ANNEXURE 1: CONSENT FORM FOR THE STUDY

Prevalence of vitamin-D deficiency and determinants of vitamin-D status among free-living adult population

I _____ have been fully informed about the purpose of study titled "**Prevalence of vitamin-D deficiency and determinants of vitamin-D status among free-living adult population (30-60 years) of Vadodara city**"

I have understood the implications of the study and I am willing to participate in the study.

Following Bio-Chemical estimations will be done:

1. Blood haemoglobin	2. Fasting Blood Glucose	3. HbA1c
4. hs-CRP	5. Liver profile	6. Lipid profile
7. Kidney profile	8. Serum TSH, T4, T3	9. Vitamin D & Calcium

Protocol for the Study

1. Blood (10 ml) will be drawn once in fasting state, i.e., after a fast of more than 8 to 10 hours.
2. The blood will be drawn by lab technician.
3. Disposable syringes and needles will be used.
4. A copy of report will be provided to you for your future use.

The information that is collected will be kept confidential and no personal information will be revealed to anyone. No remuneration will be provided to the participants to become a part of the study.

_____ _____

Signature of Investigator Signature of the participant

ANNEXURE 2: CONSENT FORM FOR THE STUDY
'Effect of Vitamin D Supplementation on Vitamin D status and Cardio-metabolic profile of Subjects with Type II Diabetes Mellitus'

Study Title

"Effect of Vitamin D Supplementation on Vitamin D status and Cardio-metabolic profile of Subjects with Type II Diabetes Mellitus' is a randomised control trial to be carried out on confirmed diabetic patients with serum vitamin D levels below 20ng/ml.

Principal Investigator

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Head, Department of Foods & Nutrition
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Co-Investigator

Dr. Mona Shah
Consultant Endocrinologist
"Harmony" 5, Vihar Society
Akota. Vadodara
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Person in-charge for collection of information

Arti Muley
Doctoral Student, Department of Foods & Nutrition
Faculty of Family & Community Sciences
M S University of Baroda, Vadodara
(M) 9979895313

Purpose of the study

Diabetes mellitus is one of the main non-communicable chronic diseases and vitamin D deficiency is also recognised as a public health problem around the world. A high prevalence of vitamin D deficiency is reported among the type-2 diabetic subjects. Thus a need is felt to frame vitamin D intervention study and see it effect on improvement of serum vitamin D levels among the diabetic subjects and bring about a positive change in their cardio-metabolic profile to improve the quality of life. The study proposes to provide you vitamin D supplements (granules) in dosage of 60,000 IU to be consumed per week for a period of 2 months.

Benefits and risks

The study will show the extent to which serum vitamin D levels are raised by supplementation (60,000 IU once a week for 2 months) and whether optimal vitamin D status plays a vital role to positively alter the cardio-metabolic profile among the diabetic subjects. By participating in the study you will also know the changes in your vitamin D, glycemic and lipemic status as a copy of the blood reports will be handed over to you after the supplementation.

There is no risk involved as the drawing of blood will be carried out by a trained lab technician and the estimations will be done at an authorised accredited lab. The dose of vitamin D supplementation provided is under the guidance of an experienced

endocrinologist, who will be available in any case of extreme condition if experienced by the subject.

Protocol of the study

1. You will be asked to provide information regarding medical and family history of lifestyle diseases, details of your dietary and physical activity patterns with the help of a questionnaire.
2. Your body measurements (weight, height, waist & hip circumference, body fat and blood pressure) will be taken to assess your nutritional status.
3. You will be provided a sachet of vitamin D granules (60,000 IU) once a week for 2 months which has to be dissolved in a glass of water and consumed.
4. 10ml blood in fasting state will be drawn by a trained laboratory technician at the end of 8 weeks and 16 weeks to estimate the following parameters:

   HbA1c, hs-CRP, Lipid profile (TC, TG, LDL, HDL, VLDL)
   Kidney profile, Liver profile and Serum vitamin D

Costs

The tests, procedures and visits that are a part of this study will cost only your time and travel. There is no financial compensation for your participation in this research, as all the costs incurred on blood tests and vitamin D supplements will be borne by the investigator. You will not be paid for being in this study.

