Collaborating to defeat Diabetes

WDF FOGSI GOI AVNI FIGO

Better Together

TRAINEES/TRAINERS HANDBOOK

Counselling, Testing and Management of Hyperglycemia in Pregnancy (HIP)/ Gestational Diabetes Mellitus (GDM)

2020

I am truly delighted to know that Hyperglycemia in Pregnancy (HIP) program in India which took roots during my Presidential years (2015 – 2018) at The International Federation of Gynecology and Obstetrics (FIGO) has made tremendous progress so far.

I am thankful to the partners of this joint initiative namely; the Government of India (GoI) – Ministry of Health and Family Welfare (Maternal Health Division), World Diabetes Foundation, The International Federation of Gynecology and Obstetrics ,The Federation of Obstetrics and Gynaecological Societies of India, Avni Health Foundation, and the six Medical colleges and Private Medical Centers in Uttar Pradesh, Maharashtra, Karnataka.

I also compliment the national core technical team comprising of Dr Sanjay Gupte, Dr Meera Agnihotri, Dr Vinita Das, Dr Girija Wagh, Dr Savitha, Dr Amita Pandey, Dr Srinivas, Dr Thelma Sequeira ably led by Mr Ajey Bhardwaj and Dr Hema Divakar for releasing this handbook, which gives an overview to HIP and comprehensively covers the topics related to Medical Nutrition Therapy, Exercise, Antenatal, Intrapartum and Postpartum care for pregnant women with HIP, Counselling, Testing and Management of Hyperglycemia in Pregnancy.

In twelve months since the program began the team has done a wonderful job, 466 doctors/nurses/lab technicians have been trained, together they have tested 20,000 pregnant women, identified and managed 1200 HIP women.

I wish this critical program continued expansion and success.

Prof. (Dr.) C. N. Purandare,

MD, MA Obst. (IRL),DGO,DFP, DOBST.RCPI(Dublin), FFIGO, FRCOG(UK), FRCPI (Ireland), FACOG (USA), FSLCOG (SL), FTAOG (Tw), FEBCOG (EU), FDGGG (GER), FEMAO&G(UAE),FAMS, FICOG,FICMCH, PGD MLS (Law)
Hon. Membership Romanian, Colombian and French (CNGOF) ,
President FIGO (2015-2018)
Emeritus Dean Indian College of Obstetricians and Gynaecologists
President, FOGSI (2009)
President Indian College of OB GYN (2009)
Professor Emeritus O&G Research institute Ministry of Health Russian Federation
Editor Emeritus Journal-FOGSI
Ex. Hon. Prof. OBGYN, Grant Medical College & J J Hospital, Mumbai
Hon. Consultant, Mumbai Police
Hon. Consultant Saifee Hospital & BSES Hospital, Mumbai
Visiting Consultant St. Elizabeth Hospital Mumbai
Consultant obstetrician & Gynaecologist Purandare Hospital, Mumbai India

I congratulate and feel very proud of the contributions made by FOGSI team that is leading the "capacity building initiative" under the grant received by World Diabetes Foundation (WDF). This will help the teams in the private and public sector hospitals to detect and manage diabetes in PREGNANCY more confidently and with competency.

This training document guides and supports this endeavor. It is a simple ready to refer handbook for the health care providers in India and South Asia as per the FIGO FOGSI GOI guidelines. I am sure that this step towards implementation will go a long way in averting the short term and long term catastrophes of NCDs in the present and future generations.

I applaud the efforts of Dr Hema Divakar, the national convener and Ajey Bhardwaj the national manager in steering ahead the initiative to its meaningful finish.

Best wishes

Dr Nandita Palshetkar
President FOGSI

Dr. Hema Divakar

Mr. Ajey Bhardwaj

MESSAGE

India has more than 62 million diabetic individuals[1],[2] and according to Wild et al.[3] the prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030, affecting up to 79.4 million individuals in India. As of 2010, there were approximately 22 million women in the age group of 20 – 39 living with diabetes & an additional 54 million women in this age group with impaired glucose tolerance (IGT) or pre-diabetes have a likelihood of developing Gestational Diabetes Mellitus/ Hyperglycemia in Pregnancy (GDM/HIP) if they become pregnant. GDM/HIP in India is estimated to be in the range of 10-14.3%. The incidence of GDM/HIP is expected to increase to 20% i.e. one in every 5 pregnant women is likely to have GDM/HIP [4]. GDM/HIP, with its long-term implications of obesity, diabetes and cardiovascular disease on the offspring will contribute to this epidemic as it has a major trans-generational impact to perpetuate diabetes.

Women develop high blood sugar as a consequence of the stress of pregnancy and their inability to increase insulin secretion to compensate for the high demand. This has harmful effects on the mother and the unborn baby resulting in worsening of maternal and new born outcomes. Thus, women with GDM/HIP are more prone to get pregnancy induced hypertension and preeclampsia a major cause of maternal deaths and preterm deliveries. Women with GDM/HIP have large babies leading to obstructed labor or shoulder dystocia requiring expert supervision of the delivery or cesarean delivery; prolonged labor and assisted delivery increases risk for postpartum hemorrhage (PPH) and high risk of infections the other major cause of maternal morbidity. There is also a high risk of abortions, still births and preterm births in women with GDM/HIP. Apart from birth injuries the babies born to women with GDM/HIP are at great risk of respiratory distress and hypoglycemia requiring intensive care for survival.

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[1] Joshi SR, Parikh RM. India - diabetes capital of the world: now heading towards hypertension. J Assoc Physicians India. 2007;55:323–4. [PubMed]

[2] Kumar A, Goel MK, Jain RB, Khanna P, Chaudhary V. India towards diabetes control: Key issues. Australas Med J. 2013;6(10):524–31. [PMC free article] [PubMed]

[3] Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes-estimates for the year 2000 and projections for 2030. Diabetes Care. 2004;27(3):1047–53. [PubMed]

[4] Health and family welfare statistics 2013, National family health survey 3, Government of India annual reports 2013, GoI guidelines on the diagnosis and management of diabetes mellitus, December 2014.

Government of India – Ministry of Health and Family Welfare (GOI) programs like Janani Suraksha Yojana and Janani Shishu Suraksha Karyakram (both cash benefits to the women and child) programs brought about a significant increase in institutional deliveries (>73% of deliveries in India currently take place in a health facilities) presenting us a unique opportunity to provide the much needed healthcare services. Further Comprehensive emergency obstetric care, basic emergency obstetric care, Skill birth attendant, LaQshya and Dakshata training programs have been strengthening the service providers to help the pregnant women through the continuum of conception to post delivery.

GDM/HIP program is a joint initiative of the Government of India (GoI) – Ministry of Health and Family Welfare (Maternal Health Division), World Diabetes Foundation, International Federation of Gynecology and Obstetrics, The Federation of Obstetrics and Gynaecological Societies of India, Avni Health Foundation, participating Medical colleges and Private Medical Centers with a broad objective to support the broad strategic direction for improving maternal and newborn health by initiating and scaling up the implementation of GDM/HIP program and contribute towards the improved maternal and infant outcomes using the GOI-GDM/HIP guidelines of 2018.

Empowering doctors, nurses, auxiliary nurse midwife, and laboratory technician for improved Maternal and New-born Healthcare during pregnancy induced hyperglycemia is a strategic initiative to strengthen quality of pre, intra and postpartum care for women having GDM/HIP in our Country.

We are pleased to present to you the Handbook, researched and prepared by the National Core Technical Team comprising of Dr Amita Pandey, Dr Vinita Das, Dr Meera Agnihotri, Dr Savitha, Dr Srinivas, Dr Sanjay Gupte, Dr Girija Wagh, Dr Thelma Sequeira, Mr Ajey Bhardwaj and myself with our teams. The handbook comprehensively covers the topics related to Counselling, Testing and Management of Hyperglycemia in Pregnancy (HIP)/Gestational Diabetes Mellitus (GDM).

Best Wishes..

Dr Hema Divakar
National Program Lead

Mr. Ajey Bhardwaj
National Program Manager

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GALLERY

World Leaders Speak!

Prof. Moshe Hod *Chairman FIGO's Hyperglycemia in Pregnancy Working Group.*

"The key focus areas of the Pregnancy and NCD Committee will be on **Prediction and Prevention of Pregnancy Complications as a consequence of common NCDs and the Life Course Approachto NCD Prevention** " says Prof.. Moshe Hod

Pregnancy, in particular the first trimester, will receive substantial attention but with other crucial points of intervention – e.g. pre-conception and postpartum also getting their fair share of attention.

Non communicable maternal conditions with the greatest potential for causing pregnancy complications and fetal origins of NCDs such as Malnutrition, Anemia, Overweight and Obesity, Hyperglycemia, Hypertension, Thyroid disorders, Environmental pollution and Smoke (household,environmental and tobacco smoking) and Gender Violence and Mental Health will form the basis for action for this committee.

Thus, Pregnancy will be in the center with specific points of entry at:

Pre – pregnancy (already with NCD)

Pregnancy – as early as possible but focusing on the **1st Trimester** and throughout gestation.

Post- Pregnancy for mother and offspring with links to major Health organizations: Neonatologists, Pediatricians, Family Physicians and others related to morbidities (Diabetes, Cardiovascular, other). Leading towards Prevention of NCD for Mother and Offspring.

The committee will promote awareness and action on other components of the **life course prevention of NCD risk such as teenage pregnancy and access to contraception, girls' education, interpregnancy interval and breastfeeding support**.

Prof. Moshe Hod is a Professor of Obstetrics and Gynecology at the Sackler Faculty of Medicine, Tel-Aviv University, Israel and serves as a Chief Consultant in Perinatal Medicine to Clalit Health Services (HMO) and as the Director of Mor Women's Health Center, Tel Aviv. Prof. Moshe Hod is the immediate past President of the European Association of Perinatal Medicine (EAPM). Prof. Moshe Hod is a member of the Executive Board of the International Federation of Obstetrics and Gynecology (FIGO) as well as the Chairman of FIGO Pregnancy and NCD Committee.

Anil Kapur *MD Chairman World Diabetes Foundation and member FIGO Pregnancy and NCD Committee*

***The inextricable link between maternal health and non-communicable diseases should be a public health priorityand requires immediate attention …* says Dr Kapur**

Non communicable diseases are high on the global development and health agenda and a third High Level Meeting of the UN General Assembly on Prevention and Control of NCDs took place in New York in September this year.

135 million pregnancies resulting in live births globally every year, an estimated 21 million are impacted by hyperglycemia, about 7-8 million by hypertension, about 42 million by maternal overweight and obesity, 26 million by maternal undernutrition and 56 million by maternal anemia. Not only do these conditions increase the risk of adverse pregnancy outcomes and increase perinatal morbidity and mortality but they also identify both the mother and the offspring at being at very high risk of future for diabetes, obesity, hypertension, cardiovascular disease and strokes.

FIGO has in the last several years made impressive efforts to highlight this important issue starting with the initiatives on hyperglycemia in pregnancy (HIP) and adolescent and maternal nutrition. This has led to development of well received pragmatic guidelines on both issues. The FIGO advocacy efforts led to several regional declarations on HIP and a FIGO and IDF Joint Statement and Declaration on HIP at the IDF World Congress in Abu Dhabi in 2017. Culmination of all these efforts was the adaption and signing of FIGO Global Declaration at the recently concluded FIGO World Congress in Rio de Janeiro on 15th Oct 2018.

FIGO's position on the issue is very clear

Maternal and child health is inextricably linked with non-communicable diseases and their risk factors, specifically such as prenatal malnutrition and low birth weight create a predisposition to obesity, high blood pressure, heart disease and diabetes later in life, and that pregnancy conditions, such as maternal obesity and gestational diabetes, are associated with similar risks in both the mother and her offspring.

Maternal malnutrition, obesity and hyperglycemia in pregnancy are significant public health challenges with adverse impact on maternal, newborn and child health and have significant implications for future burden of obesity, type 2 diabetes and cardio metabolic disorders globally.

Pregnancy offers a unique opportunity to integrate maternal and child health services with health promotion and NCD prevention thereby providing a bridge to create more integrated services at the primary care level.

Any efforts on NCD prevention and control must therefore begin with and substantially focus on preconception and maternal health.

This approach has received support from several other organizations such as the NCD Alliance, IDF, Women Deliver, World Diabetes Foundation, Jhpeigo etc.

Professor David McIntyre *Chair of Research Subcommittee*

Research priorities in Hyperglycemia in Pregnancy

Hyperglycemia in pregnancy is recognized as a major underlying cause of pregnancy complications and a contributing cause to health risks throughout the subsequent life of both mothers and babies, with amplification of the current global epidemic of non-communicable diseases.

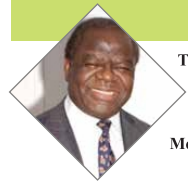
Although some aspects of these associations are well described, detailed understanding of the underlying basic mechanisms is lacking. Improved fundamental scientific knowledge must be developed to allow logical strategies for prevention and treatment.

During pregnancy, much work is required to replace current empirical approaches to diagnosis and treatment of HIP with evidence - based protocols, pragmatically adapted to differing health care and health economic contexts.

Detailed and pragmatic research is required to develop a life cycle approach to Hyperglycemia in Pregnancy, dealing both with the risk of immediate pregnancy complications and later health risks to mother and baby.

Effective strategies must be developed and implemented across a wide range of health care environments

Prof Isaac Manyonda *BSc PhD MRCOG FICOG*



The Potential Role for Myoinositol in the Prevention of Gestational Diabetes Mellitus.

