

Review of FIGO & ADA, WHO, IADPSG Guidelines for GDM for Low Resource Setting and Integration of DIPSI with MOHFW Govt of India, Guidelines

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Abstract: OGTT is performed in pregnant women by measuring the plasma glucose in fasting or non-fasting after 2-hour ingesting 75 grams of glucose (Monohydrate Dextrose Anhydrous). For diagnosing gestational diabetes (GDM) Indian Guidelines (DIPSI Test) are simple and can be done easily in low resource setting where large number of pregnant women visit for ANC check-up. The severity of GDM increases because of the action of insulin is diminished (insulin resistance) due to raised hormone secretion by the placenta. Other risk factors for GDM are being elderly, increased BMI, or obesity, weight gain in pregnancy, history of diabetes in family, stillbirth or a congenital abnormality in previous deliveries. GDM has previously been considered to be transient during pregnancy and resolve after pregnancy but, pregnant women with hyperglycaemia are at higher risk of developing GDM in subsequent pregnancies and about half of the women with a history of GDM will develop type II Diabetes within five to ten years after delivery. DIPSI simple testing protocol is endorsed by the National Health Mission (GOI) Guideline on GDM, and also endorsed by the FIGO guideline on HIP for use in South Asia. This testing protocol has been followed by Sri Lanka, Pakistan and Bangladesh in the region. Tamil-Nadu state and Uttar Pradesh states in India launched a Universal GDM Program in 2007 and 2016 respectively, covering all pregnancies by testing and managing GDM with MNT, Metformin and Insulin in most of health care facilities. Around 28,000 ANM have been given glucometers, strips, glucose 75 gm packets for implementation of the largest GDM program in Uttar Pradesh, India to date.

Keywords: FIGO Guidelines, WHO, DIPSI, GDM, HIP, DIP, NHM, MOHFW, GOI, IADPSG, ACOG, IDF, ANM, ADA, Sub-Center, NICE, CDA

1. Introduction

Hyperglycaemia Elevated Blood Sugar that is newly found in pregnancy is named as either gestational diabetes mellitus

(GDM) or hyperglycaemia in pregnancy. Pregnant women with slightly elevated blood glucose levels is called as having GDM. Pregnant women with substantially elevated blood glucose levels are named as women with diabetes in

pregnancy with previously known diabetes [1], both together is known as HIP (Hyperglycaemia in pregnancy).

It has been roughly estimated that most (75–90%) of the cases of elevated blood glucose in pregnancy are defined gestational diabetes mellitus [2]. GDM is a type of diabetes that can present in pregnant women during the first, second or third trimester of pregnancy. If it is diagnosed in the first trimester of pregnancy most likely diabetes existed before pregnancy but was undiagnosed.

GDM and diabetes in pregnancy is mostly an asymptomatic disease and may overlap with normal pregnancy symptoms.

An oral glucose tolerance test (OGTT) is therefore recommended for screening of GDM between 12-16 weeks or during 1st ANC visit and a second test at the 24th- 28th week of pregnancy [12] as universal GDM testing in all pregnant women. National guideline (NHM, GOI) for diagnosis and management of Gestational Diabetes endorse the single step test recommended by WHO for diagnosis of GDM using a 75 gm glucose, through Oral Glucose Tolerance Test (OGTT) irrespective of the last meal with a threshold value of 2-hour BS >140 mg/dl. Guidelines advocate for universal screening of all pregnant women at first antenatal contact. If the first test is negative, second test should be done at 24-28 weeks of gestation [4, 12]. However, as per ADA guidelines high risk pregnant women are selectively screened in pregnancy in second trimester [3].

2. Methodology

OGTT is performed in pregnant women by measuring the plasma glucose in fasting or non-fasting after 2-hour ingesting 75 grams of glucose (Monohydrate Dextrose Anhydrous). For diagnosing gestational diabetes (GDM) Indian guidelines are simple and can be done easily in low resource setting where large number of pregnant women visit for ANC check-up. The severity of GDM increases because the action of insulin is diminished (insulin resistance) due to raised hormone secretion by the placenta [4]. Other risk factors for GDM are being elderly, increased BMI, or obesity, weight gain in pregnancy, history of diabetes in family, stillbirth or a congenital abnormality in previous deliveries.

