Diabetes

Objectives:
- Understand Global prevalence of diabetes
- Understand the Epidemiology of diabetes in KSA
- List the risk factors of diabetes
- List complications of diabetes
- Discuss preventive measures within the framework of NCDs
- Know preventive programs in KSA towards DM

> To fit prevention of Diabetes mellitus in Non communicable diseases (NCD) frame.

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Important | Extra | Notes

Editing file

Definition:

A metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both. or uptake of insulin in peripheral muscles.

Multiple etiology: not only one risk factor can be identified to be related to DM.

Types of diabetes:

The doctor said: you should know this from before. She only read the names of the types. And she mentioned the new classification of DM which is impaired glucose tolerance and DM due to secondary causes

- Type 1 (5-10%) – due to autoimmune b-cell destruction, usually leading to absolute insulin deficiency. Usually affects younger age group (not always)
- Type 2 (90 - 95%) – due to a progressive loss of β-cell insulin secretion frequently on the background of insulin resistance. Usually older age group (not always).
- Gestational diabetes - diabetes diagnosed in the second or third trimester of pregnancy that was not clearly overt diabetes prior to gestation
- Specific types of diabetes due to other causes - e.g., neonatal, maturity-onset diabetes of the young, diseases of the exocrine pancreas, drug- or chemical-induced diabetes.
- Impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG) - intermediate conditions in the transition between normal blood glucose levels and diabetes (especially type 2).

Symptoms:

1. Increase frequency of Urine (pee). (polyurea)
2. Specially nocturnal. visiting bathroom at night.
3. Increase thirst. (polydipsia)
4. Weight loss.
5. Increase appetite. (polyphagia)
6. Blurred vision.
7. Tingling hands and feet. (very common presentation.
8. Easy fatigability
9. Dry skin
10. Slow healing wounds
11. dryness of mouth or oral cavity

The patient complains like: my feet are burning or causing pain and i get tired doing my routine work

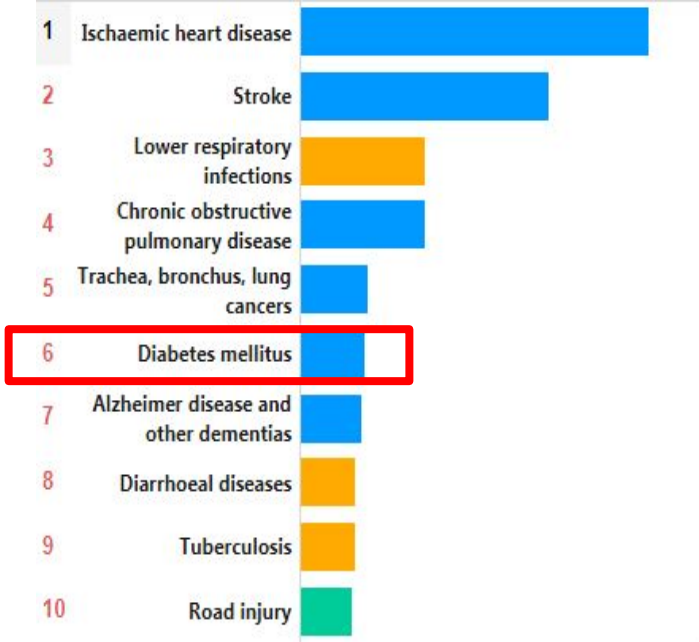| Diabetes |
|---|
| Fasting plasma glucose: ≥ 7.0 mmol/L (126 mg/dl) or
2-h plasma glucose*: ≥ 11.1 mmol/L (200 mg/dl) or
HbA1c : ≥ 6.5%
Who to call diabetic?
The fasting plasma glucose in diabetic patient is: equal or more than 7 mmol/L minimum or HbA1c level is equal or more than 6.5%
"you should know these values." |
| Impaired glucose tolerance (IGT) |
| Fasting plasma glucose : <7.0 mmol/L (126 mg/dl)
and
2-h plasma glucose* : ≥ 7.8 and <11.1 mmol/L
(140 mg/dl and 200 mg/dl)
 Impaired glucose tolerance: fasting plasma glucose: less than 7 mmol/L, less than 126mg/dl. and 2 h plasma glucose: more than 7.8 and approximately 140 mg/dl.

 The rest just for you to know the gestational level for a mother who is pregnant and maybe diabetic. |
| Impaired fasting glucose (IFG) |
| Fasting plasma glucose : 6.1 to 6.9 mmol/L (110 mg/dl to 125 mg/dl)
and (if measured)
2-h plasma glucose*: <7.8 mmol/L (140 mg/dl) |
| Gestational diabetes (GDM) |
| One or more of the following:
Fasting plasma glucose: 5.1–6.9 mmol/L (92–125 mgl/dl)
1-h plasma glucose** : ≥ 10.0 mmol/L (180 mg/dl)
2-h plasma glucose: 8.5–11.0 mmol/L (153–199 mg/dl) |
| *Venous plasma glucose 2 hours after ingestion of 75 g oral glucose load
** Venous plasma glucose 1 hour after ingestion of 75 g oral glucose load |

Key facts:

- The number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014. 108 million to 422 million, it increased 3 folds.
- The global prevalence of diabetes* among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014. 4% to 8%, it has been increased the double
- Diabetes prevalence has been rising more rapidly in middle- and low-income countries.
- Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation. amputation: This causes disabilities, tackling these disabilities will increase the cost, that's why we say we need to prevent the disease from even occurring rather than dealing with the disease because that is very expensive strategy.
- In 2015, an estimated 1.6 million deaths were directly caused by diabetes. Another 2.2 million deaths were attributable to high blood glucose in 2012**.
- Almost half of all deaths attributable to high blood glucose occur before the age of 70 years. WHO projects that diabetes will be the seventh leading cause of death in 2030. All patients are relatively young age in reproductive age, people are still working if they got DM or they are cripple or have comorbidities, it will affect the working economy.
- Healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use are ways to prevent or delay the onset of type 2 diabetes. These turned to be effective in controlling diabetes.
- Diabetes can be treated and its consequences avoided or delayed with diet, physical activity, medication and regular screening and treatment for complications.
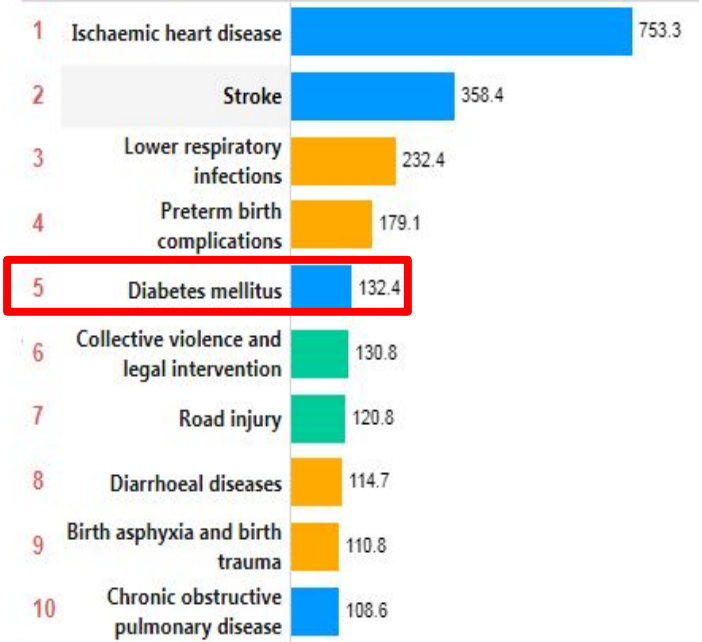
World 2015