Confidentiality

Your identity in this study will be treated as confidential. Your personal information will not be revealed in any publication or release of results. But the results of the study, including laboratory or any other data, may be published for scientific purposes. If a health condition is detected during this examination, you will be told about it and the information will be given to your doctor or clinic.

Voluntary Consent

Your decision to join in this study is voluntary. You may quit at any time, for any reason, without notice. If you have any questions about any part of the study or your rights as a volunteer, the person in-charge for collection of information will be on hand to answer them before you sign this consent form.

A clearance from the Institutional Ethics Committee of experts has been procured for the study, which will be later reviewing the study results to see if there are clear associations between the conditions.

Participant's statement
I certify that I have read, or had read to me, and that I understand the description of the study. I voluntarily consent to join in this study.

Signature _____ Date _____

ANNEXURE 3: Prevalence of vitamin-D deficiency and determinants of vitamin-D status among free-living adult population

CODE NO: _____ DATE: _____

BACKGROUND INFORMATION

1. Name:
2. Age:
3. Sex: a) male b) female
4. Address:
5. Contact no.: (M) (R)
6. Religion:
   a) Hindu
   b) Muslim
   c) Sikh
   d) Christian
   e) Jain
   f) Other
7. Educational level:
   a) Illiterate
   b) Primary
   c) Secondary
   d) Higher secondary
   e) Graduate
   f) Post graduate
   g) Others
8. Marital status:
   a) Unmarried
   b) Married
   c) Divorcee
   d) Widow/widower
9. Occupation:
   a) Unemployed
   b) Unskilled labour
   c) Housewife
   d) Service (Specify):
   e) Business
   f) Retired
10. Type of family:
    a) Nuclear b) Joint c) Extended
11. No. Of family members:
12. Total family income (monthly): PCI:
13. Menopausal status **(for women subjects)**

FAMILY HISTORY:

Type	Mother	Father	Sibling 1	Sibling 2	Sibling 3	Grandparents
Obesity						
Diabetes						
Hypertension						
CHD						
Hyperlipidemia						
Stroke						
Hypo/Hyperthyroidism						
Asthma						
Cancer						
Any other (Specify)						

MEDICAL HISTORY:

1. Do you go for regular general health checkups? a)Yes b) No

2. If yes, How often?
3. Present medical problems

Sr. N	Medical problem	Date of diagnosis
1	Hypertension	
2	CHD	
3	Hyperlipidemia	
4	Stroke	
5	Hypo/Hyperthytoidism	
6	Asthma	
7	Cancer	
8	Rheumatoid arthritis	
9	Osteoporosis/Osteopenia	
10	Other, specify:	

4. Are you taking any medication presently?
   a) Yes b) No
   If yes specify:

Name of drug	Dosage	Frequency	Date started

5. Any kind of nutritional supplements taken:
   a) Yes b) No
   If yes, specify:

Type of supplement	Dosage	Frequency

6. Did you have any fractures in your life?
   a) Yes b) No
7. If yes, please specify:
   a) No. of fractures:
   b) Site:
   c) Age at which fracture occurred:
8. Significant past illness

Illness	Years

9. Past surgery

Type of surgery	Years

LIFE STYLE:

General habits:

Sr. N	Type	Currently (Frequency)	Past (Frequency)
1	Tobacco		
	Pan		
	Patiki		
	Gutka		
	Patti		
	Cheekni		
	Bidi		
	Cigarette		
2	Alcohol		

If in past, give the reason of giving up habits:

4. What is the skin type (observe):

a) Fair b) Wheatish c) Dark

5. Between 10-3pm how often do you go out and for how long:
   a) Duration:
   b) Frequency:
6. Do you use sunscreen?
   a) Yes b) No
7. If, yes then specify the duration and frequency:

Name of sunscreen	Frequency	Duration	SPF

8. What type of clothing do you prefer to wear when you go out?

DIETARY HABITS

1. What type of diet do you take?

   a) Vegetarian b) Non vegetarian c) Ovo-vegetarian

2. Type of cooking oil purchased:
3. Quantity of cooking oil used per month/ per year:
4. Do you use the same type of oil for the whole year?
   a) Yes b) No
5. If no, duration of changing:
6. How do you use the oil which remains after deep frying?
   a) Again use it for deep frying some other day
   b) Use it in preparing vegetables
   c) Discard it
7. Which milk do you generally use?
   a) Cow b) Buffalo c) Packed (specify) d) Other
8. Number of cups of tea per day
9. Number of cups of coffee per day
10. Brand of salt purchased
11. Quantity of salt purchased in a month:
12. Quantity of sugar purchased per month:

Frequency of consuming the following foods:

	Daily	Weekly	Monthly	Never	Amount
Milk & Fats					
Milk					
Curd					
Cheese					
Paneer					
Lassi/Chas					
Butter					
Pure ghee					
Meat & its products					
Egg					
Fish					
Mutton					
Chicken					
Liver					
Kidney					

ANTHROPOMETRY:

Weight (kg): _____
Height (cm): _____
Waist Circumference (cms): _____
Hip circumference (cms): _____
WHR: _____ WSR: _____ BMI: _____
Body Fat %:_____ BMR: _____
Blood Pressure: Systolic BP (mm of Hg): _____ Diastolic BP (mm of Hg): _____

24 HOUR DIETARY RECALL (one day)

Meal time	Name of the foodstuff	Ingredients	Raw weight (g)	Cooked volume (ml)
Morning				
Mid morning				
Lunch				
Evening tea				
Dinner				

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days.**

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ **days per week**

   ☐ No vigorous physical activities

Skip to question 3

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

   _____ **hours per day** _____ **minutes per day**

   ☐ Don't know/Not sure

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

   _____ **days per week**

   ☐ No moderate physical activities

Skip to question 5

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

   _____ **hours per day** _____ **minutes per day**

   ☐ Don't know/Not sure

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time? _____ **days per week**

   ☐ No walking

Skip to question 7

6. How much time did you usually spend **walking** on one of those days?

   _____ **hours per day** _____ **minutes per day**

   ☐ Don't know/Not sure

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

   _____ **hours per day** _____ **minutes per day**

   ☐ Don't know/Not sure

This is the end of the questionnaire, thank you for participating.

SHORT LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised August 2002.

ANNEXURE 4: Vitamin D status in type II diabetes mellitus

CODE NO: _____ DATE: _____

BACKGROUND INFORMATION

11. Name:
12. Age:
13. Sex: a) male b) female
14. Address:

15. Contact no.: (M) (R)
16. Religion:
    g) Hindu
    h) Muslim
    i) Sikh
    j) Christian
    k) Jain
    l) Other
17. Educational level:
    h) Illiterate
    i) Primary
    j) Secondary
    k) Higher secondary
    l) Graduate
    m) Post graduate
    n) Others
18. Marital status:
    e) Unmarried
    f) Married
    g) Divorcee
    h) Widow/widower
19. Occupation:
    g) Unemployed
    h) Unskilled labour
    i) Housewife
    j) Service (Specify)
    k) Business
    l) Retired
20. Type of family:
    b) Nuclear
    c) Joint
    d) Extended
11. No. of family members:
12. Family Income (monthly): Rs.
13. Per capita income: Rs.
14. Menopausal status **(only for women patients):**

FAMILY HISTORY:

Type	Mother	Father	Sibling 1	Sibling 2	Sibling 3	Grandparents
Obesity						
Diabetes						
Hypertension						
CHD						
Hyperlipidemia						
Stroke						
Hypo/Hyperthyroidism						
Cancer						
Asthma						
Any other (Specify)						

MEDICAL HISTORY:

1. How often do you go for regular general health checkups?
2. Present medical problems

Sr. N	Medical problem	Date of diagnosis

1	Obesity	
2	Diabetes	
3	Hypertension	
4	Chronic Heart Disease	
5	Hyperlipidemia	
6	Stroke	
7	Hypo/Hyperthytoidism	
8	Cancer	
9	Asthma	
10	Rheumatoid arthritis	
11	Osteoporosis/Osteopenia	
12	Other, specify:	

Information regarding Diabetes Mellitus

i. Duration of disease: _____

ii. Precipitating factors:

a) Emotions b) Surgery c) Infections d) Pregnancy d)Trauma
Others (specify)

iii Symptoms

1) Polyuria (freq urination) 2) Polydipsia (↑thirst) 3) Polyphagia (↑ hunger)
4) Neuropathy (loss of sensation) 5) Fatigue 6) Unexplained loss of weight
7) Retinopathy (blurred vision) 8) Slow healing of wounds 9) Oedema
10) Gangrene