GDM previously used to be transient during pregnancy and resolve after pregnancy but pregnant women with hyperglycaemia are at higher risk of developing GDM in subsequent pregnancies and about half of women with a history of GDM will develop type II diabetes within five to ten years after delivery.

GDM women have lifetime risk for type II diabetes and obesity [5], and adverse outcomes both for women and foetus. The most common shared features among them are hypertension and LGA large for gestation age (macrosomia). Tight control of the blood sugar during all the trimesters can reduce adverse outcomes in mother and foetus. All the women who have diabetes prior to conception need counselling, antenatal care and good management of hyperglycaemia incl. post- partum care for good outcomes.

3. Prevalence

As per IDF Atlas 2017, 21.3 million or 16.2% (Figure 1) of births to pregnant women had some form of hyperglycemia in pregnancy; HIP before and during pregnancy [6]. An estimated 86.4% of HIP were due to gestational diabetes mellitus (GDM), 6.2% due to (DIP) diabetes detected prior to pregnancy (6), and 7.4% due to other types of DM (type 1 (T1DM) and type 2 diabetes) first detected in pregnancy (Table 1). The prevalence of hyperglycemia in pregnancy (HIP) increases with the age of women and is highest at the age 45 year (around 45%), Due to higher birth rates in early age, half of all the HIP, 49% cases occur in women under 30 years of age (Figure 2).

The prevalence of GDM in India is 27.9 as per IDF 2017 estimated in the age group of 20-49 Years [6].

Total live births to women aged 20-49 years	131.4 million
Hyperglycaemia in pregnancy	
Global prevalence	16.2%
Number of live births affected	21.3 million
Proportion of cases due to GDM	86.4%
Proportion of cases due to other types of diabetes first detected in pregnancy	7.4%
Proportion of cases due to diabetes detected prior to pregnancy	6.2%

Figure 1. Global Estimates of hyperglycaemia in pregnancy, 2017.

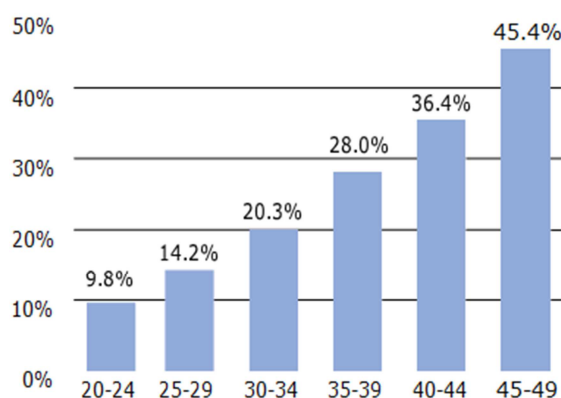


Figure 2. Hyperglycaemia in pregnancy by age group, 2017.

The prevalence of hyperglycaemia in pregnancy (HIP) varies widely around the world, with the South-East Asia Region WHO region with the highest prevalence at 24.2% compared to 10.4% in the Africa Region (Table 1). The highest number of (88%) of cases of hyperglycaemia in pregnancy are in low- and middle-income countries (LMIC), with low access to health care facility.

Table 1. Hyperglycaemia in pregnancy (HIP) in women aged 20-49 years by IDF region, 2017[6].