1	Ischaemic heart disease	
2	Stroke	
3	Lower respiratory infections	
4	Chronic obstructive pulmonary disease	
5	Trachea, bronchus, lung cancers	
6	Diabetes mellitus	
7	Alzheimer disease and other dementias	
8	Diarrhoeal diseases	
9	Tuberculosis	
10	Road injury	

EMRO, 2015

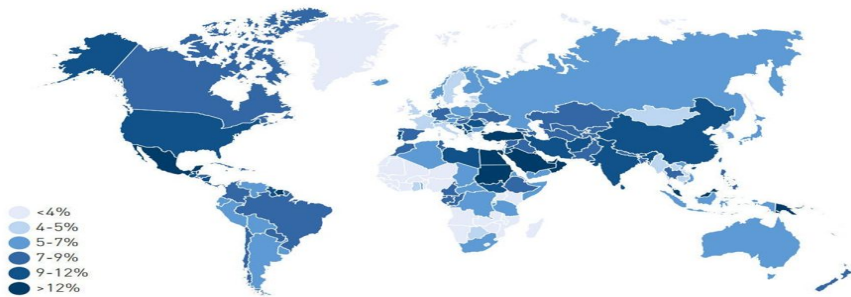|		
1	Ischaemic heart disease	753.3
2	Stroke	358.4
3	Lower respiratory infections	232.4
4	Preterm birth complications	179.1
5	Diabetes mellitus	132.4
6	Collective violence and legal intervention	130.8
7	Road injury	120.8
8	Diarrhoeal diseases	114.7
9	Birth asphyxia and birth trauma	110.8
10	Chronic obstructive pulmonary disease	108.6

Crude death rates (per 100,000)

Estimated age-adjusted prevalence of diabetes in adults (20-79 years), 2017

WHO Region	Prevalence (%)		Number (millions)	
	1980	2014	1980	2014
African Region	3.1%	7.1%	4	25
Region of the Americas	5%	8.3%	18	62
Eastern Mediterranean Region	5.9%	13.7%	6	43
European Region	5.3%	7.3%	33	64
South-East Asia Region	4.1%	8.6%	17	96
Western Pacific Region	4.4%	8.4%	29	131
Total*	4.7%	8.5%	108	422

a. Totals include non-Member States.

Source: (4).

Estimated prevalence and number of people with diabetes (adults 18+ years)

Trends in prevalence of diabetes, 1980–2014, by country income group
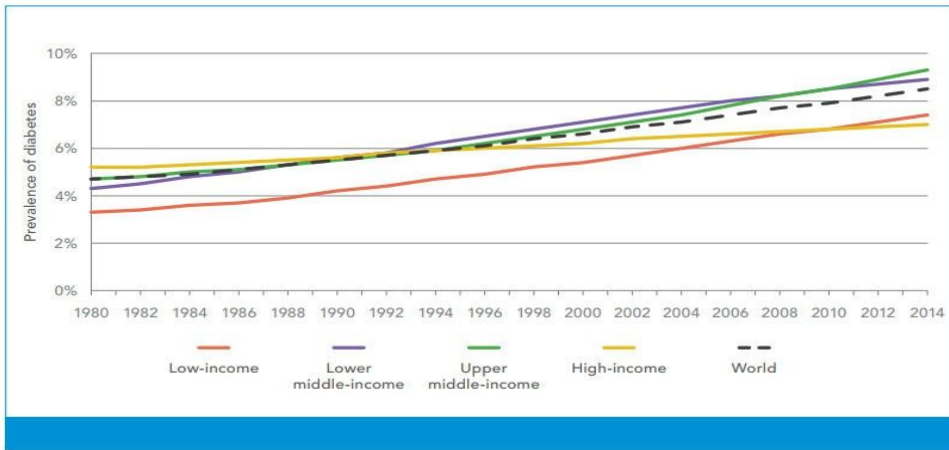
Low income line is increased
high income line raised but reached a plateau
low income & middle income are raised
lower middle income and higher middle income is increasing
the high income and low income are going toward plateau.

## Trends in prevalence of diabetes, 1980–2014, by WHO region
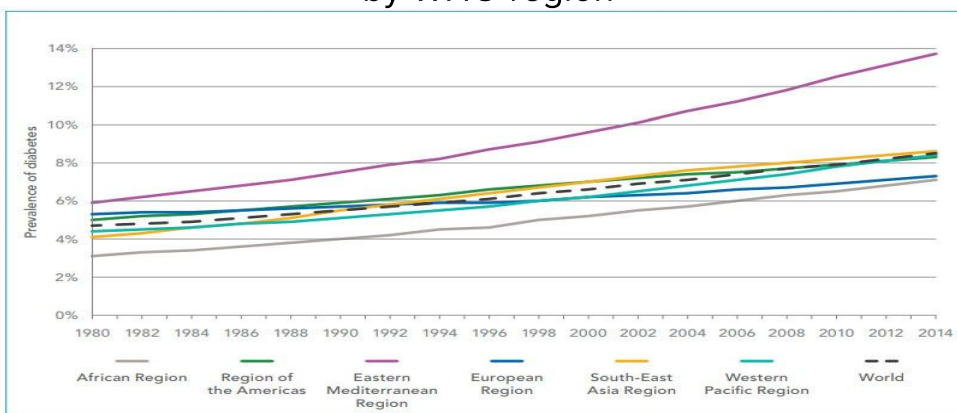
High blood glucose in eastern region (the purple line)

High blood glucose age-standardized mortality rates per 100000
# by WHO region, age 20+, 2012

	Both sexes	Female	Male
African Region	111.3	110.9	111.1
Region of the Americas	72.6	63.9	82.8
Eastern Mediterranean Region	139.6	140.2	138.3
European Region	55.7	46.5	64.5
South-East Asia Region	115.3	101.8	129.1
Western Pacific Region	67	65.8	67.8