5. Treatment followed
   a. Diet modification _____
   b. Drugs (specific) _____
   c. Insulin (specific)_____
   d. Combination therapy (specific) _____

Other Information

6. Are you taking any medication presently?
   a) Yes b) No
   If yes specify:

Name of drug	Dosage	Frequency	Date started

7. Any kind of nutritional supplements taken:
   a) Yes b) No
   If yes, specify:

Type of supplement	Dosage	Frequency

8. Did you have any fractures in your life?
   a) Yes b) No
9. If yes, please specify:
   a) No. of fractures:
   b) Site:

c) Age at which fracture occurred:

10. 11.Past surgery

Type of surgery	Years

LIFE STYLE:

General habits:

Sr. N	Type	Currently (Frequency)	Past (Frequency)
1	Tobacco		
	Pan		
	Patiki		
	Gutka		
	Bidi		
	Cigarette		
2	Alcohol		

If in past, give the reason of giving up habits:

6. What is the skin type (observe):
   b) Fair b) Wheatish c) Dark
7. Between 10-3 pm how often do you go out and for how long:
   c) Duration:
   d) Frequency:
8. Do you use sunscreen?
   c) Yes d) No
9. If, yes then specify the duration and frequency:

Name of sunscreen	Frequency	Duration	SPF

10. What type of clothing do you prefer to wear when you go out?

<u>DIETARY HABITS</u>

1. What type of diet do you take?
   b) Vegetarian b) Non vegetarian c) Ovo-lactarian
2. Type of cooking oil purchased:
3. Quantity of cooking oil used per month/ per year:
4. Do you use the same type of oil for the whole year?
   a) Yes
   b) No
5. If no, duration of changing:
6. How do you use the oil which remains after deep frying?
   a) Again use it for deep frying some other day
   b) Use it in preparing vegetables
   c) Discard it
7. Which milk do you generally use?
   a) Cow b) Buffalo d) Packed (specify) e) Other (specify)
8. Number of cups of tea/coffee per day: _____
9. Brand of salt purchased: _____
10. Quantity of salt purchased in a month:_____

11. Quantity of sugar purchased per month:_____
12. Frequency of consuming the following foods:

	Daily	Weekly	Monthly	Never	Amount
Milk & Fats					
Milk					
Curd					
Cheese					
Paneer					
Lassi/Chas					
Butter					
Pure ghee					
Meat & its products					
Egg					
Fish					
Mutton					
Chicken					
Liver					
Kidney					

24 HOUR DIETARY RECALL (one day)

Meal time	Name of the foodstuff	Ingredients	Raw weight (g)	Cooked volume (ml)
Morning				
Mid morning				
Lunch				
Evening tea				
Dinner				

ANTHROPOMETRY:

1. Weight (kg): _____
2. Height (cm): _____
3. Waist Circumference (cms): _____
4. Hip circumference (cms): _____
5. Waist Hip ratio: _____ WSR: _____ BMI: _____

BIOPHYSICAL MEASUREMENTS:

1. Body Fat %:_____
2. BMR: _____
3. Pulse:_____ Peripheral pulse:_____ Femoral pulse: _____
4. Blood Pressure: Systolic BP (mm of Hg): _____ Diastolic BP (mm of Hg): _____

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days.**

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ days per week

   ☐ No vigorous physical activities

Skip to question 3

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

   _____ hours per day _____ minutes per day

   ☐ Don't know/Not sure

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

   _____ days per week

   ☐ No moderate physical activities

Skip to question 5

5. How much time did you usually spend doing **moderate** physical activities on one of those days?

   _____ hours per day _____ minutes per day

   ☐ Don't know/Not sure

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time? **_____ days per week**

   ☐ No walking

Skip to question 7

6. How much time did you usually spend **walking** on one of those days?

   _____ hours per day _____ minutes per day

   ☐ Don't know/Not sure

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

   _____ hours per day _____ minutes per day

   ☐ Don't know/Not sure

ANNEXURE 5: Compliance sheet for vitamin-D supplementation

CODE NO: _____ DATE: _____

Name of the subject:

COMPLIANCE FOR VITAMIN-D SUPPLEMENTATION

Date and day of initiation:

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8

Signature of the participant: _____

Appendice 1: Nutrition Health Education Material

Vitamin-D and Type-2 Diabetes Mellitus: A lifestyle Management Approach

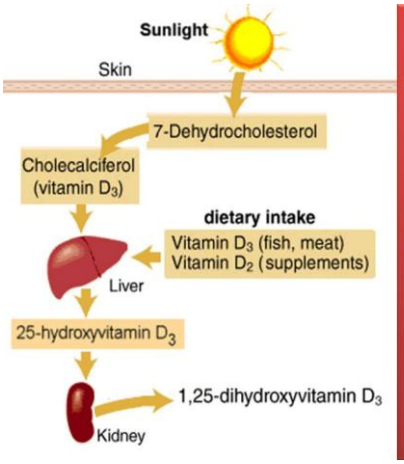
Developed by: Arti Muley & Prof. Uma Iyer

Department of Foods And Nutrition,
Faculty of Family and Community Sciences,
The Maharaja Sayajirao University of Baroda
Vadodara – 390002

Know about Vitamin-D

- Vitamin D is also called the '*sunshine vitamin*' and is a group of fat-soluble vitamins.
- Vitamin D was discovered as the factor in cod-liver oil that prevented rickets in children in the early 20th century.
- D_3 (cholecalciferol) and D_2 (ergocalciferol) are its two major biological precursors.
- Vitamin D has now evolved as an hormone having numerous non-skeletal effects by its action to regulate up to 2000 genes.

Arti Muley & Uma Iyer, 2014



Vitamin-D Metabolism in the Body

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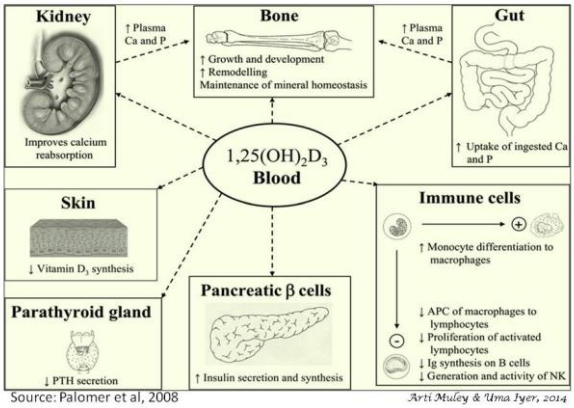
Major targets & actions of Vitamin D



Source: Palomer et al, 2008

Arti Muley & Uma Iyer, 2014

Sources Of Vitamin D

Source	Content
Cod liver Oil	400-1000 IU/tsp
Egg yolk	20 IU/yolk
Mackerel, canned	250 IU/ 100 g
Salmon, canned	300-600 IU/ 100 g
Sardines, canned	300 IU/ 100 g
Sunlight/UVB radiations	3000 IU on exposure of arms & legs to 0.5 Minimal Erythema Dose (MED) for 10-15 mins
Fortified foods like breakfast cereals, milk, cheese, yogurt	Around 100 IU per serve
Multivitamins	400, 500, & 1000 IU
Vitamin D3 supplements	400, 800, 1000, 2000, 10000, 14000 & 50000 IU

Source: Holick MF, 2007 *N. Engl. J. Med*

Arti Muley & Uma Iyer, 2014

Classification of Vitamin D Status

- Toxic >150ng/mL
- Excessive >100ng/mL
- Sufficient >30-100 ng/mL
- Insufficient 20-30 ng/mL
- Deficient <20ng/mL

Proposal for staging VDD	
Serum 25(OH)D	Stages
10-20 ng/ml	Mild VDD
5-10 ng/ml	Moderate VDD
<5 ng/dl	Severe VDD