In humans, four small randomized trials have demonstrated that myoinositol supplementation can lead to more than a 50% rate reduction in GDM compared with placebo. We now need a large, multicentered randomized controlled trial to demonstrate whether myoinositol has not only the promised impact on GDM rates, but also an effect on important secondary outcomes intricately linked to GDM, such as birth weight and neonatal intensive care unit admission…. Says Prof Manyonda.
In the capacity of research associate and Scientific director of ARTIST, he is presently guiding a multicentric research initiative on the use of myodichiroinositol in primigravidae

Isaac Manyonda is a Professor of Obstetrics & Gynaecology at St George's University of London, and Consultant Obstetrician and Gynaecologist at St George's University Hospitals NHS Trust.

National Core Technical Team Meeting, HIP/GDM training at various centers/Advocacy initiatives.












National Core Technical Team Meeting, HIP/GDM training at various centers/Advocacy initiatives.













HYPERGLYCEMIA IN PREGNANCY (HIP) INDIA

…. A joint initiative by ….

World Diabetes Foundation – The Federation of Obstetrics & Gynaecological Societies of India - The International Federation of Gynecology and Obstetrics - Government of India, Ministry of Health and Family Welfare - Avni Health Foundation

Program Goals

- Build capacities of health care providers
- Set up DIP clinics for service delivery
  - in the public and private sector
  - to practice universal testing and comprehensive management of Hyperglycaemia In Pregnancy(HIP)
  - integrated within current maternal and child health (MCH) services
- Improve identification and management of HIP cases
- Improve obstetric and perinatal outcomes in the short and long term
- A generic, universally applicable, comprehensive, competency-based Learning Resource Package is ready

Program Partners

- World Diabetes Foundation (WDF)
  - part funding the HIP project, technical & monitoring support, advocacy
- The Federation of Obstetrics and Gynaecological Societies of India (FOGSI)
  - on ground partner - responsible for program implementation, funds management, part financial contribution, and program monitoring, advocacy

Program Partners

- Maternal Health Division - Ministry of Health and Family Welfare, Government of India (GOI)
  - administrative support, part funding, supplies, training facilities, issuance of guidelines and financial norms, advocacy, nomination of service providers
- The International Federation of Gynecology and Obstetrics (FIGO)
  - technical contribution, monitoring, advocacy, lead organization to take this work to affiliate countries

Program Partners

- The Avni Health Foundation (AHF)
  - program planning, management, implementation, financial management and operational support and part funding
  - work with key stakeholders and donors for program scaleup. HIP software development/ deployment and maintenance support.
- Ministry of Health and Family Welfare, State Governments
  - administrative support, part funding - supplies, training facilities, issuance of guidelines and financial norms, advocacy
  - Nomination of trainees and trainers
- Implementing Centers
  - program implementation as per plan, reporting

Beneficiaries

- Pregnant women and their families
- Healthcare providers (Obs-Gyn & paediatric dept. consisting of medical officers, staff nurses, lab technicians, obstetricians, gynaecologists, endocrinology dept, nutrition dept)
- State, Country
- FIGO, WDF and their affiliates

Program Sites

- 06 sites – Lucknow, Kanpur, Pune (2), Bengaluru (2)
- Site Leaders – Dr Sanjay Gupte, Dr Girija Vyas, Dr Vinita Das, Dr Meera Agnihotri, Dr Hema Divakar, Dr Savitha/Dr Srinivas

Program Master Trainers/Assessors

- Site leaders
- FOGSI champions drawn from a pool of those who have completed ICOG/FOGSI GDM certificate course
- 06 Center nominees

Program Trainees/Service Providers

- All team members at the facilities
  - Doctors (OBGYNs, Pediatricians, Endocrinologists), Nutritionists, Accredited Health Social Activists, Auxiliary Nurse Midwives, Nursing Staff, Lab technicians, Medical Officers.

GDM Reference Guides/Posters/GDM card - GOI

GDM guidelines have been endorsed by

- The Maternal Health Division of the Ministry of Health and Family Welfare Government of India[1,2] - **National Guidelines** for the Diagnosis and Management of Gestational Diabetes Mellitus released in 2018.
- The Federation of Obstetrics and Gynaecological Society of India **(FOGSI)** and the Association of Physicians of India.[3,4]

1. National Guidelines for Diagnosis and Management of Gestational Diabetes Mellitus, Maternal Health Division, Ministry of Health and Family Welfare, Government of India; 2018. Available from: https://nhm.gov.in/New_Updates_2018/NHM_Components/RMNCH_MH_Guidelines/Gestational-Diabetes-Mellitus.pdf
2. Seshiah V; Diabetes in pregnancy study group. Fifth national conference of diabetes in pregnancy study Group, India. J Assoc Physicians India 2010;58:329-30.
3. Seshiah V, Sahay BK, Balaji V, Shah S, Banerjee S, Divakar H,*et al.* Diagnosis and management of gestational diabetes mellitus:Indian guidelines, Medicine Update. Ch. 44, Sec. 5 . Association of physicians of India; 2013. p. 201-4.
4. Anjalakshi C, Balaji V, Balaji MS, Ashalata S, Suganthi S, Arthi T,*et al.* A single test procedure to diagnose gestational diabetes mellitus. Acta Diabetol 2009;46:51-4

Reference Manual & Facilitators Guides Issued by GOI

Training of Doctors, Nurses, ANMs and ASHAs

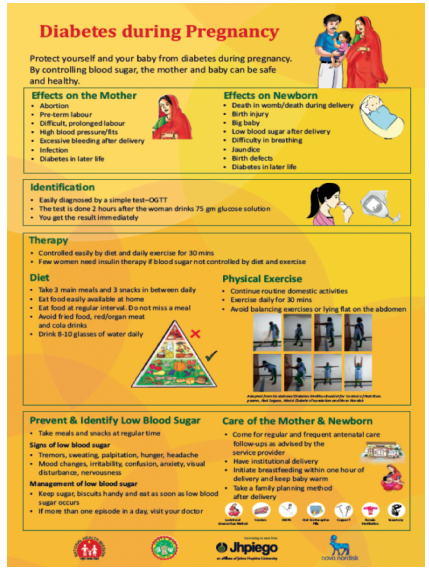
Reference Manual & Facilitators Guide developed for Training of Medical Officers & Staff Nurses

Reference Manual & Facilitators Guide developed for Training of ANMs

Reference Manual & Facilitators Guide developed for Training of ASHAs

Need for orienting Pregnant women as well as Family

Posters displayed at Facilities



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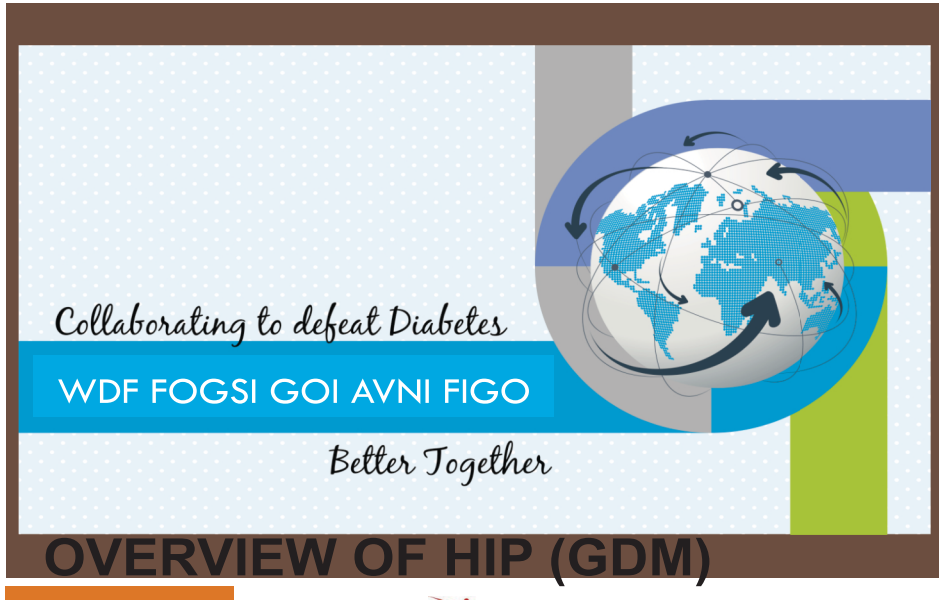
GDM Card for GDM Positive Women

Key Messages

- Controlling blood glucose critical for mother and baby's health
- Strictly follow advice on diet and exercise
- Come for regular check-ups as advised by HCW
- Keep some sugar/sweets with you and eat if you experience symptoms of low blood glucose
- Uncontrolled high glucose level increases risk of complications



Slide deck curated by ARTIST ASIAN RESEARCH & TRAINING INSTITUTE for SKILL TRANSFER

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Goal of this GDM Training

Empower service providers through knowledge update and skills standardization to perform counseling, Screening/testing and management of gestational diabetes mellitus (GDM) competently and confidently.

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STEP 1: Learn about diabetes.

What is diabetes?
There are three main types of diabetes:

- **Type 1 diabetes – Your body does not make insulin. This is a problem because you need insulin to take the sugar (glucose) from the foods you eat and turn it into energy for your body. You need to take insulin every day to live.**

- **Type 2 diabetes – Your body does not make or use insulin well. You may need to take pills or insulin to help control your diabetes. Type 2 is the most common type of diabetes.**

- **Gestational diabetes – Some women get this kind of diabetes when they are pregnant. Most of the time, it goes away after the baby is born. But even if it goes away, these women and their children have a greater chances of getting diabetes later in life**

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Take diabetes seriously.
You may have heard people say they have "a touch of diabetes" or that their "sugar is a little high." These words suggest that diabetes is not a serious disease.

That is **not correct.**
Diabetes is serious, but you can learn to manage it.

People with diabetes need to make healthy food choices, stay at or get to a healthy weight, move more every day, and take their medicine even when they feel good. It's a lot to do.
It's not easy, but it's worth it!

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Diabetes is increasing worldwide, killing, disabling and impoverishing men and women alike

Every 6 seconds a person dies from diabetes (5.0 million deaths)

415 million
adults have diabetes

By 2040 this will rise to
642 million

with roughly equal numbers of women and men

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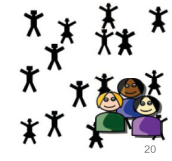
Diabetes in pregnancy is increasing rapidly

India is one of the diabetes capitals of the world, and has among the highest rates of women with GDM

One out of five pregnancies have Diabetes - HIP

In India alone, an estimated 5 million women have GDM/year

These numbers are likely to increase as levels of maternal obesity continue to rise.



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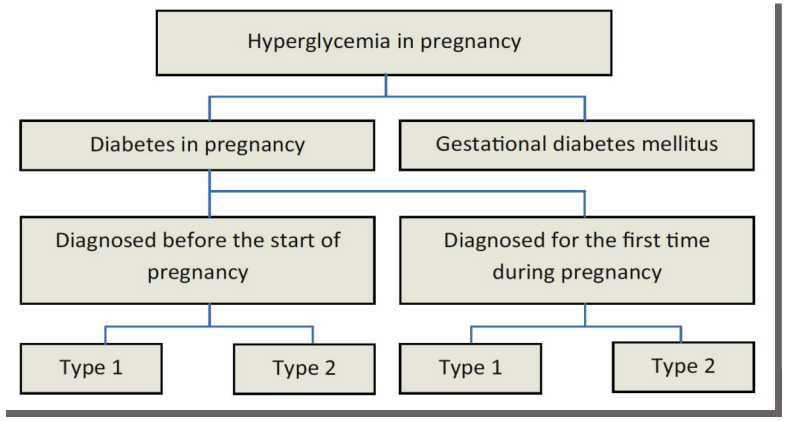
Classification



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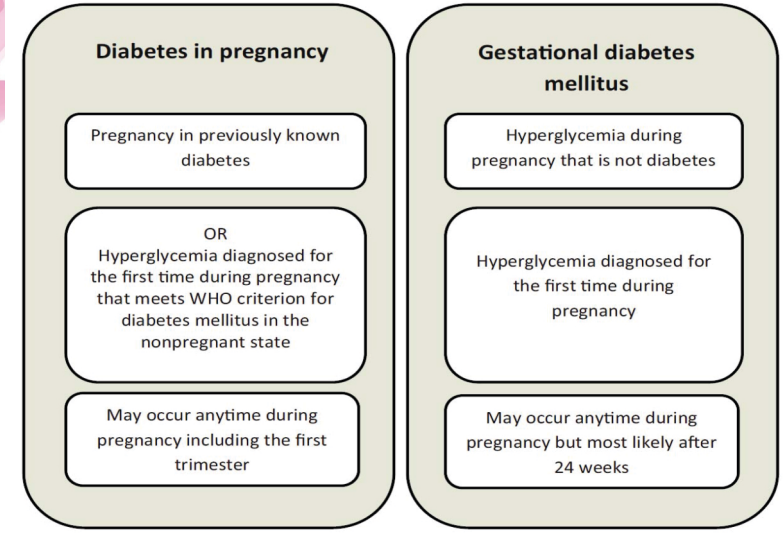

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Effect on Mother	Effect on Newborn
Spontaneous abortion	Intra-uterine death
Polyhydramnios leading to preterm or premature rupture of membrane	Fetal macrosomia
Pre-eclampsia	Shoulder dystocia
Prolonged labor leading to assisted delivery	Birth Injuries
Obstructed labor leading to caesarean section	Stillbirth
Uterine atony leading to PPH	Infant respiratory distress syndrome
Infection	Neonatal Hypoglycemia
	Congenital Malformation
	Hypocalcaemia

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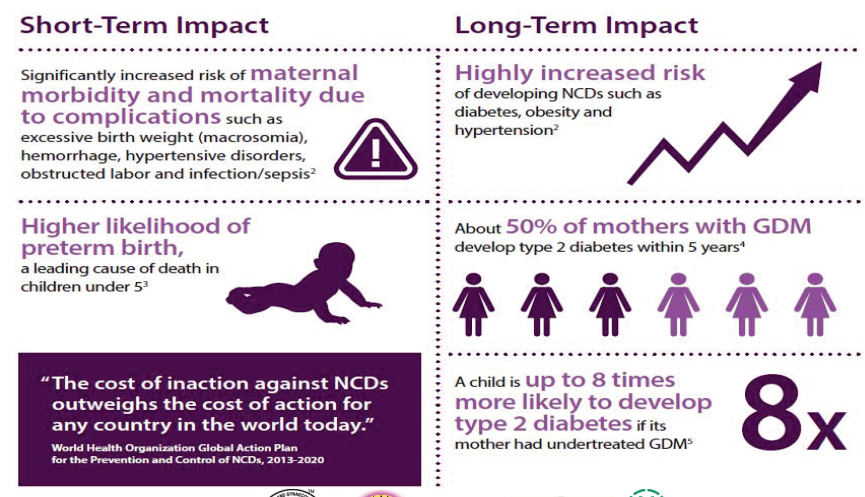
Impact of GDM on Maternal and Child Health



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Window of Opportunity

Pregnancy offers a window of opportunity to provide maternal care services to

Reduce traditional maternal and perinatal morbidity and mortality indicators

Address intergenerational prevention of NCDs, such as diabetes, hypertension, cardiovascular disease, and stroke.

