diabetes after a biochemical test (blood sugar). Either the patients were then referred to the tertiary hospital for further 'eye assessment' or recommended for secondary screening by a visiting screening team who would visit PHC facilities on pre-designated dates and locations. The medical officers were given training in the use of a direct ophthalmoscope in one of the approaches.

Secondary screening

One programme approach utilised optometrists in the visiting screening teams to examine patients with diabetes for DR and refer those diagnosed with DR to the tertiary centre. The other approach utilised optometrists to screen patients attending the diabetic clinics for DR and refer them directly to the retina specialist in the same hospital. The optometrists in both cases were given additional training in detecting DR.

DR assessment

The retina specialist at the tertiary centre assessed the referred patients and recommended clinical management as was appropriate.

Data management

Both approaches developed customised data collection and reporting mechanisms. One was used entirely at partner level, while the other was a cloud-based system managed by a private vendor.

PART 6 – LEARNINGS AND RECOMMENDATIONS

Key Learnings – Implications for Programme Strategy

The National Task Force on Diabetic Retinopathy and key stakeholders convened for a consultation workshop where programmatic approaches and ongoing government initiatives were discussed. The consultative process distilled key programmatic learnings that had implications for future programme strategy.

The programmatic learnings were divided into the six health system themes. These are presented below.

Service Delivery

Primary level screening

Lady Health Workers (LHWs) were identified as a vital link with the community who could convey selected eye health messages. Their role for conducting a diabetes risk assessment was debated considering that they already had numerous tasks to perform as part of their daily routine work of mother and child health, family planning and immunisation. The issue of over-referrals and unnecessary referrals through the use of diabetes risk assessment methodology was raised.

It was agreed that the LHWs performed a more effective role as agents to convey health information and create awareness.

At the primary health care facilities (BHUs), the role of the medical officer/general physician was of paramount importance. Ideally, one would envisage that they would be motivated enough to examine the retina of patients who had long-standing diabetes and detect presence of diabetic retinopathy. However, experience had shown that doctors at BHUs usually had a large daily workload of patients, and even though there may be the inclination or interest to perform an ophthalmoscopy where indicated, they did not have the time. It was just more practical for them to refer the patients to the next appropriate level of care. Even though the pilot projects provided direct ophthalmoscopes, their actual utilisation was limited at the BHUs.

There was consensus that it was more practical to have doctors at BHUs use an appropriate diabetes risk assessment form (rather than the LHWs), which did not involve any ophthalmic examination. The risk assessment screening process could include factors like family history, age, weight, waist circumference, and body mass index.

The role of outreach or screening teams was debated. It was noted that outreach screening teams provided a useful service for identification and referral of patients of DR. However, it was pointed out that unless outreach services were already a regular activity of the health facility, it had implications for long term sustainability if it was only project funded.

Furthermore, it raised expectations and could have a negative impact on institutionalising a referral pathway from the primary to secondary/tertiary level of health care.

Outreach teams were considered a useful option for promoting health awareness. For instance, BHUs and RHCs had static and outreach teams (comprising of school health and nutrition supervisors, vaccinators and family planning personnel). These teams could convey key health messages about diabetes in general and eye health in particular.

Other community level options tried by programme partners and found useful include the following:

- Identifying school champions to convey eye health messages including healthy life styles for diabetes prevention
- Use of local radio channels to convey eye health messages and create awareness about diabetes and its complications
- Use of local councillors for health promotion at local festivals

Secondary level screening

Secondary level screening could be either performed at a health facility like BHU or Rural Health Centre (RHC), or a sub-district or district hospital or a screening service at a tertiary hospital. The project approach of utilising optometrists to perform secondary level screening and identification of DR at any of the three levels was considered a practical option. Their role was to identify DR and refer to the tertiary hospital or to the retina specialist if screening was within the tertiary hospital.

There were three challenges noted with this approach.

First, while the optometrists were oriented in ophthalmoscopy, no system had been established to ensure quality and standardisation of their skill. Globally, the gold standard is to certify a health professional as a primary or secondary grader of DR in any screening service. This was a gap noted in both programme approaches.