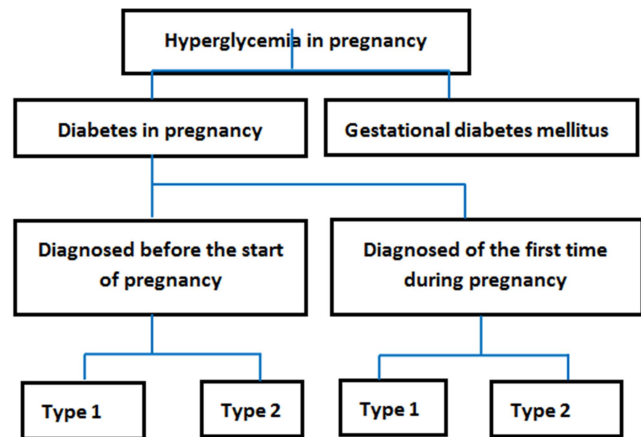
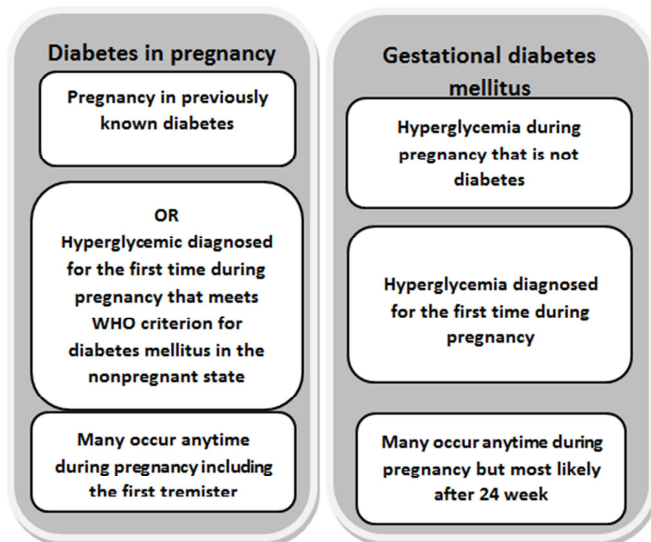
IDF region	Raw prevalence	Age-adjusted prevalence	Number of live births affected
Africa	10.4%	9.5%	3.4 million
Europe	16.2%	13.7%	1.7 million
Middle East and North Africa	21.8%	17.9%	3.8 million
North America and Caribbean	14.6%	12.0%	1.0 million
South America and Central America	13.1%	11.6%	0.9 million
South East Asia	24.2%	26.6%	6.9 million
Western Pacific	12.6%	12.3%	3.6 million
IDF Diabetes Atlas – 8 th Edition			

4. Type of GDM

GDM & Diabetes in Pregnancy combined together is designated as Hyperglycaemia in Pregnancy, later one is more fatal than GDM which may be transient but if not

managed adequately may leads to Diabetes later on in mother and child.

HIP = DIP + GDM (Differentiate) HIP, Type 1 & Type II Diabetes

**Figure 3.** Hyperglycemia in Pregnancy.

5. FIGO Recommendations & Review of Guidelines on Hyperglycaemia in Pregnancy [4]

- FIGO adopts and support the IADPSG/WHO/IDF position that all pregnant women should be tested for hyperglycaemia 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 of forhyperglycaemia during pregnancy

- 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.

HIP Hyperglycaemia in Pregnancy Guidelines Differ Ethnicity wise and regional wise around the world, below is the table for various important organizations Guidelines for HIP.

Table 2. Different Guidelines for GDM & Diabetes in Pregnancy (DIP) Diagnosis.

Organization	Fasting Plasma Glucose Mmol/dl	Glucose Challenge	1 h Plasma Glucose Mmol/dl	2 h Plasma Glucose	3 h Plasma Glucose
WHO1999 ¹	≥7.0	75gm OGTT	Not required	≥7.8 or 140 mg/dl	Not required
American Congress Obstetricians & Gynecologist ²	≥ 5.5	100gm OGTT	≥10.0	≥8.6 *	≥7.8
Canada Diabetes Association ³	≥5.3	75gm OGTT	≥10.6	≥8.9 or 160 mg/dl	Not required
IADPSG ⁴	≥5.1	75gm OGTT	≥10.0	≥8.5 or 153 mg/dl	Not required
DIPSI ⁵	-	75 gm OGTT	-	≥7.8 or 140 mg/dl	Not required
NICE ⁶	≥5.6 or			≥7.8 or 140 mg/dl	Not required

1. one value is sufficient for diagnosis
2. two or more values are required for diagnosis
3. two or more values required for diagnosis
4. one value is sufficient for diagnosis
5. one value for Diagnosis
6. one value for Diagnosis

6. Disadvantages of the IADPSG Test & Advantage of DIPSI Test in Asian Population

Measuring fasting blood sugar levels and waiting while fasting for 2 hours is impractical in most settings especially in South Asia and therefore drop-out rates are increased when repetition of testing for OGTT [7] is advised.