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❖Ante-natal care visits during pregnancy must be optimised for health promotion in young women and early detection of diabetes and GDM

❖Post-natal follow up provide important gateways to reducing the progression of type 2 diabetes in both mother and child through preventative lifestyle measures and nutritional counseling

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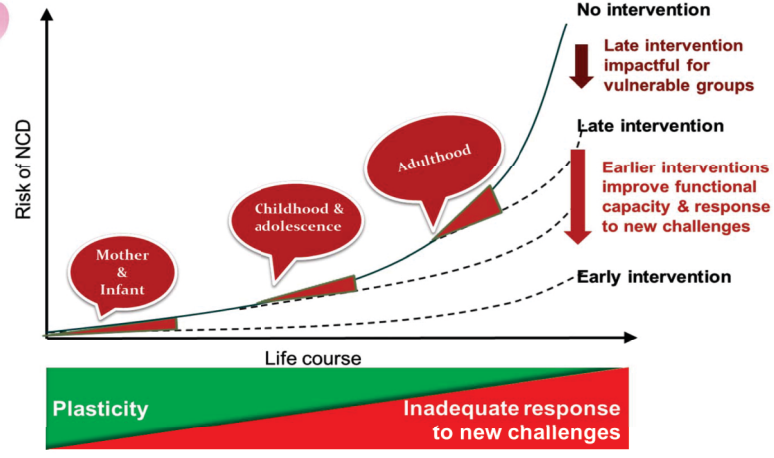
Life Course Approach to Prevention



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National Guidelines for Diagnosis and Management of Gestational Diabetes Mellitus

Reference document developed by maternal health division of Ministry of Health and Family Welfare, GoI

Provides technical and operational guidance to address the issue of GDM in India

These guidelines are aimed to roll out the screening and testing for GDM as an integral part of ANC services and early diagnosis and management of positive cases

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HYPERGLYCEMIA IN PREGNANCY (HIP): FIGO OFFERS A PRAGMATIC GUIDE TO DIAGNOSIS, MANAGEMENT AND CARE

CHAIR – Dr MOSHE HOD
VICE CHAIR – Dr HEMA DIVAKAR

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***Sensitize**
***Magnitude**
***Prevention**
***Universal testing**
***Early detection**
***proper care and follow up**

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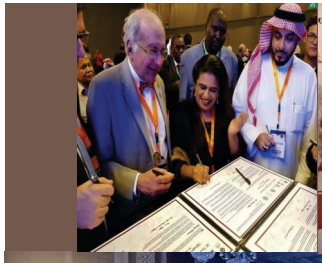

FIGO
INTERNATIONAL FEDERATION OF GYNECOLOGY & OBSTETRICS

FIGO : BRINGING WOMEN, DIABETES & OBGYNS AT THE CENTRE

NOW ..lets WALK THE TALK !

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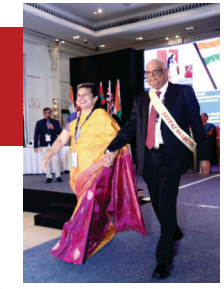
Phela Kadam – take the first step !



All pregnant women

Testing with 75gm glucose

SINGLE STEP

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TESTING FOR GDM

1960
- Diabetes was not very common

Now
- Every one in 5 women is diabetic

Soon
- Every women will be diabetic unless proved otherwise

Universal Testing for GDM

GOI has disseminated the **"National Guidelines for Diagnosis and Management of Gestational Diabetes Mellitus"**.

Considering the fact that there is high prevalence of GDM in Indian woman, **it is recommended to test ALL pregnant women during antenatal period.**

Testing pregnant woman for blood sugar levels will be the part of essential antenatal package.

Universal testing: All pregnant women should be tested for hyperglycemia during pregnancy using a one-step procedure and FIGO encourages all countries and its member associations to adapt and promote strategies to ensure this.

- All countries have an obligation to implement the best GDM testing and management practices they can.
- FIGO acknowledges that for global progress to be made, India, China, Nigeria, Pakistan, Indonesia, Bangladesh, Brazil, and Mexico must be key targets for focused GDM attention

- FIGO adopts and supports the IADPSG/WHO/IDF position that all pregnant women should be tested for hyperglycemia during pregnancy using a one-step procedure.
- FIGO encourages all countries and its member associations to adapt and promote strategies to ensure universal testing of all pregnant women for hyperglycemia during pregnancy.

Testing helps in early detection and initiation of appropriate management for better maternal and child outcomes. For universal testing, Oral Glucose Test (OGTT) is recommended.

It is a single step test using 75gm oral Glucose in 300 ml drinking water and measuring blood sugar 2 hour after ingestion, irrespective of fasting status of pregnant woman.

One step 75gm OGTT –Advantages

- 3times more pick up than with two step
- Suitable for Indian setting
- Saves time
- Saves cost
- Avoids repeated visits
- Reduces repated invasive sampling

Govt of India has adopted this test

"A man with a watch knows what time it is. A man with two watches is never sure"

We ALL need to follow a single method

When to screen?

- First trimester or at booking
- 24-28 weeks
- 32 weeks - optional

Logistics required for screening

For plasma glucose testing

- ❖Glucose pouches 75gms, one per test
- ❖Disposable glasses and stirrers, one each per test
- ❖Drinking water 300ml, per test
- ❖Glucometer with calibration strips
- ❖Sterile lancet, one per test
- ❖Cotton spirit swab or alcohol wipes, one per test
- ❖Register to record the results
- ❖Yellow and black dust bins
- ❖Puncture proof container

Glucometer calibration is recommended after 20 measurements, using calibration strips, provided with glucometer

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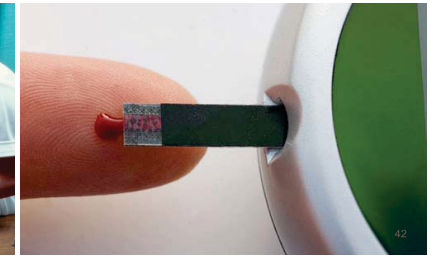
Recommendations

FIGO recommends that for the diagnosis of GDM ideally results of tests based on venous plasma samples properly collected and transported and tested in an accredited lab with well-established calibration and quality control procedures should be used. However, in primary care settings particularly in the developing world where a close-by lab or facilities for proper storage and transport of the blood sample to a distant lab may not exist, FIGO recommends that it is acceptable to use a plasma calibrated hand held glucometer with properly stored test strips to measure plasma glucose. Using a glucose meter in this situation maybe more reliable than lab tests done on samples that have been inadequately handled and transported. It is recommended that from time to time a few samples are parallel tested in a lab to document the variability.

To ensure quality, FIGO recommends that every laboratory and clinical service document its baseline quality and work towards improvement irrespective of the resources available.



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Two hour plasma glucose

Plasma glucose level	Status
>200 mg/dl	Diabetes
>140-199mg/dl	GDM
120-139 mg/dl	**GGI - keep track**
<120 mg/dl	Normal

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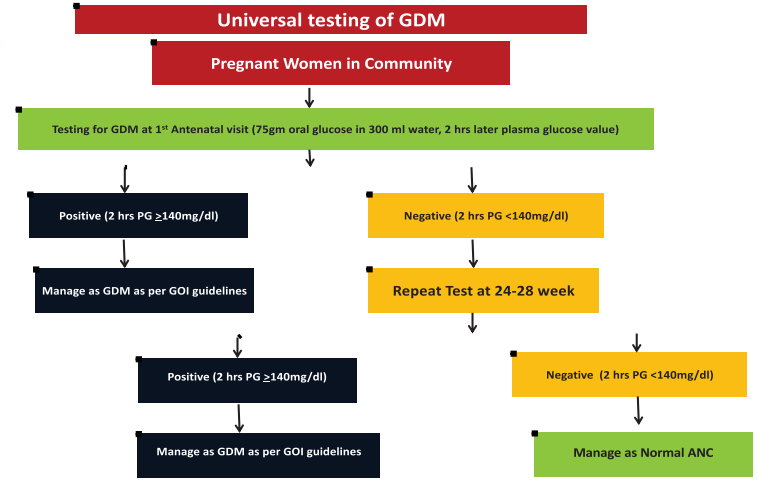
Algorithm



44

Counseling

- Inform her about GDM and how it affects her and her baby (during and after pregnancy)
- Ensure she understands the need to take care of herself and her baby during this pregnancy and after delivery during the postpartum period and later
- Inform her why this pregnancy is different from others and why she needs extra care
- Counsel pregnant women with GDM that she should continue diet control (MNT) and physical exercise during pregnancy and throughout the postpartum period.

Need for orienting Pregnant women as well as Family

Posters displayed at Facilities

Practice

Single Step Screening:

- 75gm oral glucose is dissolved in 300ml of water and is given to the pregnant woman to drink, plasma glucose (blood sugar) level is measured 2 hours after ingestion
- 75gms glucose solution is given to pregnant woman to drink, whether she has come fasting or non-fasting, irrespective of last meal. The solution should be ingested within 5 minutes
- A plasma standardized glucometer should be used to evaluate blood glucose level, 2 hours after the oral glucose intake
- If vomiting occurs within 30 minutes of oral glucose intake, the test has to be repeated next day. If vomiting occurs after 30 minutes, the test continues
- The plasma glucose level of ≥140mg/dL is taken as cut off for di of GDM

Make sure

For plasma glucose testing

- Glucose pouches 75gms, one per test
- Disposable glasses and stirrers, one each per test
- Drinking water 300ml, per test
- Glucometer with calibration strips
- Sterile lancet, one per test
- Cotton spirit swab or alcohol wipes, one per test
- Register to record the results
- Yellow and black dust bins

DEMO

Do's	Dont's
Check for expiry of the test strips	If unit of measurement for blood glucose result displayed on the glucometer is incorrect, contact manufacturer
Insert the test strip in the glucometer for readiness of the test	If any of the display elements are missing do not use the glucometer
Ensure a good sized blood drop is formed	If the code number on the display does not match code on the test strip container
Remove the test strip from the glucometer if testing is being done by health provider for a woman	If error message appears and you have not yet applied any blood, do not use this test strip any more.
Apply blood to the test strip in the glucometer only when the drop symbol flashes on the display. If done before, the meter will turn itself off	Do not rub blood drop on the test trip
Slide the test strip with blood drop back into the meter within 20 seconds of the appearance of test strip and flashing blood drop symbol	Do not store used test strips along with unused test strips in the same container
	Do not bend, move test strip while applying blood or while test is in progress
	Do not reuse a used test strip
	Do not use test strips if past their expiry date

49

Which of the following is true regarding screening for GDM?

- Blood sugar testing should be done only in pregnant women with risk factors for GDM **T/F**
- Testing should be done in the fasting state **T/F**

50

Which of the following is true regarding screening for GDM?

- Blood sugar testing should be done only in pregnant women with risk factors for GDM **T/F**
- Testing should be done in the fasting state **T/F**

- A positive test for GDM is defined as 2 hr plasma glucose value ≥140 mg/dl after a 75 gm oral glucose test irrespective of last meal taken **T/F**
- A positive screening test is defined as 2 hr plasma glucose value ≥ 140mg/dl after a 50 gm oral glucose test done in a fasting state **T/F**

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MNT

MNT slides by Ms. SHEETAL JOSHI
M.Sc (Food & Nutrition)

Objectives
MNT and EXERCISE MODULE

- **Assist mothers in selecting foods to take and which ones to avoid during the medical nutritional therapy (MNT) for a woman with GDM**
- **Explain the importance of physical exercise in controlling high blood sugar levels**
- **Counsel mothers regarding care during**
  - **Antenatal period**
  - **Labour, delivery and**
  - **Postpartum period**

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What will you learn ?