Percentage of all deaths attributable to high blood glucose for
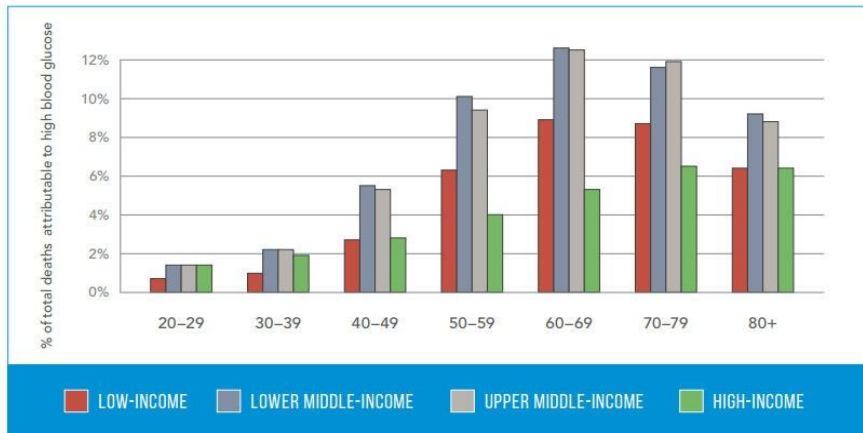# adults aged 20–69 years, by WHO region and sex, 2000 and 2012
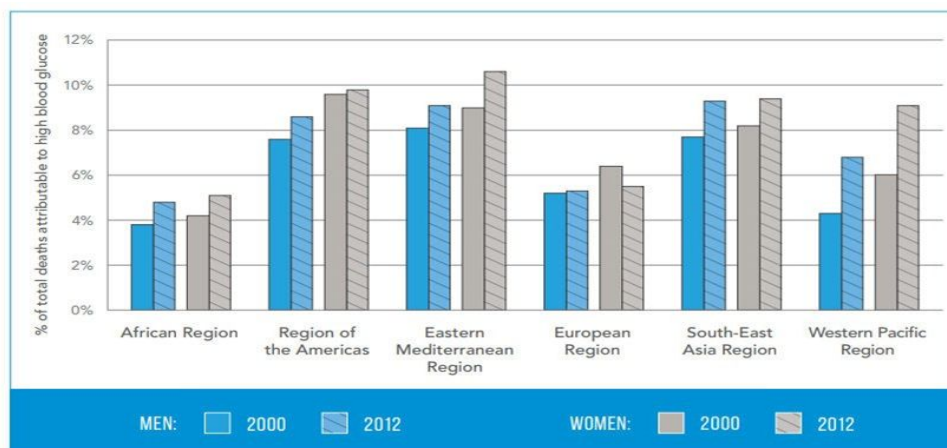
2012 women are more
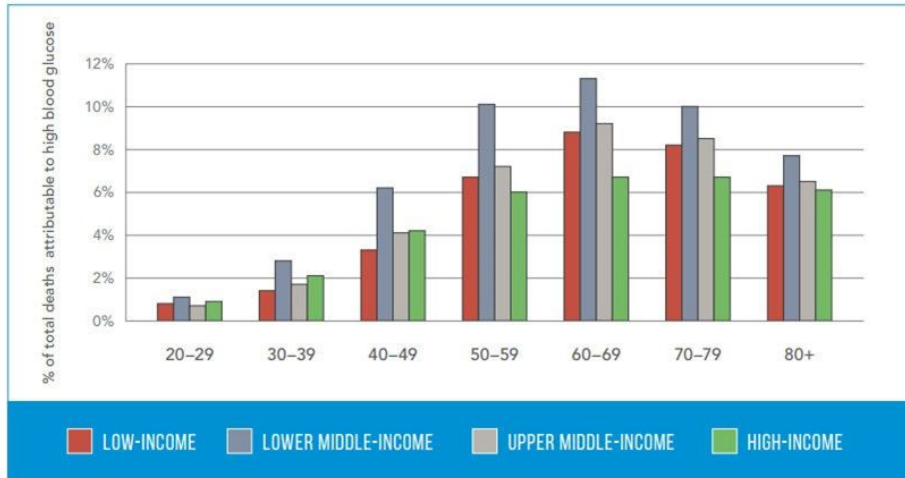
Percentage of all-cause deaths globally attributed to high blood
glucose in men, 2012

Age group most affected 60-69. Highest mortality in lower middle income.
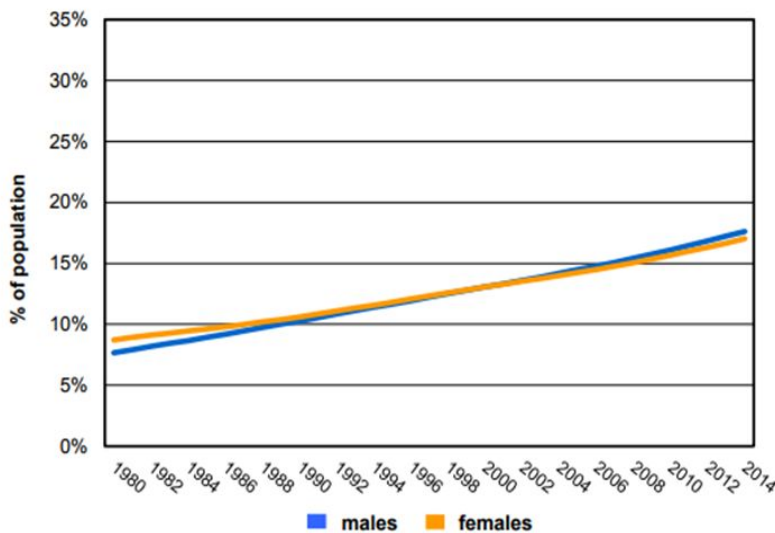
a. As categorized by the World Bank for 2012.

Percentage of all-cause deaths globally attributed to high blood glucose in women, 2012

Female same pattern. Female outflow males

Trends in age-standardized prevalence of diabetes in Saudi Arabia

Saudi: Both gender running the race together, both male and female in the country are affected

Common diabetes complications:

1. Loss of vision
2. End-stage renal disease
3. Cardiovascular events
4. Lower extremity amputations

Consequences
Diabetes can lead to complications in many parts of the body and increase the risk of dying prematurely.

- Stroke
- Blindness
- Heart attack
- Kidney failure
- Amputation
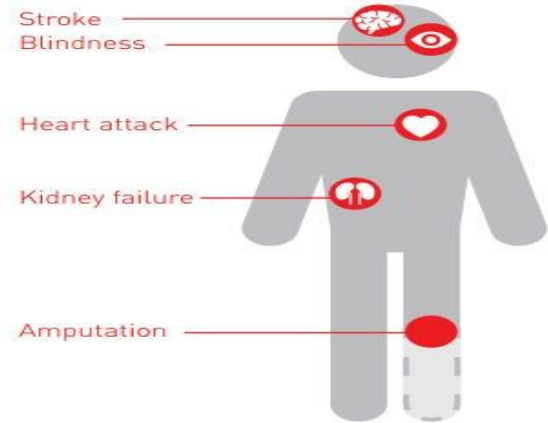
Loss of vision:

retinopathy: micro-vascular region they burst and go to blindness and macrovascular regeneration.
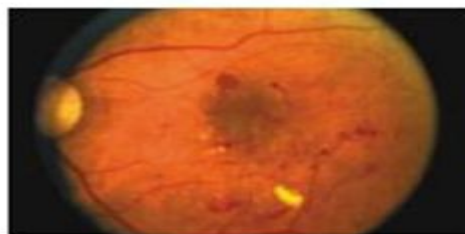
Diabetic retinopathy caused 1.9% of moderate or severe visual impairment globally and 2.6% of blindness in 2010.

Studies suggest that prevalence of any retinopathy in persons with diabetes is 35% while proliferative (vision- threatening) retinopathy is 7%.

However, retinopathy rates are higher among: people with type 1 diabetes; people with longer duration of diabetes; Caucasian populations; and possibly among people of lower socioeconomic status.

A normal retina.

A retina showing signs of diabetic retinopathy.