In GDM pregnant women fasting blood sugar is normal in most cases and post prandial 2-hour blood glucose is abnormal especially in the Asian context where GDM prevalence is around 14-16% countrywide. Therefore 2-hour OGTT with 75 gm Glucose load is able to identify most

GDM cases in an Indian context [8]. Asians and especially Indians are high risk for 2-hour post prandial blood sugar increase compared to Caucasians [9].

It is estimated that fasting FBG > 5.1 mmol/l or 92 mg/dl cut-off with 3.2% sensitivity, around 76% of pregnant women would be missed if the diagnosis is made by WHO guidelines [11].

6.1. NHM Govt of India Guidelines for GDM

NHM, Govt of India, MOHFW released in 2014, National Guidelines on diagnosis and management of gestational diabetes to screen all the pregnant women during the first visit and a second time at 24 weeks onwards. In addition, the Guidelines were revised in 2018 to include Metformin after 20 weeks of gestation in GDM cases after 2 weeks of MNT [12] as per the field experience and tolerability of oral drugs in the public health system as insulin cold chain maintenance is often an issue at PHC and sub-centre level health care facilities [12].

Thus, GDM is managed initially with MNT and physical exercise and if it is not controlled with MNT (lifestyle changes), Metformin or Insulin therapy is added to the MNT.

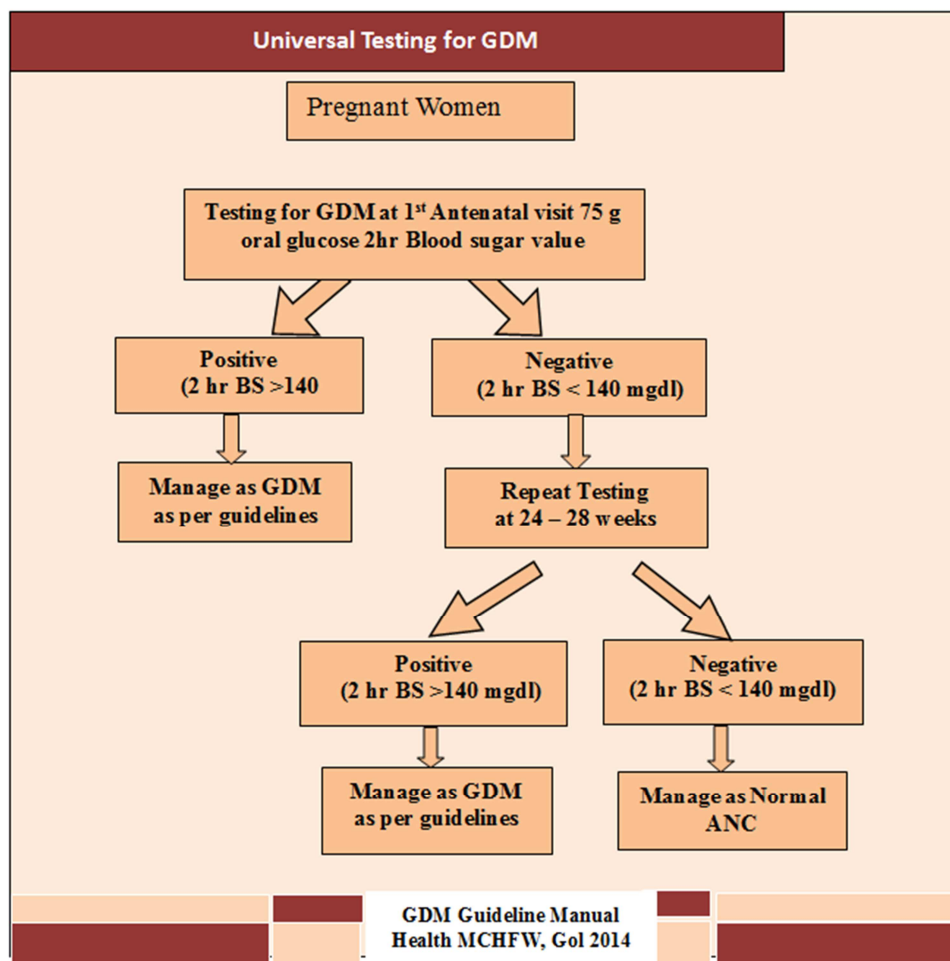


Figure 4. Universal Single test of MOHFW, Govt of India GDM Guideline Manual Health MOHFW, 2014.