- Importance of dietary management in GDM
- Principles of Medical Nutrition Therapy
- How to start with Medical nutrition therapy
- Calorie requirement and distribution
- Carbohydrate counting
- Glycemic index
- Sources of macronutrients protein and fat
- Meal plan, pattern, portion size

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Counseling

❖ Inform her about GDM and how it affects her and her baby (during and after pregnancy)

❖ Ensure she understands the need to take care of herself and her baby during this pregnancy and after delivery during the postpartum period and later

If test is positive

❖ Inform her why this pregnancy is different from others and why she needs extra care

❖Counsel pregnant women with GDM that she should continue diet control (MNT) and physical exercise during pregnancy and throughout the postpartum period.

55

Why to Counsel?

- It is important to counsel women with GDM (and their partners or accompanying family members) about the condition and its management
- For compliance with the treatment plan which will depend on the woman's understanding of:
- The implications of GDM for her baby and herself
- The dietary and exercise recommendations
- Regular monitoring of blood glucose
- If required, administration of insulin and adjustment of insulin doses
- Identification and treatment of hypoglycemia
- Care to reduce stress, cope with denial and anxiety

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Starting Medical Nutrition Therapy (healthy eating) in a pregnant woman with GDM involves calculating her daily caloric requirement on basis of:

a. Height, weight and level of activity
b. Height and weight
c. Weight and level of activity
d. **BMR, height, weight and level of activity**

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Why diet is important in managing GDM?

It helps in managing blood sugar

It provides all the nutrients required for the mother and the fetus

It helps in managing appropriate weight gain

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Principles of MNT

A Healthy eating during pregnancy

- ✓ Medical Nutritional Therapy (MNT) should be started in all PW with GDM as soon as diagnosis is made. MNT for GDM mainly involves a carbohydrate controlled balanced meal plan which promotes:
- ✓ Optimal nutrition for maternal and fetal health
- ✓ Adequate energy for appropriate gestational weight gain
- ✓ Achievement and maintenance of normoglycemia (normal blood sugar level)

B The importance of individualized nutrition assessment in GDM

- ✓ Nutrition assessment should be done for each woman with GDM. This helps to know the woman's nutritional status.
- ✓ Body Mass Index (BMI) or percentage of desirable pre-pregnancy body weight
- ✓ Optimal pattern of weight gain during pregnancy.

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How to start with Medical Nutrition Therapy

Step 1:Take the anthropometry measurements : Height, weight , Body mass index.(BMI)

Step 2:Based on BMI categorize into

- Obese women : > 24kgs/m2
- Non-obese : < 24 kg/m2

Step 3: Calculate Ideal Body weight(IBW)

Height (cms) – 100 = IBW

Step 4: Calculate the calories required :

- Obese women : 25-30 kcal / kg IBW
- Non-obese : 35 –40 kcal /kg IBW

Continued…

60

How to start with Medical Nutrition Therapy

Step 5: Based on pregnancy week (trimester) Add the calories required.

Second trimester: + 150

Third trimester : + 350

Take diet history by 24 hrs recall method. (what they have eaten in past 24 hrs). And also what they regularly eat.

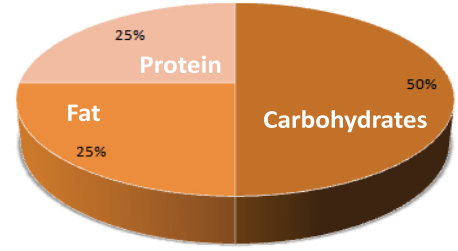
Counsel them with right nutrition.

61

Lets learn what is right nutrition.

- Calories distribution

According to ADA recommended composition of the diet for a woman with GDM is:



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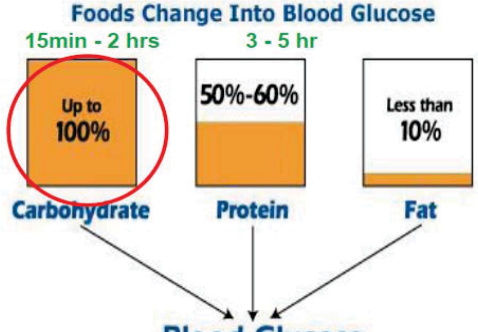
Why carbohydrate counting is very important in GDM?



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Introduce food groups

64

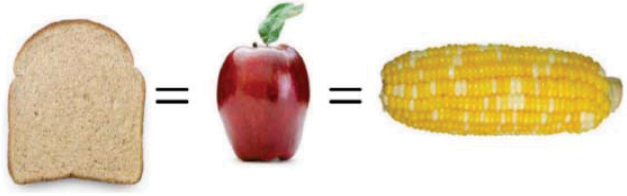
Carbohydrate counting

Carbohydrate exchange

1 exchange = 15g carbs

May also contain 3g protein, 0 – 1 g fat, 80 calories

For example, one slice of bread, a small piece of fruit, or a ear of corn each have around 15 grams of carb. Each of these equals one carb serving.



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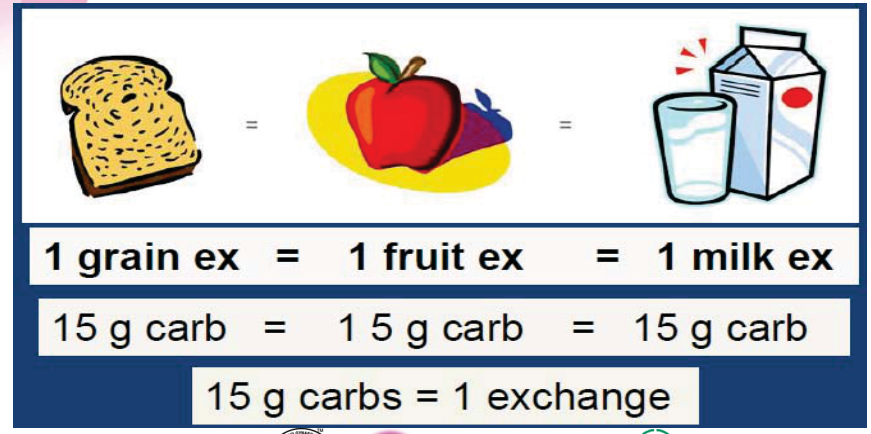
Carbohydrate counting



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Exchange Distribution

Distribution of Carbohydrate servings in a day

Breakfast	Snack	Lunch	Snack	Dinner
4	2	4	2	4

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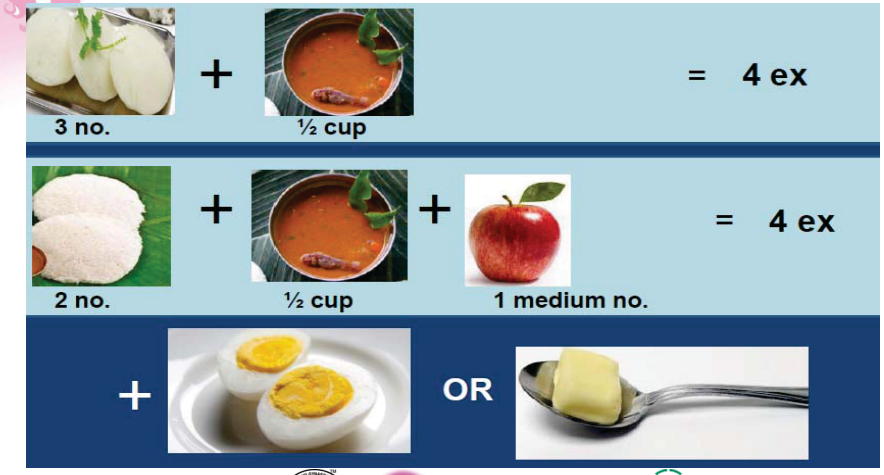
A meal : Idli sambhar



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Different meals


+

+


Breakfast 1:
Uppma + Curd + Banana

1 cup 1 cup ½ medium no.



Breakfast 1:
Roti + Dhal + cauliflower + ½ exchange

2 no. ½ cup 1 cup

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Glycemic Index.

Glycemic index is a figure representing the relative ability of a carbohydrate food to increase the level of glucose in the blood.

Low GI	**<55%**
Medium GI	**55-69%**
High GI	**>70%**

Low GI	Legumes & lentils, dried beans, peas, green gram, Bengal gram (rich in fibre) (30-40%)
Medium GI	Fruits (45-55%)
High GI	Cereals like rice, white bread, root vegetables- potato, carrot, candy bars and syrupy foods (65-70%)

Diet with low GI are generally rich in fibre and high fibre improves glucose tolerance

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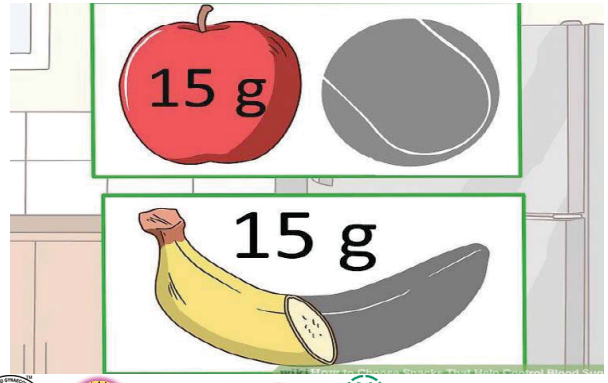
Choosing fruits for GDM

Fruits with low glycemic Index.

- ✓ Apple
- ✓ Pear
- ✓ Orange
- ✓ Apricot
- ✓ Strawberries
- ✓ Peaches

Fruits with high glycemic Index should be avoided

- X Mango
- X Banana
- X Chickoo
- X Kiwi



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Protein requirement and sources (25% - 30% of total calories)

Foods High in Protein


Meat and fish


Cheese


Eggs


Beans


Hummus


Nuts and seeds

Additional 23g/day protein is required in pregnancy for foetal growth. At least 3 servings of protein foods are required every day to meet the increased demand.

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Fat requirement and sources (25% - 30 % of total calories)

Fat Intake during Pregnancy

- Saturated fat intake (sources-ghee, butter, coconut oil, palm oil, red meat, organ meat, full cream milk etc) should be less than 10% of total calories. Good fats like omega 3 fatty acid can be got from nuts and seeds

Fat can be reduced from diet by:

- Using less fat in cooking and avoiding frying of foods
- Using low-fat dairy products in place of whole milk or full cream products
- Choosing low fat snacks like eating fresh fruit instead of high-fat snacks such as cakes, biscuits, chocolates and pastries.
- Using lean meat like fish/chicken in place of red meat such as mutton

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High fiber diet

- High fiber foods especially soluble fiber may help control blood sugar by delaying gastric emptying and slowing the entry of glucose into the bloodstream.

✓All fruits and non starchy vegetables
✓Nuts and seeds
✓Seeds like Fenugreek seeds (Methi),
✓ flax seeds

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Signal system
Healthy Vs Unhealthy food choices

What to Eat? (*Quality of food*)		
Steamed brown rice	White rice	Biryani
Whole grain bread	White bread	Cakes, cookies, croissants
Whole wheat roti	Maida roti/Naan	Paratha /Puri
Steamed/ grilled fish	Stir fry fish	Deep fry fish
Green salad	Salad with mayonnaise	Salad with cream and cheese
Fresh fruit	Unsweetened fruit juice	Candied fruit, sweetened fruit juice

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My GDM plate

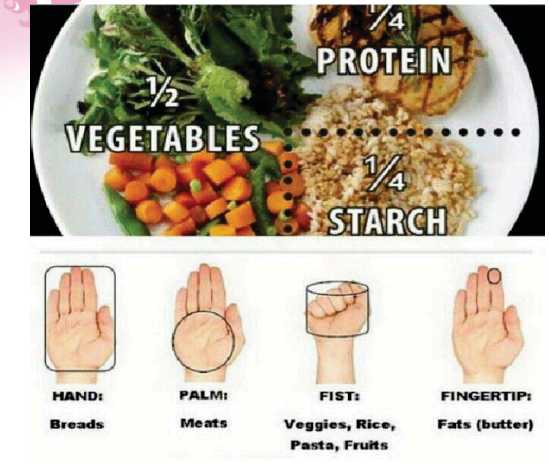

Plate method to portion out meals

✓Fill half plate with non starchy vegetables

✓On the other half, serve palm sized portion of healthy protein and fist sized portion of starchy food

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Meal plan and pattern

3 meals + 3 snacks	8 small meals
Second trimester	**Third trimester**
Morning snacks	Morning snacks
Breakfast	Breakfast
Midmorning	Midmorning
Lunch	Lunch
Evening snack	Evening snack
	Late evening snack
Dinner	Dinner
	Milk Bed time

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Sample diet plan

Snacks can be

- ✓ Streamed sprouts
- ✓ Dry fruits like almonds, walnuts, fig.
- ✓ Cut fruits or whole fruit.
- ✓ Cut salads.
- ✓ Buttermilk
- ✓ Ragi kanji
- ✓ Peanuts/roasted channa
- ✓ Paneer cubes (2 small pieces)
- ✓ Boiled Egg

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Monitoring

Pregnant woman with GDM

Two weeks trial with Medical Nutrition Therapy (MNT)

↓

2hrs PPBS

<120mg/dL
Continue MNT

≥120mg/dL
Start Insulin Therapy

↓

Monitor sugars

- Upto 28 wks: Once in 2 weeks
- After 28 wks: Once a week

Monitor FBS and 2hr PPBS every 3rd day or more frequently till insulin dose is adjusted

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Monitoring

Target sugar level

Time	Glucose
Before breakfast	69-90
Before lunch and dinner	60-105
After meals	<120
2 am to 6 am	>60

Target weight gain

	Weight gain
Normal Weight	11.5 - 16kg
Under Weight	12.5 to 18 kg
Over Weight	7 to 11.5 kg
Obese	5-9 kg

80

- Confirm, whether the woman has understood the instructions properly. Asks her to repeat key messages:

- Have small frequent meals
- After every meal stroll at least 100 steps
- Avoid all juices instead have a portion of fruit.
- Avoid all bakery products instead have homemade snacks.
- Soups, buttermilk , salads, nuts can be part of small meals.
- Finally monitor your glucose level regularly.