To convert ng/ml to nmol/L multiple by factor 2.5

Source: Lips, 2001 *Endocrine Reviews*

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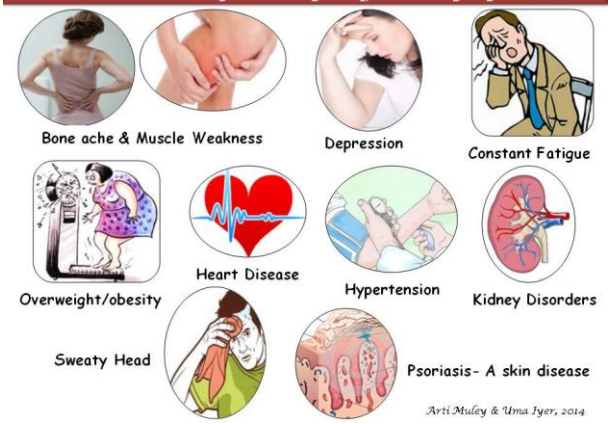
Vitamin-D Deficiency: Signs & Symptoms



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Who is at increased risk of VDD?

Elderly people

People aged 50-80 synthesize 1/3rd Vitamin-D as a person aged 22-30 after the same sun exposure

Darker skin types

- Melanin acts as an excellent sunscreen
- An Asian Indian requires 3 times the exposure to sun than fair person to produce equivalent amount of vitamin D

Geographical Location

Above and below latitudes of approx 33 °, vitamin D synthesis in skin is very low or absent for most of the year

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Who is at increased risk of VDD?

Medication

Glucocorticoids, anti-seizure or AIDS medications

Malabsorption

- Inflammatory bowel disease, Celiac disease
- Cystic fibrosis, Pancreatic insufficiency

Obese people

Vitamin D stored in sub-cutaneous fat is not easily released in circulation

Clothing coverage & Sunscreen

Sunscreen blocks UVB more than UVA

SPF-8 reduces production of pre-vitamin D by 95% & SPF-15 by 99%

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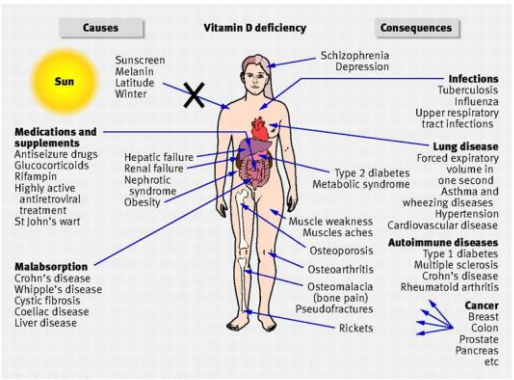
Causes & Consequences Of VDD



Holick et al, **2011** J. Clin. Endocrinol. Metab.

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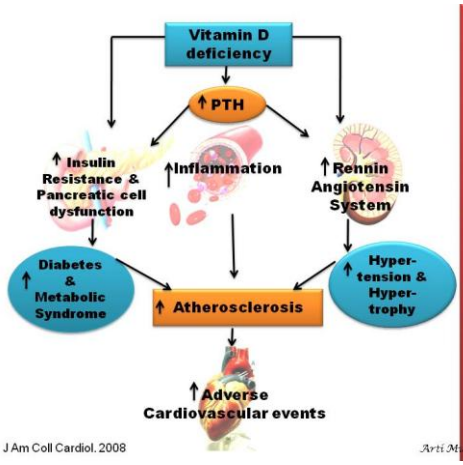

J Am Coll Cardiol. 2008

Arti Muley & Uma Iyer, 2014

Potential Links of Diabetes & CVD to Vitamin D Deficiency

What is Diabetes Mellitus?

Diabetes is a chronic disease, which occurs when the pancreas do not produce enough insulin, or when the body cannot effectively use the insulin it produces.

Type 1 diabetes (insulin-dependent or childhood-onset diabetes) is characterized by a lack of insulin production.	Type 2 diabetes (non-insulin-dependent or adult-onset diabetes) is caused by the body's ineffective use of insulin.	Gestational diabetes is hyperglycaemia that is first recognized during pregnancy.