Second, the optometrists being trained in various training centres are not provided sufficient practical exposure to ophthalmic examination and ophthalmoscopy during their residency training. They are assigned vision assessment and refraction duties in most cases even though their curriculum requires their training as a comprehensive optometric professional. Optometrists posted to district hospitals are likely to be allocated similar duties by the district ophthalmologist unless there is adequate practical training of optometrists in clinical ophthalmic examination, and orientation and sensitisation of district ophthalmologists of their role in supportive supervision and the optometrist's role in DR screening as part of the district eye care team.

Third, owing to the large workload of the district ophthalmologist, there is currently no effective DR screening/assessment being performed at the district headquarter hospital level, much less the tehsil headquarter hospital.

The rationale of appointing an optometrist at the district and tehsil headquarter hospitals is to lessen the burden of the ophthalmologist especially with regards to refraction (which is estimated to be about 50% of the workload) and also to participate in screening for glaucoma and DR.

There is need for orientation of district ophthalmologists in the working of an eye care team and how the scope of work especially for screening can be shared.

The provincial governments are in the process of creating posts of optometrists at district level and it is likely that further posts shall be created at sub-district and RHC level (a pilot phase has already begun in Punjab province). The RHC, instead of the BHU, was considered as the most suitable point for a secondary screening by an optometrist once they are posted there, being mindful of the provisos for adequate training and certification as a secondary grader for DR.

Medical Products and Technology

Ophthalmoscopes

While it forms part of the equipment list at a BHU, its minimal utilisation by primary health care physicians (medical officers) has been alluded to earlier. Optometrists are more likely to use ophthalmoscopes for DR if adequately trained in its use.

Considering the ease of examination and comfort to the patient, there was consensus that optometry residents in their final year of training should be adequately trained in the use of a 90D lens that allows retinal examination using a slit-lamp. This is an appropriate screening tool to use at any level of health care where a slit-lamp is available.

Non-mydriatic fundus cameras

Non-mydriatic fundus cameras were currently being used at the tertiary hospitals for screening of referred patients at the diabetic clinics or even in the eye clinics. It is a useful screening tool but has limitations if there is hazy media. Furthermore, for an optometrist to perform adequate clinical grading of DR, it often becomes necessary to dilate the pupil. For a busy clinic, this may not always be practical. Newer hand-held retinal cameras and screening cameras that utilise artificial intelligence are now available. Their role should be evaluated for cost-effective screening at scale.

Lasers

As part of the National Programme for the Prevention and Control of Blindness 2005-2010, several district eye units had received argon lasers. Unfortunately, the lasers remained unutilised in a large number of district eye units. However, it was noted that district hospitals attached to medical colleges had a greater likelihood of utilising lasers. There was consensus that future programmes for DR control should strengthen capacities for DR laser treatment in eye units at district hospitals attached to medical colleges and categorised as teaching hospitals.

Laser application for pan-retinal photocoagulation remains the treatment of choice for severe pre-proliferative and proliferative DR. In the case of macular involvement with diabetic macular edema (DME), A-VEGF is the preferred choice of treatment.

Anti-Vascular Endothelial Growth Factor

The role of A-VEGF has rapidly gained acceptance by ophthalmologists who practice DR care or are medical/surgical retina specialists. A-VEGF requires repeated intra-vitreous injections and has cost implications. It is also a source of income for the ophthalmologists who use it. Even though there are clear international guidelines and indications about its use, it is being administered even at district hospital level when the guidelines indicate that it should be used in a specialist retina unit under strict aseptic conditions.

The indiscriminate use of A-VEGF needs to be regulated by regulatory authorities and its administration should only be permitted if certain conditions are met.

Medical therapy

There has been a recent interest in the use of lipid lowering medicines for preventing or at least delaying the onset and proliferation of DR. Fenofibrate is widely available in Pakistan and has known lipid lowering effects. It is now being used in specialist retina clinics. A study on fenofibrate use in patients with DR was conducted at the College of Ophthalmology and Allied Vision Sciences¹⁶⁷. The researchers found that fenofibrate was almost three times as effective as intravitreal A-VEGF in reducing central macular thickness (CMT) in diabetic macular edema. The ease of use (medicine given orally) and comparatively cheap cost make it an effective alternative to the more expensive A-VEGF. However, there is need for controlled trials to study if it has any long-term ill effects.