Achieving compliance

1. **Explaining relevance of proper diet**
2. **Making the choice through every day items available to the patient**
3. **Culturally acceptable diet**
4. **Using the signaling system for every day diet**
5. **Quantifying food items in easily understandable way**

Practical implementation of MNT

❖In clinical practice where GDM is primarily diagnosed and managed by an obstetrician, MNT is a real challenge

❖Our own training in nutrition is inadequate and secondly the time that we can allot to explain and teach MNT is a real constraint.

❖One of the solution is DIP clinic - Diabetes In Pregnancy clinic

EXERCISE

The role of exercise in maintaining blood sugars?

❖Improving insulin sensitivity

❖It also increases insulin production by pancreas

85

.1 Physical Exercise

- Pregnant women have difficulty in producing enough insulin to lower blood glucose to safe levels.
- Physical exercise improves the cellular uptake of glucose by improving insulin sensitivity
- It also increased insulin production by pancreas.
- This results in decrease in excess fat and helps to prevent the excessive blood glucose levels associated with GDM

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GDM and exercise

- ❖ Exercising for 15-20 minutes after a meal helps to keep blood glucose within the target range
- ❖ Start with 20 minutes/day, gradually increasing to 45-60 minutes/day
- ❖ Important to maintain balance and avoid falls

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Exercises in GDM

- ❖ **30 min moderate intensity activity is recommended**
- ❖ **Exercises can be aerobic and low resistance exercises**
- ❖ **15-20 min moderate activity after a meal helps to keep sugar level within target range**
- ❖ **Preferably upper body low resistance exercises are recommended**

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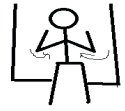
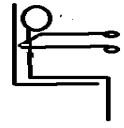
Exercises in GDM

WALL SQUATS



WALL PUSHUPS



WEIGHT TRAINING FOR UPPER LIMB

89

Check for baby's movements before and after the exercise

Brisk Walk

Household work

Arm Exercise

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Do's	Don'ts
• Participate in moderate and regular physical activity	• Get too tired while working out or doing physical activity
• Choose activities which don't required standing/balancing	• Do any activity while lying on her back after beginning of 2nd trimester
• Wear light and loose clothes to prevent excessive sweating	• Perform activities in very hot weather
• Drink lot of water before, during and after your activity	• Perform activities that may bump or hurt belly, or that may cause to lose balance
• Eat healthy diet	• Fast(skip meals)
• Stop when she get tired(unable to talk comfortably)	• Over exert

91

•Physical Activity level (PAL) values proposed by ICMR expert group (2009) are:

PAL value according to level of activity definition

Physical activity based on the occupation, and leisure time activity not considered.

Level of Activity	Eg. Of workers of this category of activity	PAL Value
Sedentary work	Teacher, Tailor, House wife, Nurse	**1.53**
Moderate Work	Maid Servant, Coolie, Weaver, Agriculture labor, Basket Maker, Bidi maker	**1.8**
Heavy Work	Stone Cutter	**2.3**

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ANTENATAL & DELIVERY CARE FOR PREGNANT WOMEN WITH GDM

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The primary goal of treatment of pregnant women with diabetes is
to
ensure normal progress of pregnancy
and
its outcome for the mother and baby
by
controlling maternal hyperglycemia
and
preventing hypoglycemia

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Frequency of ANC visits

- Pregnant woman with GDM whose blood glucose levels are well controlled and there are no complications, should go for routine antenatal visits even at the peripheral health centre as per GoI guidelines.
- Pregnant women with GDM who have uncontrolled blood glucose levels or there are any other complications of pregnancy (e.g. high blood pressure, proteinuria, big-sized baby, excessive amniotic fluid), should go for antenatal check-ups once in every two weeks in the second trimester and weekly in the third trimester.

95

Antenatal assessment for maternal well being

- Ask for any complaints such as passing more urine than normal, especially at night, being very thirsty, excessive tiredness or lethargy, or any symptoms/signs suggestive of infection
- Ask for any complaints such as severe headaches, visual disturbances or abdominal pain

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Antenatal assessment for maternal well being

- Check weight, blood pressure, urine for protein and sugar, blood sugar by glucometer and any other relevant investigations at each visit.
- If the pregnant woman is self-injecting insulin, ask if she is having any difficulties in injecting herself, or experiencing hypoglycaemic episodes

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Antenatal assessment of fetal well-being

- Ask the pregnant woman if she is having adequate daily fetal movements. Explain her about daily fetal activity assessment
- Daily fetal activity assessment method: Ask the pregnant woman to lie down on her side after a meal and note how long it takes for the baby to kick 10 times. If the baby does not kick 10 times within 12 hrs, she should immediately consult a health care worker and if required she should be referred to a higher centre for further evaluation

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Fetal risks

- ❖Congenital Anomalies
- ❖Early pregnancy losses
- ❖Preterm labor
- ❖Fetal Growth – macrosomia
- ❖Shoulder Dystocia & birth trauma

99

Ultrasound

- ❖First visit – early pregnancy to establish viability and confirm dates – best between 7 – 11 week
- ❖11- 13.5 week scan
- ❖17-19 weeks anomaly scan
- ❖ 22 weeks - Fetal Echo
- ❖Growth scans – 28 weeks , 32 weeks , 36 weeks

100

❖The prevalence of malformations appears to increase with the degree of diabetic severity.

❖3–4-fold increased incidence of congenital anomalies Pregnancies compromised by PreGDM
(Types 1 and 2) have a compared to the general obstetric population

❖The frequency of congenital anomalies among diabetic offspring at birth is estimated at 6–10%

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Neural tube defects

❖The incidence of neural tube defect is approximately 20/1000

❖ Compared with 2/1000 in the non-diabetic obstetric population

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Cardiac Anomalies

❖ The incidence of cardiac anomalies in the infants of diabetic mothers is 27/1000 compared to 8/1000 in the general population

❖ The most common cardiac anomalies seen in fetuses of diabetic mothers are transposition of the great vessels, ventricular septal defects and coarctation of the aorta, Single ventricle

103

Second trimester scan should evaluate

❖Anomaly Scan at 18 weeks : Intracranial Structures, Spine

❖Fetal Echo at 22 weeks: Cardiac Evaluation – 4 Chamber View with Outflow tracts

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Pathophysiology and effect on fetus

- The Placenta allows free transfer of excessive maternal glucose to the fetus, with subsequent stimulation of the fetal pancreas.
- Triggers fetal hyperinsulinemia, which precipitates short-term complications (i.e., macrosomia and neonatal hypoglycemia) and long-term consequences (i.e., later development of diabetes in the child)

105

Sonographic estimation of fetal development and growth

- Classically, ultrasonography has been used to support the clinical estimation of fetal size accomplished by palpation or fundal height measurement

Reece EA, Smikle C, O'Conner TZ, Holford T, Nelson-Robinson L, Degennaro N, Hobbins JC: A longitudinal study comparing growth in diabetic pregnancies with growth in normal gestations: I. The fetal weight. *Obstet Gynecol Surv* 45:161 –164, 1990

- 28 weeks onwards – 4 weekly??

106

- USG should be done for pregnant women with GDM at 28-30 weeks of pregnancy and again at 34-36 weeks to include fetal biometry and amniotic fluid estimation. There should be at least three weeks gap between the two ultrasounds.

107

Abdominal circumference

- It was shown that when AC was greater than the 90th percentile, macrosomia was present in approximately 78% of neonates

Tamura RK, Sabbagha RE, Depp R, Dooley SL, Socol ML. Diabetic macrosomia: accuracy of third trimester ultrasound. *Obstet Gynecol* 1986;

108

USG – Abdominal circumference

H I P

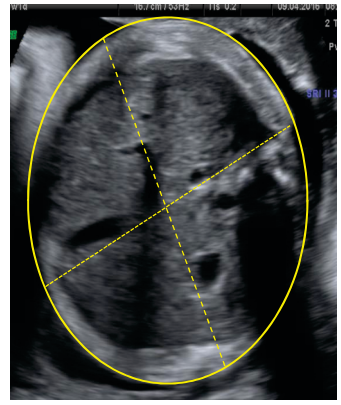
AC – single most important & reliable parameter

AC threshold for predicting macrosomia is - 35 cm

www.uptodate.com

AC > 35 cms - 93% PPPV of > 4000 gm

*fetal diagnosis therapy 2013



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- **The fetus of a pregnant woman with GDM is at increased risk of intra-uterine death (IUD).**

- **This risk is** increased in those women requiring insulin therapy. Hence, vigilant fetal surveillance in women with **GDM is required.**

110

- Pregnant women with GDM with a previous still birth or hypertensive disorders of pregnancy or any other complication should be referred to a higher centre for complete Doppler evaluation of fetal and uterine vessels.

- Foetal growth assessment should be done every two weekly in such women.

111

Umbilical artery doppler

- Landon *et a*. **found no significant association between this index and maternal blood glucose or glycosylated hemoglobin level**

- Women with vascular disease had a higher impedance in the umbilical artery compared to those with uncomplicated diabetes

- Landon MB, Gabbe SG, Bruner JP, Ludmir J. Doppler umbilical artery velocimetry in pregnancy complicated by insulin-dependent diabetes mellitus. *Obstet Gynecol* 1989;73:961–5

112

SGA fetus

- In pregnancies complicated by diabetes, and particularly those involving vascular disease, impairment of placental perfusion will typically lead to asymmetric or disproportional growth retardation of the fetus

Maulik D, Lysikiewicz A, Sicuranza G: Umbilical arterial Doppler sonography for fetal surveillance in pregnancies complicated by pregestational diabetes mellitus. *J Mat Fet Neonatal Med* 12:417 –422, 2002

Follow up of SGA fetus

- Biweekly sonographic and Doppler studies of the uterine and umbilical vessels should be used for follow-up of SGA fetuses once picked up

- If Doppler results indicate that a fetus is beginning to decompensate delivery should be planned regardless of the fetal age

How good is ultrasound prediction of fetal birth weight at term?

Fetal weight examination

- The error of estimation increases with increased birth weight and the presence of maternal diabetes such that the weight of large infants will be either underestimated or overestimated as a result of the increased fetal fat mass

- Humphries J, Reynolds D, Bell-Scarbourgh L, Lynn N, Scardo J, Chauhan S: Sonographic estimate of birth weight: relative accuracy of sonographers versus maternal fetal medicine specialists. *J Matern Fetal Neonatal Med* 11:108 –112, 2002Medline
- ↵Bernstein I, Catalano P: Influence of fetal fat on the ultrasound estimation of fetal weight in diabetic mothers. *Obstet Gynecol*79 : 561–563,1992Medline
- Wong S, Chan F, Cincotta R, Oats J, McIntire H: Sonographic estimation of fetal weight in macrosomic fetuses: diabetic versus non-diabetic pregnancies. *N Z J Obstet Gynecol* 41:429 –432, 2001

Macrosomic Newborn (4.2kg)

117

Macorsomia/LGA babies

- Fetal Hypoxia
- Sudden intrauterine death
- Brachial plexus injury

118

Shoulder dystocia

- When body measurements of the fetus, especially the shoulders and the abdomen, exceed the head measurement, the risk of shoulder dystocia increases not only in LGA fetuses but also in normal-weight fetuses
- Shoulder dystocia can occur even during caesarean section

- Landon M, Gabbe S: Fetal surveillance and timing of delivery in pregnancy complicated by diabetes mellitus. *Obstet Gynecol Clin North Am*23 : 109–123,1996
- Sacks D, Chen W: Estimating fetal weight in the management of macrosomia. *Obstet Gynecol Surv* 55:229 –239, 2000

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Antepartum Management (contd)…

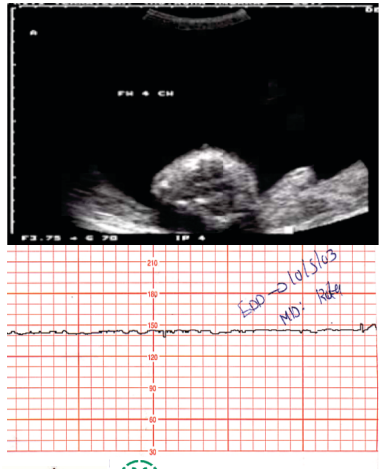
As per ACOG recommendations for GDM patients weekly fetal surveillance was started from 32nd week of gestation for

- Clinical Examination
- Growth profile
- Biophysical profile
- Non stress test

120

Decision for intervention

The decision for intervention depends on the maternal outcome variables such as



- ❖Poor glycemic control
- ❖on diet / insulin
- ❖or Macrosomia
- ❖Surveillance test showing non-assuring / ominous NST – flat NST

121

General guideline principles during labor

- ❖There is delayed lung maturity of the foetus in pregnancies with GDM. Hence, routine delivery before 39 weeks is not recommended
- ❖In pregnant women with GDM between 24-34 weeks of pregnancy and requiring early delivery, antenatal steroids should be given as per GoI guidelines
- ❖Injection Dexamethasone 6 mg IM 12 hourly for two consecutive days should be given
- ❖Blood glucose should be monitored closely for 72 hours following Dexamethasone injections
- ❖If blood glucose levels are raised during this period, insulin dose should be adjusted accordingly
- ❖Vaginal delivery should be preferred in most cases and LSCS done for obstetric indications only

122

Timing of delivery

- ❖**Good glucose control with diet and exercise and no complications:** Expectant management till 40 weeks of gestation
- ❖**GDM on insulin:** Induction of labour at 38 weeks because the incidence of shoulder dystocia
- ❖**GDM with HTN or previous stillbirth:** Induction of labour at 37-38 weeks depending on the condition of the fetus

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Counselling message for pregnant women with GDM?