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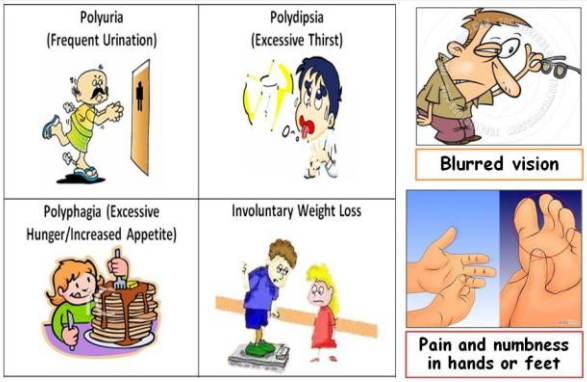
T2DM: Signs and Symptoms



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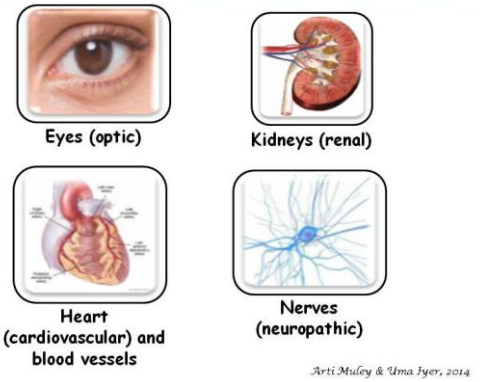
Possible complications in Type-2 Diabetes



Arti Muley & Uma Iyer, 2014

Management: ABCD Of Diabetes

	Good	Fair	Poor
HbA1c (%)	<6.0	<7-8	>8.0
Blood pressure (mm Hg)	<120/80	<130/85	>130/85
Total cholesterol (mg/dl)	<180	<200	>200
LDL (bad) cholesterol (mg/dl)	<100	<130	>130
HDL (good) cholesterol (mg/dl)	>45	>40	<40
Plasma triglyceride (mg/dl)	<150	<180	>180

Arti Muley & Uma Iyer, 2014

Management: Two more important B's

Blood sugar levels

	Glucose in mg/dl
Fasting Blood Sugar (FBS)	≥126
Post Prandial Blood Sugar (After meals)	≥200

FBS	Normal	Borderline	Confirmed Diabetes
	100	125	>126

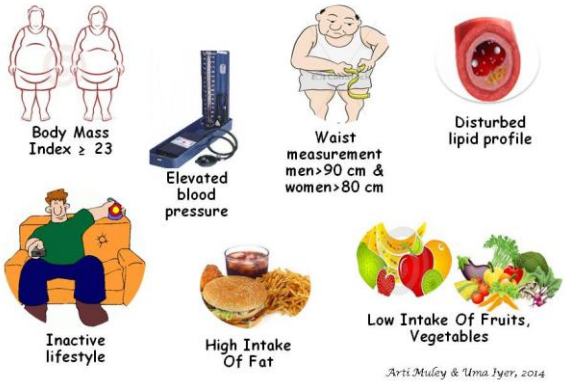
Body Mass Index (BMI)

Generalized Obesity		Abdominal Obesity	
Normal	18-22.9	Men	WC ≥ 90 cm
Overweight	23-24.9	Women	WC ≥ 80 cm
Obesity	≥ 25		

WC=Waist circumference

Arti Muley & Uma Iyer, 2014

T2DM: Modifiable risk factors



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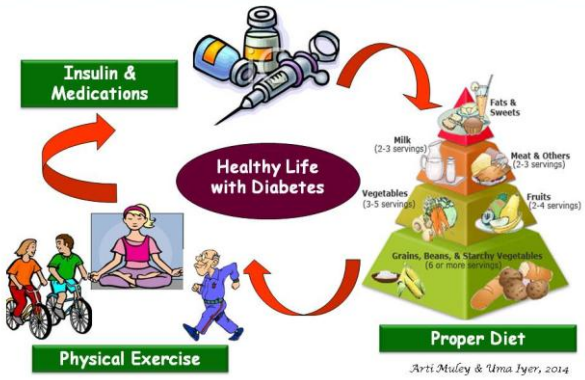
Points to remember



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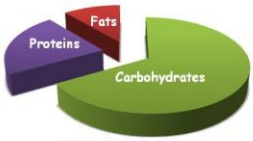
Dietary Guidelines

Carbohydrates	Protein	Fats
55-60% of total calories	20-25% of total calories	15-20% of total calories



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Dietary Fibre

- Consume high fiber foods such as legumes, whole-grain products, fruits and vegetables
- Choose whole fruits more often than fruit juice
- Start the day with a whole grain breakfast cereal
- 30-40 g/day preferably from natural sources