Health Workforce

It was noted that the core team for a DR control programme are the following:

- Lady Health Workers – for health awareness in communities
- Primary Health Care facilities – medical officers/general physicians can play a vital role in risk assessment and referral for further ophthalmic assessment and DR management

- Outreach teams of static primary health care facilities – for health awareness and advising about life style changes
- Optometrists – secondary level screening and grading of DR at RHC or tehsil or district headquarter hospital level; and referral of DR patients to tertiary hospitals
- District Ophthalmologists – supportive supervision of optometrists in screening and grading of DR, and laser application for PRP where indicated and where laser facilities exist
- Medical Retina specialists – tertiary level medical management of DR
- Surgical Retina specialists – surgical treatment of DR complications

Two programme partners employed the use of a diabetic educator for their DR programme. This cadre was found to be extremely useful especially for patient counselling, explaining the importance of glycaemic control of diabetes, health promotion and advising lifestyle changes for diabetes, ensuring follow-up of DR patients, and maintaining records.

All agreed that the role of diabetic educator needs to be made mandatory in any DR programme. At present, training of diabetic educators is only offered at the Baqai Institute of Diabetology and Endocrinology¹⁶⁸ (BIDE) in Karachi. They offer a one-year diploma in diabetes education.

Health Information

Prior to the pilot projects for DR, there was no institutional mechanism to report patient load of DR, referrals from other facilities, and DR treatments. Whatever data that was available was on ad hoc basis. The pilot projects instituted customised software for the projects.

There were two main issues with the health information pathway established by the pilot projects. First, the information flow pathway was not part of any existing information pathway and therefore was an add-on to data management in hospitals and eye departments. Second, while outsourcing of data management was useful from a project context, it was not considered a long-term solution.

The absence of a formal eye health information pathway integrated in the government District Health Information System (DHIS) is perhaps the single most important bottleneck to collecting and reporting essential programme-based eye health information. The DHIS collects 3 indicators for eye care but these need to be revised and a mechanism established that allows review and analysis of eye health data for monitoring and service development.

The government of Pakistan has launched a nationwide district health information system that merges data flows from the primary health care facilities and secondary health care facilities. The Lady Health Worker programme has its own information pathway. Efforts are underway to merge this with the DHIS.

Existing health information pathways have limited provision for specialty-oriented data collection and reporting and rely mostly on reporting of secondary health care, primary health care and mother and child health indicators.

Furthermore, there are challenges in recording and maintaining DR patient information at the primary health facility level in the current system. However, recently in Punjab, the NCD Unit has established an Electronic Medical Reporting (EMR) system for the NCD programme in collaboration with the Punjab Information Technology Board (PITB). The NCD unit is part of the Primary and Secondary Health Care Department. It spearheads a large-scale 'Provincial Programme for Prevention and Control of Non-Communicable Diseases and Dental Health' that was launched in Punjab in 2016 (see separate section on this programme).

This has been piloted and is in the process of being scaled up throughout the province. It offers an opportunity to integrate a few but essential DR reporting indicators initially at the district headquarter hospital level and subsequently to other levels of health care.

Health Financing

Currently, there is no government funding dedicated to prevention and control of diabetic retinopathy. Each province has its respective provincial eye health programme financed through a PC-1. The programmes focus on comprehensive eye care. It was debated whether there was likelihood of a vertical DR control programme. There was consensus that since DR was a consequence of diabetes, it was more logical and sustainable to align with an existing NCDs control programme and integrate components of DR care into the diabetes intervention under the programme.

However, it was also highlighted that investment in medical retina services at tertiary hospitals and district hospitals attached to medical colleges could improve the uptake of DR referrals and provide timely treatment and counselling to patients with DR.

Leadership and Governance

The National Task Force on DR, under the auspices of the National Committee for Eye Health, has provided leadership and guidance to programme development in and to raise the profile of DR in eye health. It developed the national guidelines on DR.

However, there have been some challenges. First, the guidelines on DR were not disseminated or publicised sufficiently to gain widespread adoption among ophthalmologists. Second, the guidelines have been superseded by new development and therefore need to be revised and updated. Third, the strategic direction of DR pilot programmes while attempting to develop demonstration models, has missed out on vital institutional integration and

alignment with ongoing NCD initiatives. This demands a reassessment of DR initiatives and strategic alignment with NCD programmes.

Recently in 2018, the Specialised Health Care and Medical Education Department in Punjab established 'Yard Sticks' for tertiary level health care facilities. Posts of vitreo-retinal specialists are now an integral part of the 'Yard Stick' at all tertiary teaching hospitals. This will extend medical and surgical retina services across the network of tertiary teaching hospitals in Punjab province.