- □ The main aim of good blood glucose control during pregnancy is to reduce maternal and fetal complications **YES/NO**
- □ b. The pregnant woman can choose home delivery if blood glucose levels are well controlled **YES/NO**
- □ c. In most women blood glucose can be controlled with diet and exercise alone **YES/NO**
- □ d. In most pregnant women insulin injections will be stopped after delivery **YES/NO**

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Fetal risk of gestational diabetes mellitus?

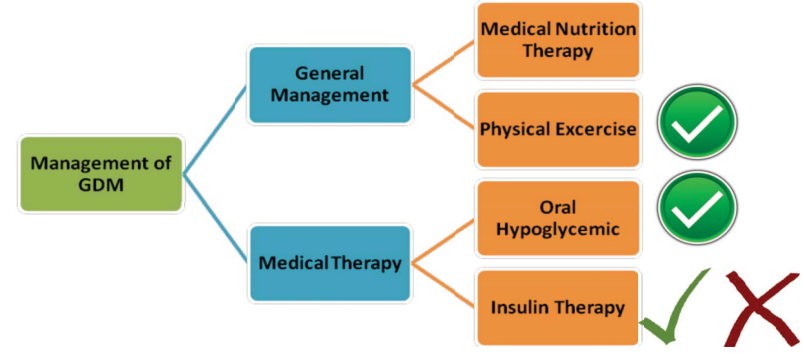
- Pre-term birth Y/N
- Macrosomia (large sized baby) Y/N
- Twins Y/N
- Stillbirth (IUD) Y/N

METFORMIN, INSULIN AND NEWER OPTIONS

Prescription – beyond diet

- Can metformin help?
- Insulin – when and how?
- Is Myo-Inositol supplementation worthwhile?

Practical implementation of MNT and Exercise



Targets for blood sugar level

	Target levels (mg/dl
Fasting/ Pre breakfast	<95
Post prandial	<120 (2 hr)

If not achieved, we have to move on with oral hypoglycemics or insulin

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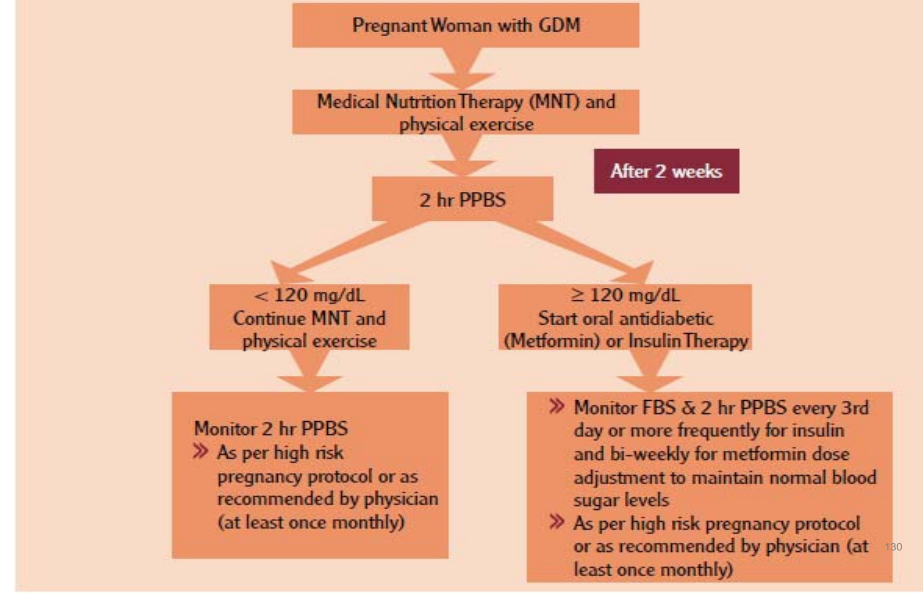
Management of Pregnant Woman with GDM



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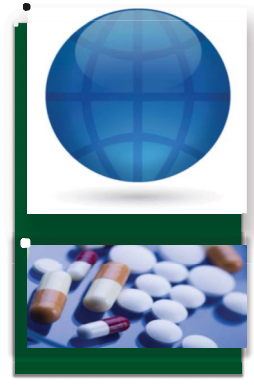
Oral hypoglycemic agents

- Changing trend in the acceptability of OHA in HIP
- Recent evidence – some OHAs are safe and useful in pregnant diabetics
- OHAs – non-invasive, cost effective and patient friendly → more compliance
- Especially suitable for our Indian women



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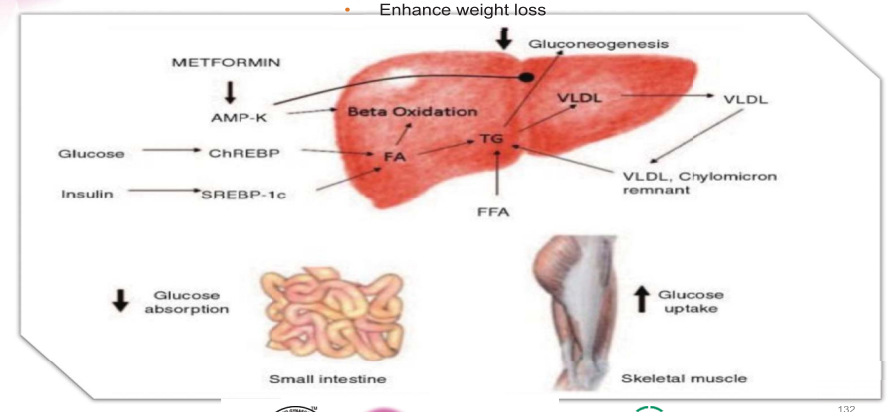
Insulin sensitizing agents

Metformin

Metformin is useful in the management of young girls with PCOS to:

- Suppress appetite
- Enhance weight loss



132

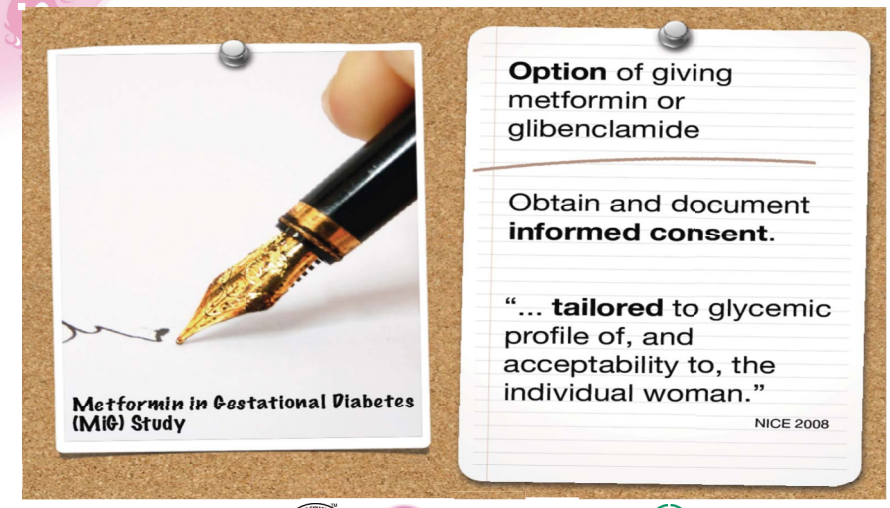
- Arslanian, SA, et al J Clin Endocrinol Metab 2002

Metformin

- Oral biguanide antihyperglycemic drug.
- Used for treatment of non-insulin-dependent diabetes.
- Category B drug for pregnant women.
- Metformin lowers blood glucose by:
  - Inhibiting hepatic glucose production.
  - Enhancing peripheral glucose uptake.
  - Enhancing insulin sensitivity at the post-receptor level.
  - Stimulating insulin mediated glucose disposal.

133

Oral hypoglycemic agents



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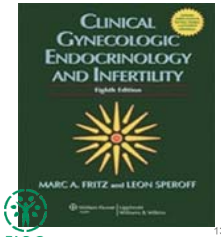
Metformin inclusion

- GDM is twice as common among PCOS women and therefore close monitoring of sugar levels is recommended.
- Insulin sensitizing agents like Metformin initiated during pre-pregnancy in the management of PCOS have been found to be beneficial in reducing the incidence of GDM. However their use in pregnancy is pending subject to arrival of results from long term studies.



135

Oral Antidiabetic Drug-Metformin

- Metformin or Insulin therapy is accepted medical management of GDM not controlled on MNT
- **Metformin can be given after 20 weeks of gestation**
- **Dose: 500 mg BD**
- **Maximum dose : 2 gm/day**

- The common side-effects
- diarrhoea,
- nausea, gastritis

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Who should start medical therapy

- At PHC, MO should initiate treatment

- At CHC/DH/MC a Specialist/Gynaecologist/ Physician/MO can start
- **metformin**
  or
- **insulin**

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When would you start insulin?

Blood Sugar values at diagnosis has
FPG>120mg%
2hr PPBS >199mg%
Needs insulin straight away

OR

When sugars are not controlled with MNT or metformin and targets are not met
FPG >95mg%
2hr PPBS >120mg%

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About Insulin

If 2hr PPBS is >200 mg/dL at diagnosis,
- starting dose of insulin should be
- 8 units pre-mixed insulin.

If she requires more than 20 units insulin/day
- she should be referred to higher health-care centre.

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How to administer

- Insulin injection is to be given subcutaneously only.
- Single use-insulin syringe and pen needle should be used.
- Never clean needle with spirit or any other disinfectant.
- Before use, check syringe every time whether needle is straight or not.
- Tip of needle of syringe or pen should not come in contact with anything else except cleaned skin.

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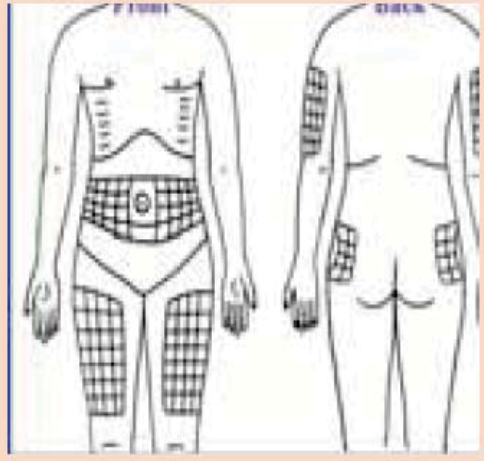
Insulin Injection Sites



- Front/Lateral aspect of the thigh or over abdomen
- Appropriate arrangement should be made for storage of insulin in refrigerator at 4 – 8degC (in the door of the refrigerator)

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Preparation and dose adjustment

- Only Injection Human premix insulin 30/70 is to be administered
- Insulin vial – 40 IU/mL is to be used
- Insulin cartridge – insulin dose to be adjusted as per units required
- Health provider to train the pregnant women on use of insulin pen or syringe for self administration of insulin.

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When to refer ?

- Requires more than 20 units insulin/day
- Fasting blood sugar >200 mg/dL with or without metformin or insulin
- Fasting blood sugar >150 mg/dL or PPBS >250 mg/dL even after giving metformin or insulin,
- If PPBS is more than 200 mg/dL at any point of time

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Hypoglycemia

- Blood sugar level falls <70mg/dL
- Any pregnant women on insulin therapy should be instructed to keep sugar/jaggery/glucose powder handy at home to treat hypoglycemia if it occurs.

What she needs to do if she develops hypoglycemia?

- Take 3 teaspoons of glucose powder (15-20 grams) or 6 teaspoon sugar, dissolved in a glass of water and drink
- After taking oral glucose, you must take rest and avoid any physical [illegible]y

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LABOUR AND DELIVERY

- GDM with good control of blood sugar (2 hr PPBS <120 mg/dL) levels may be delivered at their respective health facility

- GDM on insulin therapy with uncontrolled blood sugar levels (2 hr PPBS ≥120mg/dL) on MNT and physical exercise
and metformin or insulin requirement >20 U/ day should be referred at 34-36 weeks for delivery planning at CEmOC centres under care of gynaecologist.