Sources of Fibre

Cereals like wheat, jowar, bajra, ragi, maize
Legumes & dals like beans, lentils, peas, whole grains
Fenugreek seeds, nuts and fruits

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Whole Grains

Replace maida, suji with whole wheatflour, multigrain flour
Consume at least half of all grains as whole grains, pulses

Grain Products To Avoid	Grain Products to choose
Maida/Suji	Whole wheat flour
White bread	Whole grain / multigrain bread
Noodles	Oatmeal
Biscuits / Bakery goods	Ground flaxseed
	Brown rice
	Barley
	Pulses

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Proteins and Dairy Products

- Protein 1 g/kg body weight.
- Incorporate legumes, soyabean that are an excellent source of soluble fibre, plant sterols.
- Choose a mix of cereals, millets, pulses
- Sprout legumes
- If meat is consumed, extra lean meat should be the choice. Eat fatty fish twice at least per week if religion permits

Increase intake of fat-free or low-fat milk and milk products
Use low fat milk when preparing desserts

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Fats and Oils

Type of fat	Recommendation
Total fat	Less than 20-25% of total daily calories
Saturated fat	Less than 7% of total daily calories
Trans fat	Less than 1% of total daily calories
Cholesterol	Less than 200 mg/d for adults with high levels of LDL -C or those who are taking cholesterol-lowering medicines

Healthy Practices

- Cook with minimum oil.
- Avoid foods high in trans-fats.
- Avoid re-use of cooking oils.
- Avoid ghee, butter, whole milk & cream in food preparation.
- Cooking oil: 0.5 kg/month/person

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Oil Blends

Cooking Oil Combinations
Groundnut/Seasame/Rice bran + Mustard
Groundnut/Seasame/Rice bran + Canola
Groundnut/Seasame/Rice bran + Soyabean
Palmolein + Soyabean
Safflower/ Sunflower + Palmolein + Mustard
Sunflower / Safflower + Palmolein / Olive
Safflower / Sunflower + Groundnut /Seasame/ Rice bran

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Tips For Healthy Eating

Avoid/ Restrict	· Sugar items. · Use of artificial sweetners in limited quantity
Use Sparingly	· Fermented foods, Ragi, Rice, refine flours, fats
Use Moderately	· Snacks with cereal-pulse, cereal-pulse-veg. Minimum processing and having less fat
Use Liberally	· Whole grains, Cereals-Pulses, Fruits and Vegetables

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Lifestyle changes: Sun Exposure

- Sunlight is the most abundantly available natural source of vitamin-D
- When full body is exposed to sun, enough to induce a slight pinkness, probably between 10,000-25,000 IU of vitamin D is produced in the body.
- Cutaneous vitamin D synthesis is maximum between 10 AM-3 PM.
- Try to do daily activities like reading, gardening, exercising or housewhole work in sunlight.
- Avoid the use of sunscreens or covering your body with sun coats

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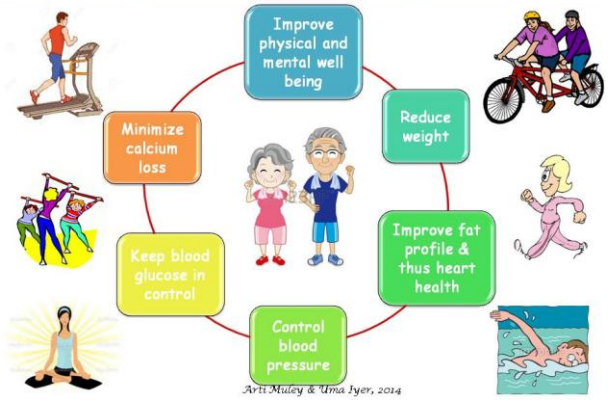
Physical Exercise helps to...



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Remember while exercising...

1. Feet should be inspected daily (before and after exercise) for cuts, blisters and infections
2. Exercise should be avoided in extreme hot and cold weather conditions
3. The exercise program should start slowly, build up gradually
4. Include exercises that you are familiar with
5. Always carry quick acting carbohydrate to be used in the event of hypoglycemia

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