One-stop approach

Al-Ibrahim Eye Hospital in Karachi developed a novel one-stop approach for patients with diabetes. They have established a separate registration counter for patients with known diabetes. From the point of registration to discharge, the patient information is fully computerised and follows a paperless system.

The diabetic service area has a separate outpatient clinic for outpatients where they are provided ophthalmic examination and diagnostic services. In addition, they have a diabetic educator who counsels the patients and explains about life style changes, nutrition and glycaemic control. The hospital has a permanent diabetologist who provides the clinical management of diabetes. The hospital also has a service for foot care and a laboratory for biochemical tests.

Community mobilisation has enhanced the referrals by LHW and private general physicians (GPs) and walk-ins from the community. The referral rate from local private general physicians has gone up because patients are referred back to their referring GP with a feedback note. This has allayed their anxieties about losing their patients from their private practice.

As a result of these initiatives, the daily outpatient workload has risen to 60 diabetic patients and the follow-up rate has improved to 57%.

Prevention and Control of Non-Communicable Diseases and Dental Health Punjab 2016-2021

The Government of Punjab launched a large-scale province-wide programme for prevention and control of NCDs and dental health in 2016. The essential features of this programme relevant to diabetes and DR and strategic integration points (SIPs) are shown in **Table 15** below.

Table 15 – Overview of the prevention and control of NCDs and dental health programme Punjab

Programme component	Component summary	SIPs for eye health
Duration	Phase 1 2016 – 2018 Renewed and extended as a Phase 2 for 2018 – 2021	
Title	Prevention and control of NCDs and dental health	
Sponsoring agency	Government of Punjab Primary and Secondary Health Care Department	
Executing agency	Prevention and control of NCDs and dental health	
Operation and Maintenance	Prevention and control of NCDs and dental health	
Programme Goal	Reduce the preventable and avoidable burden of morbidity, mortality and disability due to non-communicable diseases, so that populations reach the highest attainable standards of health and productivity at every age and those diseases are no longer a barrier to well-being or socioeconomic development	
Scope and purpose	Strengthen and support the districts to deliver and manage integrated facility and community-based interventions to prevent and control NCD in rural and urban areas of Punjab in order to achieve the SDGs target related to NCDs	
Programme objectives	<ul style="list-style-type: none"> ▪ Raise priority accorded prevention and control of NCDs by a multi-sectoral action plan ▪ Reduce modifiable risk factors for NCDs and underlying social determinants through health promotion and multi sectoral action ▪ Strengthen and orient health systems for effective management of NCDs ▪ Assess the determinants of non-communicable diseases and monitor progress in their prevention and control 	
Strategic alignment	<ul style="list-style-type: none"> ▪ Sustainable Development Goal (SDGs): Global target (by 2030) to reduce by one-third premature mortality from Non-Communicable Diseases (NCDs) ▪ Commitment of the Government of Punjab to achieve Universal Health Coverage 	

	<ul style="list-style-type: none"> Health sector governance reforms, especially: setting quality standards; essential service package; access to affordable medicine 	
Programme strategy: Prevention of NCDs by risk factor modification	Tactical strategy for health promotion: <ul style="list-style-type: none"> Health communication Health education Health policies Environmental strategies 	SIP 1 Integrate eye health messages and IEC material in NCDs health promotion plan
Programme strategy: Multi-sectoral action	Tactical strategy for multi-sectoral action: <ul style="list-style-type: none"> Multi-sectoral provincial action plan Health diet Physical activity 	SIP 2 Eye health as stakeholder for multi-sectoral plan
Programme strategy: Control of NCDs	Tactical strategy for control of NCDs: <ul style="list-style-type: none"> Development of guidelines <ul style="list-style-type: none"> Programme has developed guidelines for integrated management of diabetes, hypertension, COPD and asthma Capacity building <ul style="list-style-type: none"> Master trainers and district focal persons trained Master trainers shall train doctors and paramedics on modules for integrated management of NCDs in each district Plan for training of the general doctors working in primary and secondary healthcare facilities and induction trainings through DHDC Work with Pakistan Society of Family Physicians to keep NCD training manual in CME for credit point Train LHWs and SH & NS on the modules for prevention and control of NCDs through DC IRMNCH 	SIP 3 Advocate to incorporate DED in guidelines SIP 4 Integrate DED component in training modules
Programme strategy: Early detection	Tactical strategy for early detection: <ul style="list-style-type: none"> Screening all people of age above 40 coming to hospitals in routine for any other reason, for obesity, diabetes, hypertension, and chronic lung diseases 130 screening desks established in secondary health care facilities Establishment of 128 NCDs Clinics at Secondary Healthcare Facilities (26 DHQs & 102 THQs) – 62 NCDs clinics already established Project has piloted early detection model at 30 primary level facilities in 3 districts (Chiniot, Okara and Nankana Sahib) Health Weeks conducted as 5 days long activity at 442 all level health care facilities (DHQs, THQs, RHCs and BHUs) 	SIP 5 Value addition of DED screening at district hospitals – linkage with NCD clinics