Diabetes affects the kidney

Healthy	Diabetic
Urine	Protein leaking / Protein in urine

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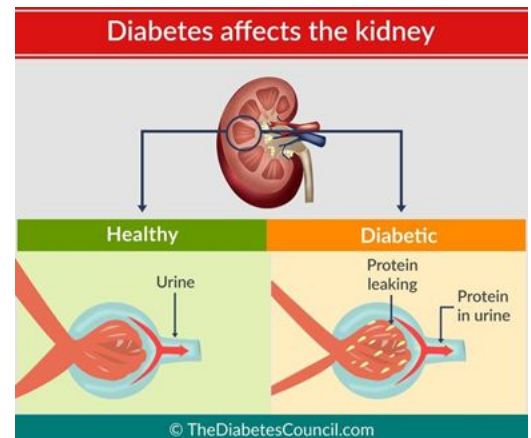
End-stage renal disease:

Pooled data from 54 countries show that at least 80% of cases of end-stage renal disease (ESRD) are caused by diabetes, hypertension or a combination of the two.

The proportion of ESRD attributable to diabetes alone ranges from 12–55%.

The incidence of ESRD is up to 10 times as high in adults with diabetes as those without.

Renal disease: Nephropathy chronic shutdown then patient will be on dialysis.

Cardiovascular events:

 Adults with diabetes historically have 2-3 times higher rate of cardiovascular disease (CVD) than adults without diabetes.

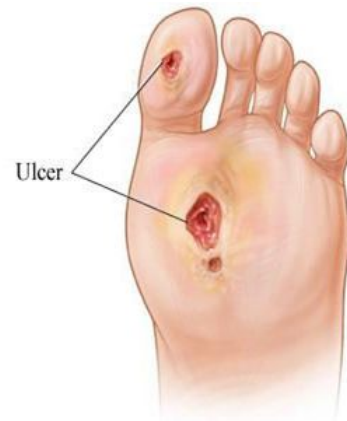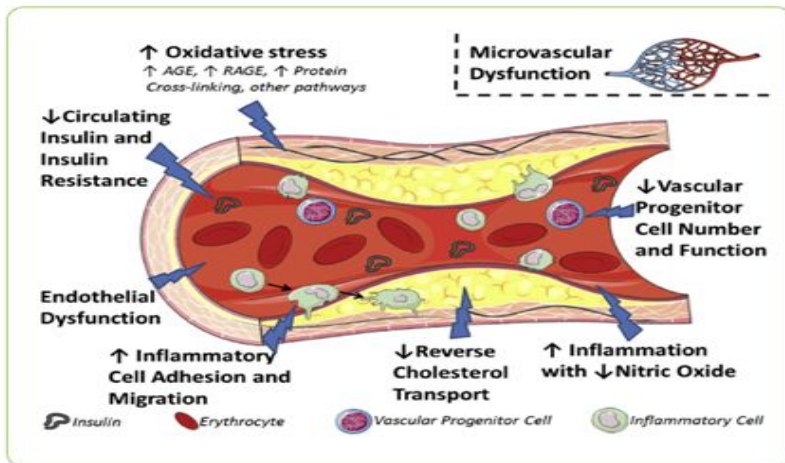 The risk of cardiovascular disease increases continuously with rising fasting plasma glucose levels, even before reaching levels sufficient for a diabetes diagnosis.

 Almost 7 in 10 people with diabetes over age 65 will die of some type of heart disease. About 1 in 6 will die of stroke.

High burden of diabetes is one of the causes of mortality in cardiovascular patients .

Figure1: Relationships between cardiovascular disease and diabetes.

Lower extremity amputations:

 Diabetes appears to dramatically increase 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 nondiabetic populations.

 Encouragingly several studies show a 40% to 60% reduction in rates of amputations among adults with diabetes during the past 10–15 years in western countries.

Lower extremities amputation: There is no healing of wounds because of high blood glucose level and hence this increase causes of gangrance and causes of amputations and remains disabilities of person for the rest of the time.

Risk factors

Like: Family history, genetics, diet, saturated fat intake, smoking.

Genetic factor play a main part of development of DM. However, researches are still going on and they are saying that it is more related to type one rather than type two diabetes. However, this is debatable.
There is enough evidence to say that genetic factor or hereditary or family factor is related with development of DM.

Genetic factors:

- May play a part in development of all types; autoimmune disease and viral infections may be risk factors in Type I DM.
- Twin studies

Family history:

- Compared with individuals without a family history of type 2 diabetes, individuals with a family history in any first degree relative have a two to three-fold increased risk of developing diabetes.
- The risk of type 2 diabetes is higher (five- to six fold) in those with both a maternal and paternal history of type 2 diabetes . (huge impact)
- The risk is likely mediated through genetic, anthropometric (body mass index, waist circumference), and lifestyle (diet, physical activity, smoking) factors.

Obesity:

The more obese, the more BMI, the more likelihood of developing DM is increased.
The relative risk of having DM in female if BMI is between 22-23 is 3 times.
If it is between 24-25 the risk is 5.
if it is greater than 31 the risk is 40.

- The risk of impaired glucose tolerance (IGT) or type 2 diabetes rises with increasing body weight.

The more body weight, the more obesity the more glucose intolerance, peripheral metabolism (the peripheral absorption) of glucose is affected
the body tissue is compromised insulin secretion is compromised, lots of carbohydrate in blood and not going to be absorbed.

- The Nurses' Health Study demonstrated an approximately 100-fold increased risk of incident diabetes over 14 years in nurses whose baseline body mass index was >35 kg/m2 compared with those with BMI <22 .
- The risk of diabetes associated with body weight appears to be modified by age.

How age plays a factor?
if age is increased, if bmi is increased the likelihood of developing DM will also increase
That doesn't mean that younger age with increased bmi doesn't hold the risk of DM>
that also means that if you are young but having a bmi above 30 that also hold an equal risk of developing DM however this proportion increases with increase of age.

- Obesity acts at least in part by inducing resistance to insulin-mediated peripheral glucose uptake, which is an important component of type 2 diabetes

•**Contributes to the resistance to endogenous insulin.**

– **RR risk of DM in females (ref. BMI < 22)**

22-23	3.0
24-25	5.0
>31	40.-

Fat distribution:

- The distribution of excess adipose tissue is another important determinant of the risk of insulin resistance and type 2 diabetes. The way fat is in the body
- The incidence of type 2 diabetes are highest in those subjects with central or abdominal obesity, as measured by waist circumference or waist-to-hip circumference ratio. That is why they say that waist circumference is very important.

  In population studies or survey of DM and you want to see the prevalence, it is not enough to see the BMI of the patient you need also, to have measurement of their waist circumference and hip waist ratio.

- Intra-abdominal (visceral) fat rather than subcutaneous or retroperitoneal fat appears to be of primary importance.

Physical inactivity.:

Prolonged TV watching is associated with a significantly increased risk of type 2 diabetes. Men who watched TV more than 40 h per week had a nearly threefold increase in the risk of type 2 diabetes compared with those who spent less than 1 h per week watching TV.

Infections:

A range of relatively rare infections and illnesses can damage the pancreas and cause type 1 diabetes.

Pregnancy:

more prone to infection will lead to low resistance in the body which will lead to more prone to infection, it is a vicious cycle with impaired insulin secretion and glucose absorption.