6.2. FIGO/WHO Guidelines for GDM in Low Resource Setting

In fully resource setting Diabetes in pregnancy can be detected by PPG or HbA1c in First trimester, and FBS is ≥ 92 as per IADPSG Criteria for GDM diagnosis, if negative

Pregnant women is followed for 2 hr- OGTT with 75 gm of Glucose. In the situations where women may not be able to come for testing in a fasting state, a single step 75-g 2-hour non fasting test (> 140 mg/dl) as used in India, may be applied [12].

Table 3. Option for diagnosis of gestational diabetes mellitus based on resource settings.

Strategy Setting	Who to test when	Diagnostic test	Interpretation	Grade
Fullyresourced setting	All women at booking/first trimester 24 week	Measure PPG, RBS, or Hba1c to detect diabetes in Pregnancy If negative: perform 75 –g 2hour OGTT		1 ⊕⊕⊕0
Fullyresourced setting serving ethnic populations at high risk	All women at booking/first trimester 24 week	perform 75 –g 2hour OGTT to detect diabetes in pregnancy If negative: perform 75 –g 2hour OGTT		2 ⊕000
Any setting (basic): particularly medium-to low-recourse setting serving ethnic population at risk	All women between 24 and 28 week	perform 75 –g 2hour OGTT		1 ⊕⊕⊕0

6.3. FIGO GDM Diagnosis Recommendation

GDM diagnosis should be ideally based on blood tests done in an accredited laboratory on properly collected and transported venous plasma sample.

1. FIGO recommends the use of a plasma-calibrated handheld Glucometer with properly stored test strips to measure plasma glucose in primary care settings. Particularly in low-resource countries, where a close-by laboratory or facilities for proper storage and transport of blood samples to distant laboratory may

not exist. This may be more convenient and reliable than tests done on inadequately handled and transported blood samples in a laboratory. It is recommended that form time to time a few samples are parallel tested in an accredited laboratory to document the variability.

2. FIGO recommend that all laboratories and clinical services document their baseline quality and work toward improvement irrespective of the recourses available.

Table 4. POINT OF CARE TESTING (POC) FOR GDM FIGO Recommendations.

Recommendation for prenatal supervision in women with Gestational diabetes mellitus:

Recommendation	Resource setting	Strength of recommendation and quality of evidence
Routine prenatal care should include visit to: Healthcare professionals skilled in women with diabetes in pregnancy (obstetrician, penologist, dialectologist, diabetes educator, nutritionist ect.): 1-3 week as need Nurse: weigh, blood pressure, dipstick urine protein: 1-3 weeks as need Parental follow-up determined locally according toavailable resource: A minimum of monthly check-up with a healthcare provider knowledgeable in diabetes in pregnancy	High Mid and Low	1 ⊕⊕⊕0 2 ⊕000

6.4. FIGO Recommendation for Foetal Monitoring

FIGO Recommends at least one USG for Growth every 2-4 Weeks in GDM Diagnosed cases, as it will help in Labelling of Macrosomia and Small of Gestational Age (SGA).

Table 5. Recommendation for growth assessment in women with gestational diabetes mellitus.

Recommendation	Resource setting	Strength of recommendation and quality of evidence
Clinical and songraphic growth assessment every 2-4 weeks from diagnosis until time.	High	1 ⊕000
Periodic clinical and sonographic growth assessment from until time.	Mid and Low	2 ⊕000

7. Management of GDM

7.1. NHM Govt of India Guidelines, Management of GDM

National health Mission, Ministry of health & Family Welfare, Govt of India released GDM Guidelines and

Management in which MNT is the mainstay of the Treatment once GDM is Diagnosed for 2 weeks, and after that if Blood Sugar Post Prandial failed to reach <120 mg/dl, Metformin can be initiated after 20 weeks of Pregnancy. Insulin can be added if failed to achieve target with or without metformin [12].