Programme strategy: Continuity of Care	<p>Tactical strategy for continuity of care:</p> <ul style="list-style-type: none"> ▪ District NCD clinic has a trained NCD doctor with an NCD web app trained data entry operator who registers the patient after confirmation of diagnosis using the health facility's existing services, and issues a unique NCD ID and follow-up of patients as per schedule and update information on the live web-based app ▪ Registered patient of Diabetes, Hypertension & CRDs is issued a registration card with a unique NCD ID and a patient book. The NCD registration card is retained in the NCD clinic. The registered patient is prescribed medicine on the patient book according to the standard guidelines developed by the programme. The patients are followed up according to the standard guidelines through automated follow-up mechanism (SMS) ▪ Patients registered in NCDs clinics are not only given prescription of medicine but also counselled for risk factor modification according to counselling tools and desk guides developed by the programme 	<p>SIP 6</p> <p>Integration of DED in web app through unique NCD ID</p> <p>SIP 7</p> <p>Integration of counselling of diabetics about DED in counselling tools and desk guides</p>
Programme strategy: Surveillance	<p>Tactical strategy for surveillance:</p> <ul style="list-style-type: none"> ▪ Risk factor assessment <ul style="list-style-type: none"> ○ WHO STEPs planned – NCD programme shall adapt WHO STEPs ▪ NCDs surveillance system shall be a merged with recently developed HMIS for hospitals to avoid duplication of data 	<p>SIP 8</p> <p>Incorporate DED screening component in STEPs</p>
Monitoring and Evaluation	<ul style="list-style-type: none"> ▪ All the data entered in real-time using android based app on Android tablets. A web-based application is being used for recording and relaying the patient clinical data with a built-in automated follow-up mechanism to be implemented all over Punjab at NCDs Clinic. The data is available online for provincial access on web ▪ Data is stored at NCD servers placed at HISDU with backups at provincial NCD PMU. A data base manager with support staff ensures daily analysis of the data being uploaded by health facilities 	<p>SIP 9</p> <p>Integration of digital space for DED integral to NCD (diabetes) data</p>

(Source: Prevention and Control of NCDs and Dental Health, Primary and Secondary Health Care Department, Punjab)

Table 16 presents the overall progress update of the Punjab Prevention and Control of NCDs and Dental Health Programme 2016-2021.

Table 16 – Progress update of the prevention and control of NCDs and dental health programme Punjab

Activity	2016-2018	Progress
Provincial Task Force	To steer the development and implementation of an integrated NCDs Care at the Primary and Secondary Health Care level in the province, led by the Director General Health Services (DGHS) Punjab, represents a range of technical & managerial expertise and partners	Notified by the P&SHD
Establish Provincial Setup for NCDs	Plan, arrange and recruit the provincial program staff Total Positions = 27	Filled Positions = 9 Fourth Phase of Recruitment is in-process for vacant posts
	Arrange office premises and procure furniture and equipment for the provincial program office	54 Bridge Colony, Askari 2, Abdul Majeed Road, Lahore
Development and Printing of Intervention Package (Training Materials, Guidelines, Reporting Tools etc.) for Integrated Management of NCDs	Doctors Training Manuals Desk Guides Paramedics Training Manuals Patient Counselling Tools Chronic Disease Cards Growth Cards Monthly Report Cards Disease Management Record Book (Muawen-e-Sehat)	Printing completed and distributed to Screening Desks and NCDs Clinics
Development and Printing of IEC Materials	Brochures & Leaflets for Patients	Printing completed and distributed to NCDs Clinics
Nomination of District Focal Persons for NCDs	36 District Focal Persons (DHO Preventive Services) The district focal persons were given a monthly incentive of PKR 10,000 for this additional task.	Completed
Arrange District Staff Training for NCDs Interventions	Training of Master Trainers in 36 Districts of the Punjab 72 Master Trainers	72 Master Trainers including 36 District Focal Persons (PD-DHDC) and 36 Hospital Focal Persons (MO's, SMOs etc.) trained on NCDs & MH interventions