Pregnancy causes weight gain and increases levels of estrogen and placental hormones, which antagonize insulin.

and there is impaired absorption of glucose

Diet:

A number of dietary factors have been linked to an increased risk of type 1 diabetes, such as low vitamin D consumption; early exposure to cow's milk or cow's milk formula; or exposure to cereals before 4 months of age. However, none of these factors has been shown to cause type 1 diabetes.

- Consumption of red meat, processed meat, and sugar sweetened beverages is associated with an increased risk of diabetes

  Early exposure to cow milk for children, especially serials exposure between age 9 month in babies related to development of DM. However, none of these has shown to cause only type one so they are more related to type 2

- Fruits, vegetables, nuts, whole grains, and olive oil is associated with a reduced risk.

  lack of vegetable intake lack of nuts, lack of fruits, lack of olive oil
  it is also associated with increase risk of DM

- It is important to recognize that most studies have used food frequency questionnaires to capture dietary patterns and that none of the food stuffs examined can be considered in isolation. For example, higher meat intake always means more saturated fat intake, relatively lower fruit and vegetable intake, and frequently, higher BMI (body mass index).

Smoking:

Several large prospective studies have raised the possibility that cigarette smoking increases the risk of type 2 diabetes. In a meta-analysis of 25 prospective cohort studies, current smokers had an increased risk of developing type 2 diabetes compared with nonsmokers (pooled adjusted RR 1.4, 95% CI 1.3-1.6).

A definitive causal association has not been established, a relationship between cigarette smoking and diabetes mellitus is biologically possible based upon a number of observations:

- Smoking increases the blood glucose concentration after an oral glucose challenge.

smoking increase blood glucose concentration after oral glucose ingestion, if you eat some meal which have high in glucose and you are smoking then the absorption is said to be decreased. Why? because smocking is to be said that it decrease insulin sensitivity.
Researchers said that smoking have high probability and increasing diabetes impaired.

- Smoking may impair insulin sensitivity.
- Cigarette smoking has been linked to increased abdominal fat distribution and greater waist-to-hip ratio that may have an impact upon glucose tolerance.

Medications:

3 medications so far as to be said to be related to DM:

- Drugs that are known to antagonize the effects of insulin:
- Thiazide diuretics,
- Adrenal corticosteroids,
- Oral contraceptives.

Physiologic or emotional stress:

Causes prolonged elevation of stress hormone levels (cortisol, epinephrine, glucagon and growth hormone), which raises blood glucose levels, placing increased demands on the pancreas.

stress: not consider as the risk factors. However now it is proven by researches that people who have stressful lifestyle or having stressful personality are at high risk of having or developing DM.

Prevention

How to prevent it? how do you approach to DM: after listening to all the global statistics to saudi arabia framework of ncd that we discussed in lecture Dm frame work & NCD prevention answer is very systematic how? modifiable factors?
Primary, Secondary, tertiary.
Primary prevention:
Both population and high risk including: reduce weight, physical activity, facilities.
Early intervene: in childhood or adolescence level, the better the outcome.
Promotion of physical activity. Promotion of healthy diet.
smoking cessation: your youth are more in smoking, you have to educate the smokers that this is wrong.
Counseling: individual and population level.

secondary prevention: controlling the disease complains: before that screening diagnose patient with dm the cut of levels and what sort of laboratory investigations are available for screening and identifying diabetic patients,
if you identify them give them medications and regular follow up, loss of follow up will increase pool of prevalence of DM.
uncontrolled diabetes will lead to amputations, renal failure, blindness
they all will end up in the hospital.
DM: what we need at the regional level is prevention and in all these levels. So, there is no area we can spare because it is epidemic.

- **Type 2 diabetes is largely preventable**.

  - Multisectoral, population-based approaches are needed to reduce the prevalence of modifiable diabetes risk factors – such as overweight, obesity, physical inactivity and unhealthy diet – in the general population.

    accompunation of all of these policies along with regulations, changing in environment, raising awareness, all will work together. Putting investment in one strategy leaving the other is not going to work and we have seen that, they have increased failure.

  - A combination of fiscal policies, legislation, changes to the environment and raising awareness of health risks works best for promoting healthier diets and physical activity.
  - Diabetes can be delayed or prevented in people who are overweight and have impaired glucose tolerance (IGT). Diet and physical activity interventions are more effective than medication.

Prevention – type 2 diabetes:

Non modifiable factors	Modifiable factors
genetics	Being overweight or obese
ethnicity	Unhealthy diet
age	smoking
	insufficient physical activity

HEALTHY DIET AND PHYSICAL ACTIVITY:

1. Saturated fatty acid intake - less than 10% of total energy intake (and for high risk groups, less than 7%);
2. Dietary fibre - minimum daily intake of 20 g through regular consumption of whole grain cereals, legumes, fruits and vegetables.
3. Free sugars - less than 10% of total energy intake
4. Further reduction to 5% could have additional health benefits

> If you reduce sugar from total energy, you are taking of 500 you reduce it by 15% there will be drastic decrease in the risk of developing DM.

5. Children and youth aged 5–17 - at least 60 minutes of moderate- to vigorous-intensity physical activity daily.

> And the best way to do that is in school especially in KSA schools there were no policies. But nowadays they declared and we still are waiting for the results

6. Adults aged 18–64 - at least 150 minutes of moderate-intensity aerobic physical activity (for example brisk walking, jogging, gardening) spread throughout the week, or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity activity.
7. Older adults (above 65) - the same amount of physical activity, but should also include balance and muscle strengthening activity tailored to their ability and circumstances

> Because as we grow older muscle and knee joints decrease their resilience.

Prevention – type 2 diabetes:

Population-based prevention	Preventing diabetes in people at high risk. vigorous intervention
A life-course approach to preventing diabetes.	Intensive behavioral interventions for people with IGT
Improving early childhood nutrition.	
Supportive environments for physical activity	
Settings-based interventions	Pharmacological interventions for people with IGT
Fiscal, legislative and regulatory measures for healthy diet	
Education, social marketing and mobilization	

A life-course approach:

1. Taking a life-course perspective is essential for type 2 diabetes prevention.
2. Early in life, when eating and physical activity habits are formed and when the long-term regulation of energy balance may be programmed, there is a critical window for intervention to mitigate the risk of obesity and type 2 diabetes later in life.
3. Recognize the increasing risk that comes with advancing age, and the need to identify the unique needs for risk reduction in older adults.

Improving early childhood nutrition:

Strategies to improve early childhood nutrition aimed at improving maternal health and nutritional status and infant and young child feeding practices, focusing on the first 1000 days from a woman's pregnancy to her child's second birthday.

1. promoting the nutritional well-being of pregnant women;
2. promotion of breastfeeding, including the implementation of the Code of Marketing of Breast Milk Substitutes
3. exclusive breastfeeding up to 6 months of age
4. breastfeeding until babies are 2 years of age or more
5. a variety of safe, nutritious and adequate foods at 6 months of age to complement breastfeeding
6. preventing the consumption of foods that are high in energy, fats, sugars and sodium
7. facilitating physical activity

Breast feeding: those children who didn't breastfeed have 4 relative risk of developing DM type 2 in the adult age.