Management of GDM, Guidelines 2018 [12]

Medical Management (Oral Anti-diabetic Drug-Metformin; and Insulin Therapy)

1. Metformin or Insulin therapy is the accepted medical management of pregnant women with GDM not controlled on MNT. Insulin is the first drug of choice and metformin can be considered after 20 weeks of gestation for medical management of GDM.
2. Insulin can be started any time during pregnancy for GDM management. If pregnant women with GDM before 20 weeks, and Medical Nutrition Therapy (MNT) failed, Insulin should be started.
3. Metformin can be started at 20 weeks of pregnancy, if

MNT has failed to control her blood sugar. If the woman's blood sugar is not controlled with the maximum dose of metformin (2 gm/ day) and MNT, Insulin to be added. The dose of metformin is 500 mg twice daily orally up to a maximum of 2 gm/day.

4. Hypoglycemia and weight gain with metformin are less in comparison to Insulin.
5. If Insulin is required in high doses, metformin may be added to the treatment.
6. At PHC, MO should initiate treatment & refer pregnant women with GDM to a higher center if blood sugar levels are not controlled or there is some other complication.

Thus, GDM is managed initially with MNT and physical exercise and if it is not controlled with MNT (lifestyle changes), Metformin or Insulin therapy is added to the MNT.

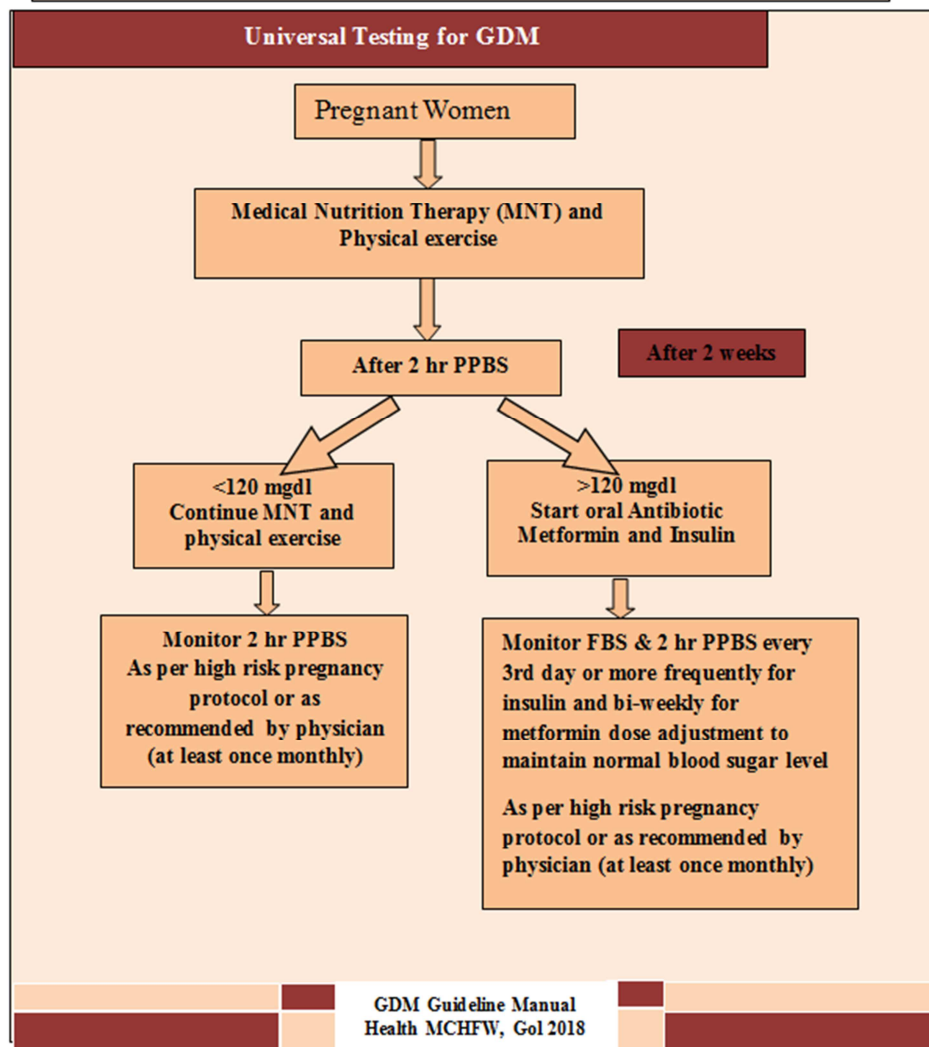


Figure 5. Medical Management of Gestational Diabetes Mellitus.