	Trickle Down Trainings in 30 Districts of Punjab	Trickle down training conducted in 30 Districts of Punjab 450 Doctors 582 Paramedics
	Orientation of District and Health Facility Managers on Tobacco Cessation Intervention Package	Target achieved 100 % 350 District & Health Facility Managers
	Trickle Down Trainings in 36 Districts	Trickle down training conducted in 30 Districts of Punjab 216 Doctors 260 Paramedics
Public Awareness Campaign	Print Media Newspaper ads = 130	Completed
	Electronic Media TVCs = 20 Radio Spots = 350	Completed
Conduction of Screening Camps	11 Screening Camps conducted in Lahore = 6930 Persons screened	Completed
	Conduction of First Health Week = 362,017 Persons screened	Completed
	Organisational Screening Camps Health Professionals = 118,000 Punjab Police = 66,000 Local govt. employees = 45,000	Completed
Establishment of Integrated Screening Desks	Establishment of 128 NCDs Screening Desks at Secondary Healthcare Facilities (26 DHQs & 102 THQs)	Completed
	Piloting of 30 Screening Desks at Primary Healthcare Facilities (12 RHCs, 18 BHUs)	Screening desks established in 7 RHCs and 11 BHUs
Establishment of NCDs Clinics	Establishment of 128 NCDs Clinics at Secondary Healthcare Facilities (26 DHQs & 102 THQs)	62 NCDs Clinics established
Revamping of Dental Services	128 Dental Clinics at Secondary Level Healthcare facilities	Completed
Strengthening of DHQs and THQs for NCDs care	Procurement of Screening Equipment, furniture & IT equipment for health facilities	Procurement of screening equipment, furniture & IT equipment completed and

		distributed to the districts Screening Desks & NCDs Clinics
	Recruitment of 40 Data Entry Operators in Districts for NCDs Screening Desks (26 DHQs & 14 THQs) Recruitment of 88 Data Entry Operators (88 THQs)	16 DEOs have joined the Program. Hiring in process for vacant seats of DEOs. Hiring in process.
Digitalisation of Record	Development of android applications for NCDs Screening Desks, Clinics and Dental clinics for data recording. Development of Web-Portal and dashboard.	Completed
Deliver and monitor NCDs care	Screen and register NCDs Cases	254,522 persons screened 84,065 NCDs cases registered
Deliver and monitor dental care	Screen and register dental cases	215,685 persons screened for dental diseases 232,508 dental procedures
Mid Term Project Assessment	Mid-term assessment of the project implementation	Request sent to Procurement Cell

(Source: Prevention and Control of NCDs and Dental Health, Primary and Secondary Health Care Department, Punjab)

Recommendations

General

While the overall global prevalence of diabetes has increased by almost a fourth between 2006-2016, cataract, glaucoma and macular degeneration have also increased by about a third and refraction and accommodation disorders by 15% suggesting the need for a comprehensive approach to eye health.

Owing to various comorbidities between diabetes and other conditions, diabetes management can be integrated with management of other NCDs; women, children and adolescent health; mental health; and in some settings tuberculosis and HIV/AIDS, to improve equity, efficiency and outcomes. This has implications for DR care, which by consequence is an integral part of diabetes care.

People centred, integrated health services need to be developed. The one-stop shop approach is an example of an integrated approach to diabetes care and its complications.

DR services need to be part of the package of essential non-communicable (PEN) disease interventions for primary health care.

There is need for a thorough understanding of the NCDs sub-sector, diabetes care services, and the overarching health sector and NCD strategies and plans to facilitate meaningful engagement of eye health stakeholders with health authorities, NCD units, diabetic associations and diabetes care stakeholders. This will ensure that programmatic strategies for DR have synergy with and support of other NCD initiatives.