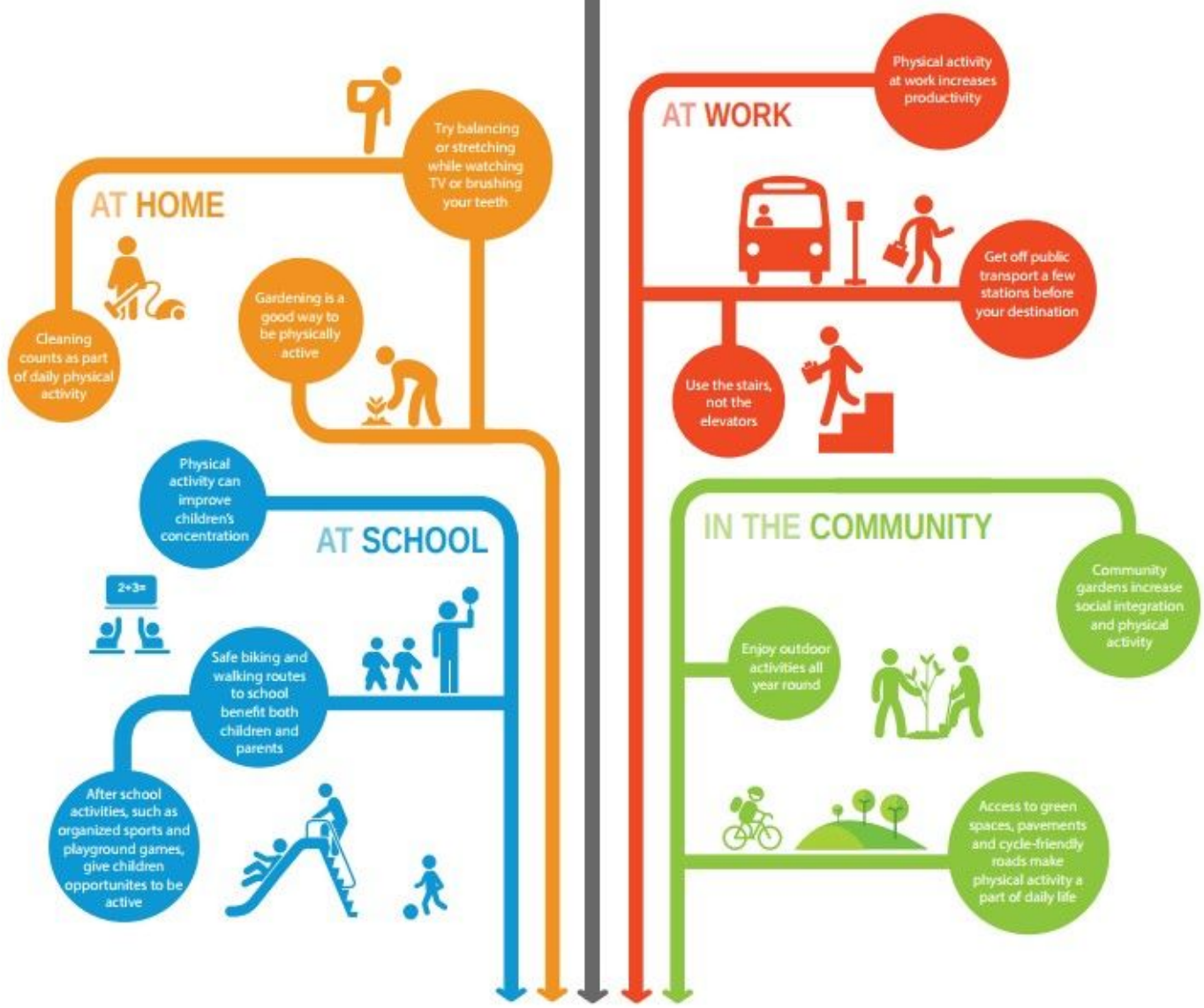## Supportive environments for physical activity:

1. The physical or built environment plays an important role in facilitating physical activity for many people.
2. Urban planning and active transport policies can ensure that walking, cycling and other forms of non-motorized transport are accessible and safe for all.
3. The physical environment can also provide sports, recreation and leisure facilities, and ensure there are adequate safe spaces for active living for both children and adults.
4. The poorest groups in society, especially women, may have less time and fewer resources to participate in leisure-time activity, making policy interventions that target active transport and incidental physical activity throughout the day much more important.
5. Promotion of stair use – including placement of physical activity promotion messages on stairs – as part of a workplace programme has been shown to increase awareness and use of stairs.
6. The sports sector can encourage regular structured activities, especially among children and adolescents, and can strengthen the link between physical activity, sports and health.
7. Partnerships with communities, the private sector and nongovernmental organizations can also contribute to developing facilities for physical activity.

Regulations that women and children & adolescence can go outside and do physical activity.
Also using education, social marketing and mobilization to promote physical activity. Internet is shown to be effective reading information regarding prevention of risk factors. People with glucose intolerance, to be effective in high risk group so to say people who in borderline you need to give them regular intervention rather than just telling them diet is good this diet is not, assure that they are coming to the follow up in the prevention clinic. Behavioral change is very difficult. Social media is very effective to share a preventive message. Like social media campaign for smoking cessation had have an effect in decreasing smoke consumption. Decreasing smoke consumption is leading to decrease of the occurrence of chronic diseases. Breastfeeding until the baby is 2 years and you intervene with food items after 6 month of age. Before 6 months it said that body develops antigens and antibodies and hence the immunity comes down and it is related to development of non communicable diseases.

The chart shows regular physical activity throughout life course. Which unable to live better longer. What is shown is basically, that we are all being involved in some sort of physical activity in our daily routine. Taking steps rather than elevator, taking bus or walking. At home you can involve household work, you can involve gardening, you can involve aerobic or non aerobic.

At school, promotion of physical activity by regular physical activity classes. Playgrounds for kids. In community by bicycling/ going to the park, help in community services, safe environment, helping to clean parks, helping local community members, to have outside gym, this is good example of community mobilization to adapt.

AT HOME

Try balancing or stretching while watching TV or brushing your teeth

Cleaning counts as part of daily physical activity

Gardening is a good way to be physically active

AT WORK

Physical activity at work increases productivity

Get off public transport a few stations before your destination

Use the stairs, not the elevators

Physical activity can improve children's concentration

AT SCHOOL

2+3=

Safe biking and walking routes to school benefit both children and parents

After school activities, such as organized sports and playground games, give children opportunites to be active

IN THE COMMUNITY

Community gardens increase social integration and physical activity

Enjoy outdoor activities all year round

Access to green spaces, pavements and cycle-friendly roads make physical activity a part of daily life

REGULAR PHYSICAL ACTIVITY THROUGHOUT THE LIFE-COURSE ENABLES PEOPLE TO LIVE BETTER AND LONGER LIVES

Settings-based interventions:

That means you provides strategy which is helpful within your own settings. Say for example exercise in your faculties, but you have to have system or it will collapse. . So, something will reinforce all these strategies is the key for success.

Regulations:
1.using tobacco in public is prohibited.
2.If the restaurants don't have the calorie chart when you are buying foods it going to be penalized.
These are example of policies.

Changes in agriculture, farming, introduction of fresh foods, organic vegetables, outer policy level intervene by this where you have your local farms, local people grow this crop, will be in the market, people will be bound to buy them rather than getting can food or frozen strawberries.

Education and social marketing we just talk about that in schools and having playgrounds in neighborhood, promotion of that and campaigns that allow people to utilize these services.