A personalised diet plan should be framed by a trained dietician, which should provide necessary healthy nutrition for the increased demand of the mother and foetus. [13]. Lifestyle modification is the most important intervention for GDM control and is sufficient to control around 70-80% of

all pregnant women with GDM [13].

In Pregnant women especially those with T1DM and pre-existing type II diabetes, ADA advocates for the use of Insulin however, changing the physiological demand in pregnancy may require more monitoring and titration of

Insulin and should be frequently self-monitored by the women [13].

In the 1st trimester: Generally, insulin continues in DIP but GDM rarely requires the use of insulin in Type II diabetes. T1DM may experience hypoglycaemia, therefore Insulin titration may be needed more frequently for this group.

In the 2nd trimester: Insulin requirement increases in second trimester because of increase of anti- insulin hormones & Placental lactogen which is increased bi- weekly or twice a week to achieve glycaemic goals. Generally, 50% insulin given as basal dose and 50% as prandial dose to achieve good control.

Late in 3rd trimester:

Treatment with Insulin is complex and need referral to higher centres where specialised team of Obstetrician, endocrinologist and trained Dietician is needed.

Diabetes in pregnancy is associated with high risk of preeclampsia hence women with type 1 or type 2 should be prescribed a low dose aspirin 81mg/day from the end of the first trimester until the baby is born (13).

In T1DM during pregnancy the risk of hypoglycaemia is increased many folds and unawareness of hypos is also increased as counter regulatory hormone disturbances occur. Therefore patient education toward hypos are very important through pregnancy and afterwards. After delivery during the post- partum period placental hormones decreases and insulin resistance drops which may lead to hypos and which in turn may lead to diabetic keto-acidosis (DKA). DKA should be treated immediately in order to also prevent diabetic retinopathy [13].

GDM is not at high risk of diabetic retinopathy but DIP or pregnant women who have diabetes before conception are at increased risk of diabetic retinopathy and should therefore be screened for diabetic retinopathy after conception earliest during the 1st trimester and follow-up 3 monthly in NPDR and monthly in severe NPDR [14].

Family planning should be addressed to all women with HIP before conception [13]. Tight blood sugar controls; HBA1c < 6.5% for reduction of risk of outcomes like anencephaly, congenital heart disease, microcephaly and caudal regression syndrome in foetus.

7.2. Preconception Testing

Women with HIP with T1DM and Type II diabetes, who are planning pregnancy should be screened for diabetes retinopathy and counselled for potential progression.

Other testing and counselling is needed concerning HIV, Hepatitis B, Rubella and Pap smear, blood group,

administration of folic acid 400 mcg daily. Testing HBA1c, TSH, Urine albumin and creatinine.

Teratogenic drugs in pregnancy like ACE inhibitors, ARB [15], statin should be avoided [16], monitoring for diabetic retinopathy before the pregnancy, Use of Anti-hypertensive medication which is indicated in pregnancy i.e methyl dopa, Labetalol, Diltiazem, Prazosin and Clonidine should be followed, use of chronic diuretic should be stopped as it restricts utero-placental perfusion.

T1DM and Type II Diabetes during diabetes in pregnancy (DIP) leads to more risk in mother and foetus compare to GDM, adverse outcomes includes abortion, foetal malformations, preeclampsia, macrosomia, raised bilirubin and neonatal hypoglycaemia (18) and in futures it increases risk of Type II Diabetes and obesity in mothers and offspring's [18].

All the Women & adolescent with diabetes risk during the reproductive period should be educated about outcomes of unplanned pregnancies [18], Preconception counselling is very effective method to reduce health cost and burden of complication associated with hyperglycaemia in pregnancy & offspring, family planning methods should be negotiated until the women become pregnant [18].