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INSULIN DOSE ADJUSTMENT
additional information

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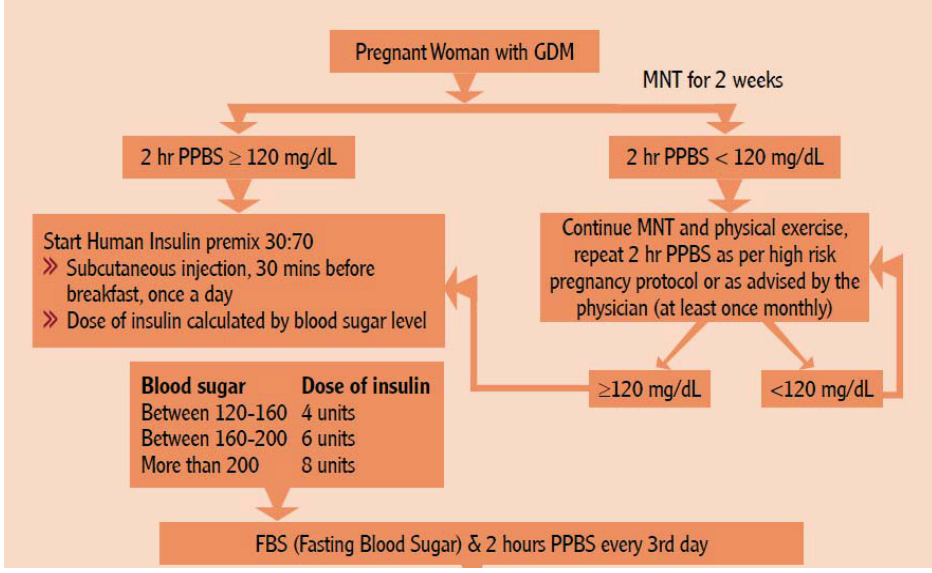

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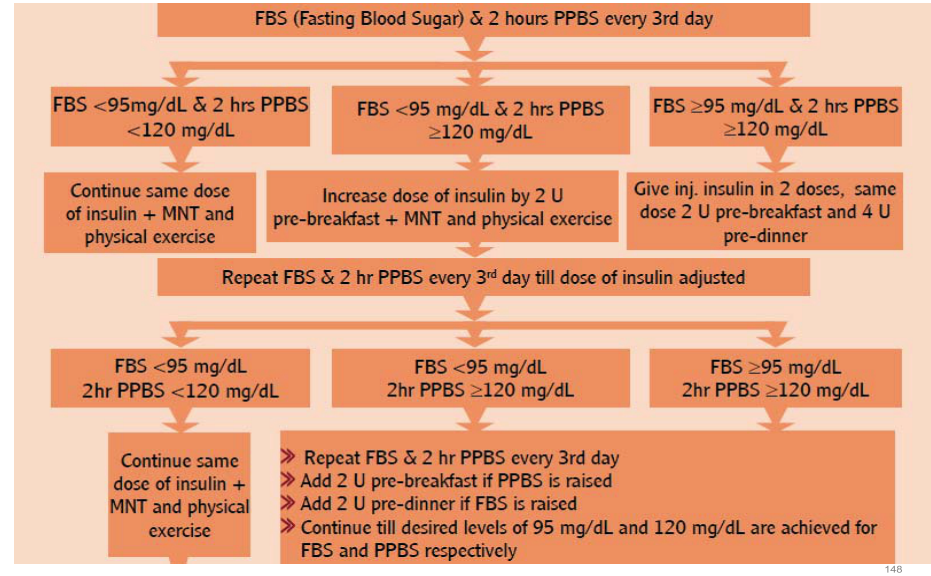

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Remember
Diet control beyond pregnancy

- Women with GDM are at risk for developing type 2 diabetes postpartum.

- Nutrition interventions for GDM should emphasize overall healthy food choices, portion control, and cooking practices that can be continued postpartum and may help prevent later diabetes, obesity, cardiovascular disease, and cancer

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Post pregnancy weight retention!!!!

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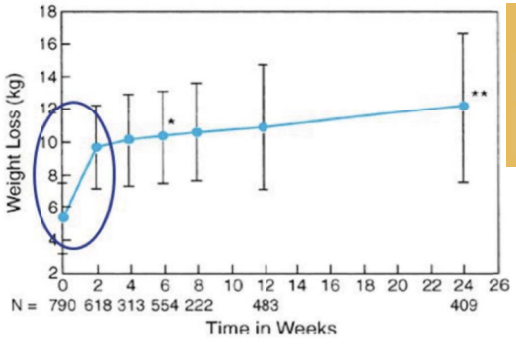
I-1. Weight Retention After Pregnancy



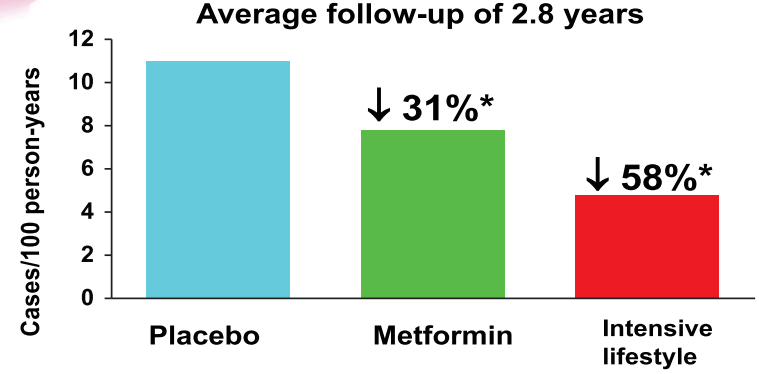
Not all weight gained during pregnancy is lost during and immediately after delivery.

Dietary interventions help says evidence

Cumulative weight loss from last antepartum visit to 6 months postpartum. *Statistically different from 2-week weight loss, **Statistically different from 6-week weight loss.
(From Schauberger and co-workers, 1992, with permission.)

- As shown in Figure 8–8, the majority of maternal weight loss was at delivery—*about 12 lb (5.5 kg)*—and in the ensuing **2 weeks thereafter—about 9 lb (4 kg).**
- An additional 5.5 lb (2.5 kg) was lost **between 2 weeks and 6 months postpartum.**

Diabetes Prevention Program: Progression to Type 2 Diabetes



*All pairwise comparisons significantly different by group; sequential log-rank test.
The Diabetes Prevention Program Research Group. *N Engl J Med.* 2002;346:393.

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- Obesity and type 2 diabetes are intimately related.
  - Treating obesity can prevent diabetes.
  - Diabetes treatment should be selected with effect on weight in mind.
  - Aggressive management of weight is important even once diagnosed with Type 2 diabetes.
  - Insulin while necessary in Type 1 DM can contribute to insulin resistance.

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Newer thoughts

- Existing dilemmas
  - When to start metformin?
  - Safety? In all trimesters?
  - Efficacy?
  - Is life style modification / insulin better than metformin usage?
  - Are there any newer options from inositol family?

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Meta Analysis Of Pregnancy Outcome After 1st Trimester Exposure To Metformin

"There is a statistically significant protective effect for fetal malformations among metformin recipients (1.7%) compared to disease-matched controls (7.2%)."

(Gilbert, et al., Fertil. Steril. 2006;86:658-63).

Safe

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Metformin – Effect On Infant Development

"No significant abnormalities of growth, motor, or social development in the babies of women treated with metformin compared to matched controls."

(Glueck, et al., Hum Reprod.)

Safe

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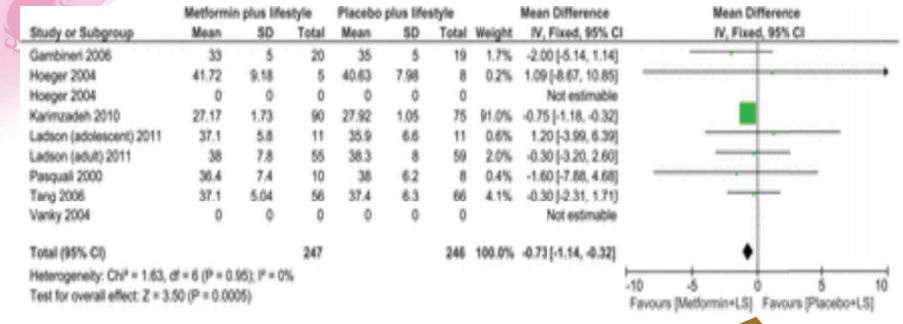
Lifestyle modification with or without Metformin



Focus on lifestyle is good enough

No difference in the improvements noted in blood glucose, IR and lipid profile over 6 and 12 months

From: Metformin and lifestyle modification in polycystic ovary syndrome: systematic review and meta-analysis
Hum Reprod Update. 2015;21(5):560-574. doi:10.1093/humupd/dmv025
Hum Reprod Update | © The Author 2015. Published by Oxford University Press on behalf of the European Society of Human Reproduction and Embryology. All rights reserved. For Permissions, please email: journals.permissions@oup.com

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MiG Trial - Metformin in GDM Trial

Prospective, randomized, multicenter trial

Objective — Efficacy and safety of metformin compared with insulin in women with GDM.

Recruits – 457 Women with GDM at 20 weeks – 33 weeks, singleton pregnancy, mean age of 33.3 yrs.;
Mean fasting glucose at recruitment 95.5mg/dl,
Long term follow-up of children started at age 2yrs.

Result – No significant difference whether you use metformin or insulin

Metformin can be used before you think of using insulin

Diabetes Care, Vol 33, No1, Jan 2010

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Approval of Metformin in the management of GDM is pending subject to arrival of results from trials studying the long term effects of the drug.

However, in women with PCOS it can be used to prevent or slow the progression to Type II DM and at reducing long term risks for CVS disease in:

- Women with impaired tolerance or Type II DM
- Those with obvious evidence of insulin resistance (Acanthosis Nigricans).
- Women with other features of Metabolic syndrome like Obesity, HT and dyslipidemia.

Now included in recent GOI guidelines

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Whats new ?
Myo-Inositol revisited

Clinical experience prove efficacy of MI-DCI in Preventing GDM

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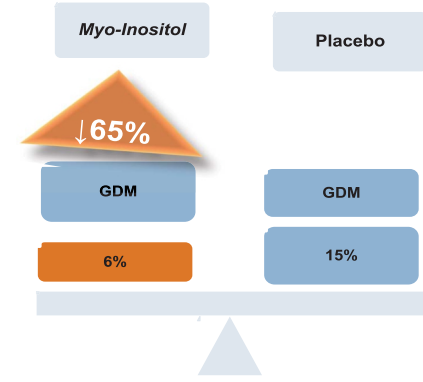
Myo-Inositol Supplementation for Women With Family History of Type 2 Diabetes

Incidence of Macrosomia: Nil

Risk of GDM



Myo-Inositol supplementation prevented the occurrence of gestational diabetes in women with a family history of Type 2 diabetes and also reduced incidence of Fetal macrosomia.

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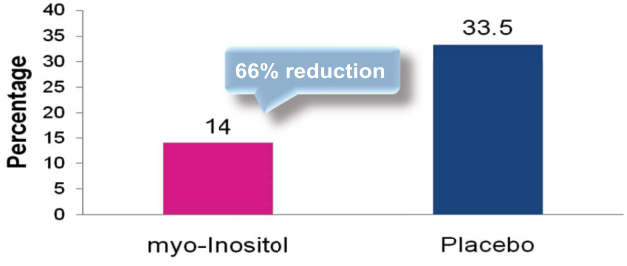
Myo-Inositol Supplementation for Obese Pregnant Women

The incidence of gestational diabetes was lower in the myo-inositol group (p=0.001).



In obese pregnant women, *Myo*-Inositol reduced the incidence of gestational diabetes by reducing insulin resistance.

Myo-Inositol showed a significantly greater reduction in the homoeostasis model assessment of insulin resistance compared with the control group, -1.0±3.1 compared with 0.1±1.8 (p=0.048).

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CARE OF MOTHER WITH GDM AND NEWBORN DURING IMMEDIATE POSTPARTUM PERIOD

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At higher risk

Immediate Postpartum Period

- Postpartum haemorrhage
- Genital tract trauma
- Infections
- Hypoglycaemia

Immediate postpartum period is critical for early initiation of preventive health care for both mother and baby.