1. Interventions reach families and communities where they live, study, work and play.
2. Should be comprehensive, make use of existing programmes when possible and focus on actions that do not require additional resources.
3. A whole-of-school approach that focuses on improving both diet and physical activity.
4. Successful school-based physical activity interventions should result in consistent improvements in the knowledge, attitudes and behaviour of children and, when tested, in physical and clinical outcomes.
5. Workplace interventions addressing diet and physical activity can be effective in changing behaviours and health related outcomes.
6. Healthy eating messages in cafés and restaurants have been shown to stimulate consumption of healthy food – provided that healthy food items are made available.
7. Workplaces can help develop environments that are conducive to physical activity at work and provide incentives and opportunities for active commuting to and from work.
8. Workplaces may offer their employees free or discounted vouchers for physical activity facilities.

Fiscal, legislative and regulatory measures for healthy diet:

- Fiscal measures
    - Policies that increase the price of foods high in fat, sugar and salt can decrease their consumption.
- Trade and agricultural policies that promote healthy diets
    - in 2000 Fiji banned the supply of high-fat mutton flaps under the Trading Standards Act.
    - Changes in agricultural subsidies to encourage fruit and vegetable production can be beneficial in increasing their consumption and improving diet.
- Regulation of marketing of foods high in sugars, fats and salt.
    - Marketing of foods and non-alcoholic beverages influences children's knowledge, attitudes, beliefs and preferences.
    - Nutrition labelling is a regulatory tool that can guide consumers towards healthier food choices. Nutrition labelling comprises nutrient declarations and supplementary nutrition information

Education, social marketing and mobilization:

- Consumer awareness and knowledge of healthy diet and physical activity can be achieved through sustained media and educational campaigns.
- These campaigns have greater impact and are more cost-effective when used within multicomponent strategies.
- For example, a social marketing campaign in Tonga using netball has resulted in increased participation both in netball and leisure-time physical activity by women.

Preventing diabetes in people at high risk:

—Intensive interventions that change people's diet, increase physical activity and lead to the loss of excess body weight can prevent type 2 diabetes in people with impaired glucose tolerance, with or without impaired fasting glucose.

- Diabetes Prevention Program (DPP) in the USA
- Finnish Diabetes Prevention Study (DPS)
- Chinese Da Qing Study

—These studies showed that active intervention, lasting 2 to 6 years, could have extended benefits for glycaemic and cardiovascular outcomes that last for 10 to 20 years.

—Several pharmacological interventions (for example, metformin and acarbose) have also been shown to prevent or delay type 2 diabetes but, in the majority of studies, this is not as effective as changes in diet and physical activity, and the effect dissipates after discontinuation of the medication.

Criteria for testing for diabetes in asymptomatic adults:

Criteria of testing of diabetes is:

asymptomatic people. You don't know if a person is having symptoms what are we going to do with them?
All those who are overweight or obese should be tested.
First degree relative, family history, history of cardiovascular hypertension.
women with polycystic ovarian syndrome.
physical activity, people who are less active.
Conditions associated with insulin resistance is severe obesity, it should be screened.
Patient with prediabetic should be tested yearly.
Women who are diagnosed with gestational diabetes need to be screened because they are more prone to develop diabetes.
For all patient testing should be ate age of 45 years old
At least tested once at age of 45 the strategy by fasting blood glucose or Hb1Ac

I.   Testing should be considered in overweight or obese adults who have one or more of the following risk factors:
    A.   First-degree relative with diabetes
    B.   History of CVD or Hypertension
    C.   Women with polycystic ovary syndrome
    D.   Physical inactivity
    E.   Conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
II.   Patients with prediabetes should be tested yearly.
III.   Women who were diagnosed with GDM.
IV.   For all other patients, testing should begin at age 45 years.
V.   If results are normal, testing should be repeated at a minimum of 3-year intervals

Global efforts

at the international level. this was the target for year 2020 along with that sustainable development to goals that goes back and forth. 17 goals they are together to reduce all these NCD, by decreasing the risk factors.

Global action plan for the prevention and control of non-communicable diseases 2013-2020

The WHO had nations sign:

GLOBAL ACTION PLAN FOR THE PREVENTION AND CONTROL OF NONCOMMUNICABLE DISEASES 2013-2020

From the goals

- Halt the rise in diabetes and obesity.
- A 25% relative reduction in the overall mortality from cardiovascular diseases, cancer, diabetes, or chronic respiratory diseases

The Sustainable Development Goals (SDGs):

-A collection of 17 global goals set by the United Nations.

-The third goal is : Good health and well being

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Saudi Efforts in preventing and controlling diabetes:

There are multiple sectors serving people with diabetes in Saudi Arabia both in the private and public sectors at primary, secondary, and third level preventions.

Examples:

- Saudi Charitable Association of Diabetes
- The Ministry of Health
- National Guard Health Affairs
- The Saudi Society of Endocrinology and Metabolism[under the umbrella of the Saudi Commission for Health Specialties.]

We will zoom on the most prominent entity, the Ministry of Health.

. Now there are great efforts from ministry of health to support screen to identify and to do population-based strategies to reduce all risk factors, one of them is to base consumption. So, there is programs for diabetes control.

This is in Arabic you can read later on.
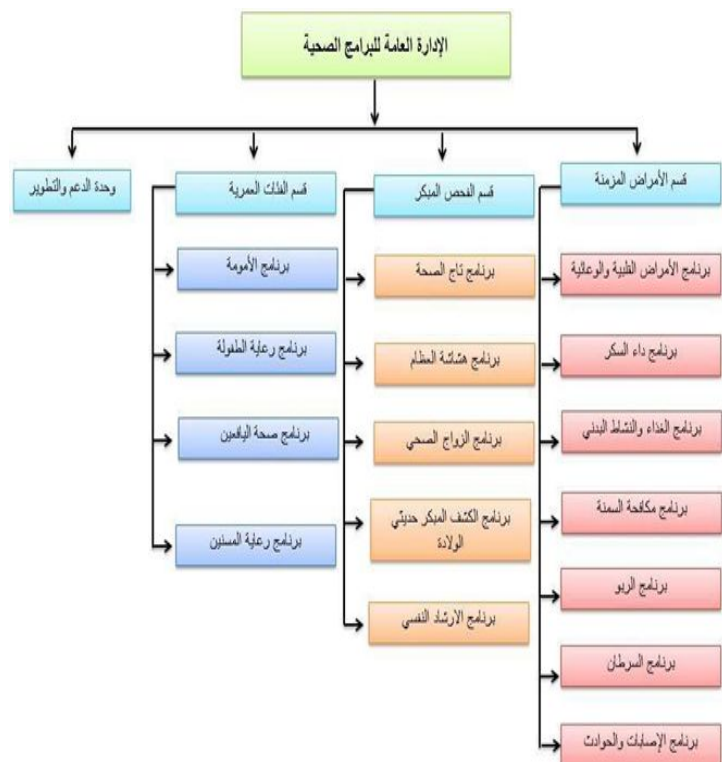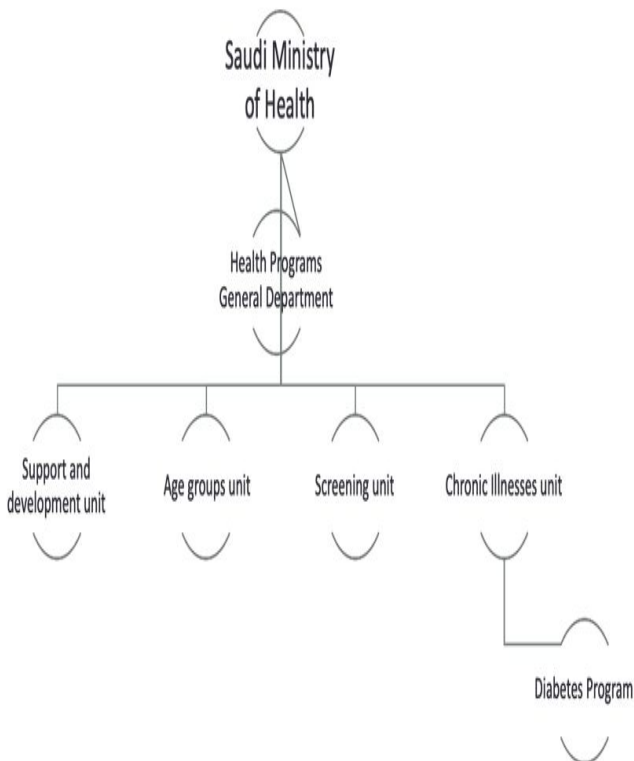
The program's goals:

1. Suggest research pertaining to diabetes
2. Work on creating a national registry for diabetes in Saudi Arabia
3. Suggest collaborations and coordination efforts on a local level, Gulf region level, and international level to achieve set goals.
4. Suggesting preventive and curative diabetes programs, as well as overlook their execution and development.
5. Create sub-committees to follow up on created programs.
6. Study reports form sub-committees, finalize them, and develop recommendations.
7. Take decisions and develop recommendation in issues raised to the program.

The Twitter accounts, researches contains diabetes, work and diabetes in Saudi arabia, and they want to select cooperation with everybody in a local base in gulf region and international region. And they are also tend to achieve the goals of the 2020 for the global for development and control of non-communicable disease. Saudi Arabia is also one of the partners.
What else are they doing? We want to make subcommittees that creates programs and they want to follow it up.

Summary

A metabolic disorder of multiple etiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both. However, Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation.

Types:

Type 1 due to autoimmune b-cell destruction,

Type 2 (90 - 95%) – due to a progressive loss of β-cell insulin secretion frequently on the background of insulin resistance.

Gestational diabetes, drug induced diabetes, endocrine diabetes

Symptoms: Increase frequency of Urine, Specially nocturnal. Increase thirst. Weight loss. Increase appetite. (polyphagia) Blurred vision. Tingling hands and feet., Easy fatigability, Dry skin, Slow healing wounds.

Diagnosis:

Diabetes
Fasting plasma glucose: ≥ 7.0 mmol/L (126 mg/dl) or
2-h plasma glucose: ≥ 11.1 mmol/L (200 mg/dl) or
HbA1c : ≥ 6.5%

Impaired glucose tolerance (IGT)
Fasting plasma glucose: <7.0 mmol/L (126 mg/dl)
and
2-h plasma glucose: ≥ 7.8 and <11.1 mmol/L
(140 mg/dl and 200 mg/dl)

Impaired fasting glucose (IFG)
Fasting plasma glucose : 6.1 to 6.9 mmol/L (110 mg/dl to 125 mg/dl)
2-h plasma glucose: <7.8 mmol/L (140 mg/dl)

Gestational diabetes (GDM)
Fasting plasma glucose: 5.1–6.9 mmol/L (92–125 mgl/dl)
1-h plasma glucose : ≥ 10.0 mmol/L (180 mg/dl)
2-h plasma glucose: 8.5–11.0 mmol/L (153–199 mg/dl)

Age group most affected 60-69. Highest mortality in lower middle income, Both gender running the race together.

Common diabetes complications:

1. **Loss of vision:** retinopathy rates are higher among: people with type 1 diabetes; people with longer duration of diabetes; Caucasian populations; and possibly among people of lower socioeconomic status

2. **End-stage renal disease:** 80% of cases of end-stage renal disease (ESRD) are caused by diabetes, hypertension or a combination of the two.The proportion of ESRD attributable to diabetes alone ranges from 12–55%.

   The incidence of ESRD is up to 10 times as high in adults with diabetes

3. **Cardiovascular events:** 2-3 times higher rate of cardiovascular disease (CVD) than adults without diabetes.The risk of cardiovascular disease increases continuously with rising fasting plasma glucose levels, even before reaching levels sufficient for a diabetes diagnosis.

4. **Lower extremity amputations:** increase 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 nondiabetic populations.

Risk factors:

- **Genetic:** more with type 1
- **Family history:** a family history of type 2 in any first degree relative have a two to three-fold increased risk of developing diabetes.
  The risk of type 2 diabetes is higher (five- to six fold) in those with both a maternal and paternal history.
- **Obesity:** The risk of impaired glucose tolerance (IGT) or type 2 diabetes rises with increasing body weight.

- **Fat distribution:** The incidence of type 2 diabetes are highest in those subjects with central or abdominal obesity,
- **Physical inactivity**
- **Infections:** can cause type 1 diabetes
- **Pregnancy**
- **Diet**: Fruits, vegetables, nuts, whole grains, and olive oil is associated with a reduced risk.
- **Medications**: Drugs that antagonize the effects of insulin: Thiazide diuretics, Adrenal corticosteroids, Oral contraceptives.
- **Physiologic or emotional stress**
- **Smoking**

Prevention

Type 2 diabetes is largely preventable in people who are overweight and have impaired glucose tolerance (IGT). Diet and physical activity interventions are more effective than medication.

- **Healthy diet & physical activity:**
1. Saturated fatty acid intake - less than 10% of total energy intake (and for high risk groups, less than 7%);
2. Dietary fibre - minimum daily intake of 20 g through regular consumption of whole grain cereals, legumes, fruits and vegetables.
3. Free sugars - less than 10% of total energy intake
4. Further reduction to 5% could have additional health benefits
5. Children and youth aged 5–17 - at least 60 minutes of moderate- to vigorous-intensity physical activity daily.
6. Adults aged 18–64 - at least 150 minutes of moderate-intensity aerobic physical activity spread throughout the week, or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity activity.
7. Older adults (above 65) - the same amount of physical activity

Population-based prevention:

- **Fiscal, legislative and regulatory measures for healthy diet**:
  - Fiscal measures: Policies that increase the price of foods high in fat, sugar and salt can decrease their consumption.
  - Trade and agricultural policies that promote healthy diets
    - Changes in agricultural subsidies to encourage fruit and vegetable production
    - Regulation of marketing of foods high in sugars, fats and salt.
    - Marketing of foods and non-alcoholic beverages influences children's knowledge, attitudes, beliefs and preferences.
    - Nutrition labelling can guide consumers towards healthier food choices.
- **Education, social marketing and mobilization**.
- **A life-course approach**
- **Improving early childhood nutrition**
- **Supportive environments for physical activity**
- **Settings-based interventions**

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Intensive interventions that change people's diet , increase physical activity & lead to the loss of excess body weight can prevent type 2 diabetes.

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    E. Conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)

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Good luck!