To the National Coordinator, National Eye Health Programme

- Request the Federal Minister for Health and Minister for Primary and Secondary Health Care Services Punjab to co-host a high-level meeting of federal and provincial health secretaries, director general's health, provincial focal persons for NCDs, provincial eye health coordinators, national and international eye care partners to:
 - Learn about the Government of Punjab programme for prevention and control of NCDs and determine how similar approaches can be fast-tracked in other provinces
 - Obtain conceptual approval to develop a roadmap to strengthen the capacity of the health system to respond to emerging DR care needs integrated in NCD services
- Request the Punjab Health Secretary of the Primary and Secondary Healthcare Department for incorporation of DR/DED component in:
 - the strategic framework being developed for NCDs
 - the NCD EMR
 - future planned STEPs

- key eye health messages in NCD patient counselling tools and integrated management guidelines
- training and refresher training sessions of NCD master trainers, NCD focal persons and NCD doctors and primary health care staff
- NCD weeks as a value addition to patient screening

To national and international eye care partners

- Accord consideration to the nine strategic integration points (SIPs) for DR/DED in the NCD programme when developing future collaborative DR initiatives:
 - SIP 1 - Integrate eye health messages and IEC material with the NCD health promotion plan
 - SIP 2 - Eye health as a stakeholder for multi-sectoral plan
 - SIP 3 - Advocate to incorporate DED in implementation guidelines
 - SIP 4 - Integrate DED component in training modules conducted by NCD programme
 - SIP 5 - Value addition of DED screening at district hospitals – linkage with NCD clinics
 - SIP 6 - Integration of DED in web app through unique NCD ID
 - SIP 7 - Integration of counselling of diabetics about DED in counselling tools and desk guides
 - SIP 8 - Incorporate DED screening component in STEPs
 - SIP 9 - Integration of digital space for DED integral to NCD (diabetes) data

Leadership and Governance

- Engage with NCD units to ensure that DR programming is aligned with and derives synergy from ongoing NCD programme strategies and initiatives
- Conduct orientation of district ophthalmologists in the working of an eye care team, the role of optometrists and how the scope of work especially for screening can be shared
- Strengthen capacities for DR laser treatment at eye units in district teaching hospitals attached to medical colleges
- Consider development of a zonal approach whereby a medical retina service in a tertiary eye department in a medical college provides supportive supervision to selected district eye units for DR screening and laser treatment

Service Delivery

- Work in a defined geographical area e.g. a priority district of the NCD programme
- Undertake a TADDS, (and ECSAT and RAAB-DR if resources permit) to identify available services and human resources and determine service gaps
- Adapt already available international clinical guidelines for DR for training and establishing standards
- Establish referral links of DR services with low vision and rehabilitation services
- Monitor quality and service outcomes

- First build capacity for DR care at the tertiary health care level; then develop screening and treatment capacity at the secondary level; then work towards building demand and undertake outreach
- Where feasible, prioritise and invest in a one-stop shop approach that provides a holistic approach to diabetes care including DR care
- Develop and establish medical retina services at tertiary and district teaching hospitals to enhance coverage and access for DR patients

Medical Products and Technology

- Develop laser services at tertiary centres and district teaching hospitals attached to medical colleges where there are staff who can be trained and can devote time to retinal examination and laser
- Various image capture technology options are available – the most feasible and replicable option should be selected and tested before adoption on a large scale
- Automated screening and grading present a good option that needs to be tested in Pakistan
- Administer A-VEGF in units where medical retina expertise exists and quality and safety control protocols can be strictly followed

Health Workforce

- Utilise optometrists, where they exist, for secondary screening
- Incorporate deployment of diabetic educators as an essential cadre for DR services – posts for diabetic educators would need to be created in government tertiary hospitals and district teaching hospitals providing DR care
- Collaborate with NCD units to incorporate sections of DR/DED in NCD modules and their capacity building programme
- Ensure elements of training are properly institutionalised (curriculum, trainers, learning resources)

Health Information

- Align and adapt DR programme indicators with NCD strategic plan indicators so that they contribute towards national outcomes, and ensure that they are reflected in NCD monitoring reports
- Integrate DR reporting in existing information pathways like the NCD EMR and DHIS

Health Financing

- Work with NCD teams and diabetic associations to incrementally increase public sector financing for components of DR care
- Demonstrate improved health outcomes, disease prevention, health promotion and universal health coverage for policy advocacy for incremental investment

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National Eye Health Committee
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