Late Postpartum Period

- Metabolic syndrome
- Future obesity
- Type 2 Diabetes
- Hypertension
- Cardiovascular disorder

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Care of newborn of mother with GDM during immediate postpartum period

- Newborn of mother with GDM are usually born prematurely and are at greater risk of developing respiratory distress
- These neonates are at an increased risk of morbidity and mortality because of harmful intrauterine metabolic environment, if plasma glucose levels of mother is uncontrolled, or due to the obstetric interventions required to facilitate delivery
- The best possible diabetic control minimizes risks to the mother and the fetus, and reduces the risk of complications in the newborn

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Possible neonatal outcome born to mother with GDM are

- Perinatal death
- Difficulty in breathing
- Preterm birth
- Hypoxic ischemia
- Macrosomia, leading to possible obstructed labor and/or birth injury
- Polycythemia/Jaundice
- Congenital malformation
- Hypoglycemia
- Hypocalcemia, Hypomagnesemia and iron abnormalities

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Management of newborn of mother with GDM

- All neonates should receive essential newborn care immediately after birth and early breast feeding to prevent hypoglycemia
- If required, the sick neonates should be immediately resuscitated at the newborn care corner in the lobour room/OT
- Newborn should be monitored for hypoglycemia (capillary blood glucose <45mg/dl)
- Monitoring blood sugar should be started at 1 hour of delivery and continued every 4 hours (prior to next feed) till four stable glucose values are obtained
- Neonate should also be evaluated for other neonatal complications like respiratory distress, convulsions, hyperbilirubinemia and paediatrician informed
- It would be good if a paediatrician is present at the time of delivery to give appropriate and prompt treatment to the newborn if required

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Signs and symptoms of hypoglycemia in a newborn

- Jitteriness or tremors
- Episodes of sweating
- Intermittent apneic spells or tachypnea
- Convulsions
- Weak and high pitched cry, limpness and lethargy
- Episodes of cyanosis
- Difficulty in feeding
- Stupor or Apathy
- Eye rolling
- Any unexplained clinical feature in baby of diabetic mother

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Newborn with hypoglycemia

- Immediately ask mother to give breast feed without any delay. Direct breast feeding is the best management step for neonatal hypoglycemia
- If the infant is unable to suck, expressed breast milk from mother should be given
- If mother is not in a position to give breast feed or no breast milk secretion/production, baby should be given any formula or top feed
- Dissolve one TSF of table sugar in 100 ml of normal cow's milk and give
- Once feed has been given, check blood glucose again after one hour
- If blood glucose is >45 mg/dl, 2 hourly feeding (breast feeding is the best option but if not available, formula feed can be given) should be ensured by explaining to mother/relatives and supervised

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- If at any time plasma glucose by glucometer is <20 mg/dl, give immediate intravenous bolus injection of 10% dextrose 2 ml/kg body weight of baby
- This should be followed by intravenous infusion of 10% dextrose at a rate of 100 ml/kg/day
- Blood glucose should be checked 30 minutes after starting the infusion

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Breastfeeding

- **Early breastfeeding should be encouraged and supported**
- Early breastfeeding prevents hypoglycemia in newborn and promotes bonding between mother and baby
- Breast feeding protects against the occurrence of infant and maternal complications such as reduction in childhood obesity, Type 2 DM, and helps in postpartum weight loss in the mother
- Treatment with insulin or oral hypoglycemic drugs may be started even in breastfeeding women as secretion of these drugs is negligible in breast milk and does not affect the quality of milk nor the health of newborn

172

Infections

- Mothers with GDM are at increased risk of infection especially if delivery was prolonged or required operative intervention

- Pay attention to detect
- early signs of UTI,
- puerperal sepsis,
- and surgical site infection (episiotomy and caesarean delivery)

- Large-sized babes of diabetic mothers do not suckle well. This may lead to milk retention and increased risk of breast engorgement and abscess formation

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Contraception

- A safe, effective and reversible method of postpartum contraception should be offered to the woman to space or limit her next pregnancy

- With adequate spacing, her metabolic parameters can return to normal either spontaneously or with life-style modifications. Thus there is reduced risk of GDM, spontaneous abortions or congenital malformations in the next pregnancy

- **Progestin-only methods (pills or injections) have been shown to increase glucose tolerance and hence are not first-line choices**

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Postpartum glucose testing

- **Maternal glucose levels usually return to normal after delivery**

- Fasting blood sugar (FBS) and 2hr post prandial blood sugar (PPBS) are performed on the 3rd day of delivery at the health facility before discharging the woman

- Hence, mothers with GDM are not discharged at 48hrs like other normal PNC mothers. They have to stay at least 3 days after delivery or longer according to their blood sugar levels

- **Later 75gm OGTT should be done at 6 weeks postpartum to evaluate glycemic status of mother**

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Importance of testing and procedure

Result	Instructions
Normal: <140mg/dL	-Lifestyle modifications, weight monitoring, appropriate diet and physical exercise - Blood sugar to be tested every 3 years
Impaired Glucose Tolerance: 140-199mg/dL	-Lifestyle modifications, weight monitoring, appropriate diet and physical exercise -Blood sugar to be tested every year -Refer to consult physician to learn about ways to lower risk for developing diabetes later in life
Diabetes: ≥200mg/dL	-Lifestyle modifications, weight monitoring, appropriate diet and physical exercise -Blood sugar to be tested every year -Refer to consult with physician to start treatment for diabetes

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Postpartum women with GDM should be counseled on:

- Identification and early management of hypoglycaemia in the mother and newborn
- Continue exclusive breastfeeding for the health of the baby and to prevent neonatal hypoglycaemia
- Maintenance of breastfeeding
- To come to the hospital immediately if she or the newborn has any problem or she has concerns
- Returning to the health facility after 6 weeks for an oral glucose test
- Planning their next pregnancy with optimal weight and normoglycemia
- Early glucose testing in the subsequent pregnancy to reduce the risk of early fetal loss or major congenital abnormalities
- Healthy eating even after delivery, regularly at the same time
- Planned physical activity (30-60 min daily at-least 5 times a week)
- Weight reduction as required

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FIGO – GLOBAL PERSPECTIVE AND GUIDELINES

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FIGO and the GDM Initiative

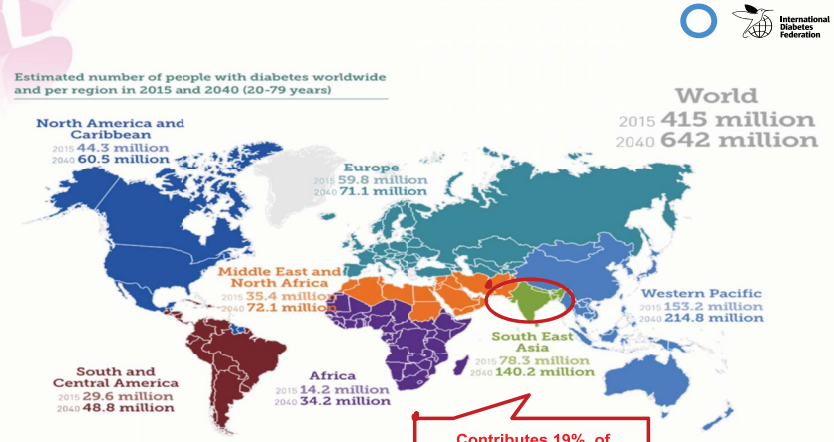
FIGO brings together professional Obstetrics & Gynaecology Societies from 130 countries.

FIGO's vision is for women of the world to achieve the highest possible standards of physical, mental, reproductive and sexual health and wellbeing throughout their lives.

FIGO has identified hyperglycemia in pregnancy as a priority area

The membership of FIGO is composed of 130 professional societies of obstetricians and gynecologists worldwide:

Diabetes: A global emergency



FIGO recommends that hyperglycemia/ Gestational Diabetes Mellitus (GDM) beconsidered a global health priority

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GDM facts:

2015
- 199,5 million
- Women with diabetes

2030
- 313,3 million
- Women with diabetes

- 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.
- The prevalence of hyperglycaemia in pregnancy increases rapidly with age and is highest in women over the age of 45.

181

1 in 6

births globally is affected by Gestational Diabetes*

* Source: International Diabetes Federation. IDF Diabetes Atlas, 7th edn. Brussels, Belgium: International Diabetes Federation, 2015

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PREGNANCY OFFERS A WINDOW OF OPPORTUNITY TO:

FIGO
INTERNATIONAL FEDERATION OF GYNECOLOGY & OBSTETRICS

- Establish services
- Improve health
- Prevent intergenerational transmission of noncommunicable diseases

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Universal testing: All pregnant women should be tested for hyperglycemia during pregnancy using a one-step procedure and FIGO encourages all countries and its member associations to adapt and promote strategies to ensure this.

- All countries have an obligation to implement the best GDM testing and management practices they can.
- FIGO acknowledges that for global progress to be made, India, China, Nigeria, Pakistan, Indonesia, Bangladesh, Brazil, and Mexico must be key targets for focused GDM attention

- FIGO adopts and supports the IADPSG/WHO/IDF position that all pregnant women should be tested for hyperglycemia during pregnancy using a one-step procedure.
- FIGO encourages all countries and its member associations to adapt and promote strategies to ensure universal testing of all pregnant women for hyperglycemia during pregnancy.

Recommendations

- FIGO recognizes that nutrition counseling and physical activity are the primary tools in the management of GDM.
- FIGO recommends that women with GDM receive practical nutrition education and counseling that empowers them to choose the right quantity and quality of food.
- Women with GDM must be repeatedly advised to continue the same healthy eating habits after delivery to reduce the risk of future T2DM.

Box 9
Recommendations for nutrition therapy in women with gestational diabetes mellitus.

Recommendations	Resource setting	Strength of recommendation and quality of evidence
We recommend that the following principles should be adhered for all pregnant women with diabetes: • Design an appropriate diet with respect to prepregnancy BMI, desired body weight, physical activity, habits, and personal and cultural preferences. • Provide routine follow-up and diet adjustments throughout pregnancy to achieve and maintain treatment goals. • Offer training, education, support, and follow-up by a qualified dietician experienced in care of women with diabetes. Issues for discussion include: weight control, food records, carbohydrate counting, prevention of hypoglycemia, healthy foods, and physical activity.	All	1|⊕⊕○○
We suggest that caloric intake be calculated based on prepregnancy BMI and desirable weight gain as follows: • 35–40 kcal/kg desirable body weight for underweight women • 30–35 kcal/kg desirable body weight for normal weight women • 25–30 kcal/kg desirable body weight for overweight women	All	2|⊕⊕○○
We recommend limiting carbohydrate intake to 35%–45% of total calories, with a minimum of 175 g carbohydrate per day, distributed in three small-to-moderate sized meals and 2–4 snacks.	All	1|⊕⊕⊕○
For obese women, caloric intake may be reduced by 30%, but not below 1600–1800 kcal/d	All	2|⊕⊕○○
For women with diabetic nephropathy, protein may be lowered to 0.6–0.8 g/kg ideal body weight	All	2|⊕○○○

Nutrition counselling and physical activity are KEY to reduce risk of future obesity, type 2 diabetes, and cardiovascular diseases

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Recommendations

Management of GDM: Management should be in accordance with available national resources and infrastructure even if the specific diagnostic and treatment protocols are not supported by high-quality evidence, as this is preferable to no care at all.

Box 1
Recommendations for prenatal supervision in women with gestational diabetes mellitus.

Recommendations	Resource setting	Strength of recommendation and quality of evidence
Routine prenatal care should include visits to: • Healthcare professionals skilled in care of women with diabetes in pregnancy (obstetrician, perinatologist, diabetologist, diabetes educator, nutritionist etc): 1–3 weeks as needed • Nurse: Weight, blood pressure, dipstick urine protein: 1-2 weeks as needed	High	1|⊕○○○
Prenatal follow-up determined locally according to available resource: • A minimum of monthly check-ups with a healthcare provider knowledgeable in diabetes in pregnancy	Mid and Low	2|⊕○○○


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Recommendations

Pharmacological management: If lifestyle modification alone fails to achieve glucose control, metformin, glyburide, or insulin should be considered as safe and effective treatment options for GDM.

Box 5
Recommendations for glucose monitoring in women with gestational diabetes mellitus.

Recommendations	Resource setting	Strength of recommendation and quality of evidence
Self-monitoring of blood glucose is recommended for all pregnant women with diabetes, 3–4 times a day: • Fasting: once daily, following at least 8 hours of overnight fasting • Postprandial: 2-3 times daily, 1 or 2 hours after the onset of meals, rotating meals on different days of the week	All	2|⊕⊕○○
Self-monitoring of blood glucose is recommended for all pregnant women with diabetes at least once daily, with documented relation to timing of meal	Low	2|⊕○○○



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- FIGO supports the concept that the postpartum period in women with GDM provides an important platform to initiate early preventive health for both the mother and the child who are both at a heightened risk for future obesity, metabolic syndrome, diabetes, hypertension, and cardiovascular disorders.
- FIGO encourages obstetricians to establish connections with family physicians, internists, pediatricians, and other healthcare providers to support postpartum follow-up of GDM mothers linked to the regular check-up and vaccination program of the child to ensure continued engagement of the high-risk mother-child pair.

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Links between maternal health and NCD prevention – the health economic arguments

From HIP (Hyperglycemia in Pregnancy)/ Diabetes in Pregnancy (DIP)

to

prevention of DAP(Diabetes after Pregnancy)

Life course approach to

management , prediction and prevention of NCD – Mother and Offspring

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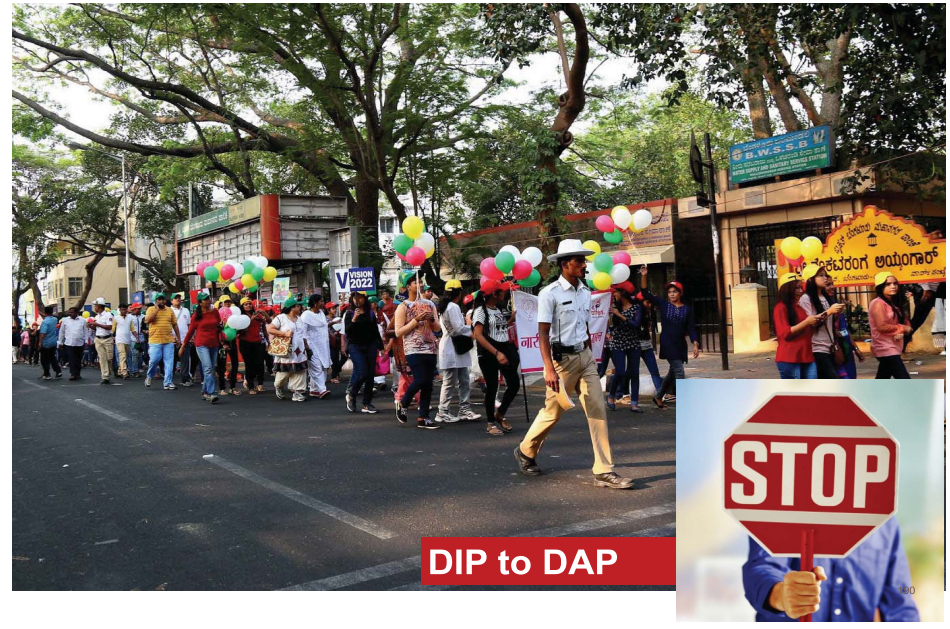

Thank you

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Notes

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