7.3. Diabetes in Preeclampsia & Use of Aspirin

DIP (Diabetes in Pregnancy) is also linked with greater risk for preeclampsia [19] as a results of clinical trial and therefore US Preventive Task force suggest use of 81 mg/day aspirin after 12 weeks of gestation for women high risk for preeclampsia [20].

Recommendation: Level of evidence A

Type I or Type II diabetes Women should be given aspirin 60-150 mg/daily or usually 81 mg/dl to lower risk of preeclampsia since first trimester onwards.

7.4. Medical Nutrition Therapy

MNT (Medical Nutrition therapy) is personalised Diet plan prescribed by Dietician trained in nutrition & Diet for the management of Gestational Diabetes Mellitus [24]. Diet plan should be based on adequate healthy nutrition and calories intake for appropriate weight. Although research is lacking whether GDM have different calories intake compare to Non-GDM therefore diet plan should be as per Dietary Reference Intake which recommend at least 175 gm of carbohydrate, minimum protein of 71 gm and 28 gram of Fibers. It's is common that amount of carbohydrates will leads to post prandial glucose excursions [24].

Table 6. Nutritional Therapy Recommendations, FIGO.

Recommendations for nutrition in women with gestational diabetes mellitus

Recommendation	Resource setting	Strength of recommendation and quality of evidence
We recommended that the following principals should be adhered for all pregnant women with diabetes:		
1. Design an appropriate diet with respect to pregnancy BMI, desired body weight, physical activity, habits, and personal and cultural preference.	All	1 ✱✱00
2. Provide route follow-up and diet adjustment throughout pregnancy to archive and maintain		

Recommendation	Resource setting	Strength of recommendation and quality of evidence
treatment goals.		
3. 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		
We suggest that caloric intake be calculated based on pregnancy BMI and desirable weight gain as follows:		
1. 35-40 kcal/kg desirable body weight for underweight women	All	2 ⊕⊕00
2. 30-35 kcal/kg desirable body weight for normal weight women		
3. 25-30 kcal/kg desirable body weight for overweight women		
We recommended limiting carbohydrate intake to total calories, with a minimum of 175 carbohydrate per day, distributed in three small-to-moderate size meals and 2-4 snacks.	All	1 ⊕⊕⊕0
For obese women, caloric intake may be reduced by 30%, but not below 1600-1800 kcal/d	All	2 ⊕⊕00
For women with diabetic nephropathy, protein intake be lowered to 0.6-0.8 g/kg ideal body weight	All	2 ⊕000

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

7.5. Physical Activity for GDM

Physical activity is recommended to all the Pregnant Women with GDM preferably 30 minutes every day, brisk walking is helpful after meal to lower Post Prandial Glucose Excursions. Women with Diabetes in Pregnancy should continue their previous Exercise Plan as before the Pregnancy.

Table 7. FIGO Recommendation for Physical Activity in HIP.

Recommendation	Resource setting	Strength of recommendation and quality of evidence
We suggest that appropriate, personally adapted, physical activity be recommended for all women with diabetes:		
1. Planned physical activity of 30 min/day	All	2 ⊕⊕00
2. Brisk walking or arm exercises while seated in a chair for 10 min after each meal.		
3. Women physical activity prior to pregnancy should be encouraged to continue their previous exercise routine.		

8. Pharmacological Management

Pharmacologic treatment in HIP with large insulin increase may need early initiation of oral drugs. Such treatment has demonstrated better outcome in perinatal women in two randomised trials by the US Preventive Task Force Review. Insulin is the initial drug of choice as per ADA Guidelines and US Preventive Task Force advocate safety and efficacy of Metformin and Glibenclamide [25, 26] in GDM, but both pass the placenta. Another randomised trial showed that Metformin

and Glibenclamide are both effective and reduced insulin use but Metformin was more effective as it causes less hypoglycaemia compared to Glibenclamide [26]. However, more definitive studies are required in this area. Long-term safety data are not available for any oral agent [27].

If Lifestyle Modification alone fails to achieve glucose control, Metformin is a better option compared to Glibenclamide and insulin and should be considered as safe and effective treatment options for GDM. GOI- MOHFW, has Introduced Metformin as 1st line drug for GDM treatment after MNT failed to control Blood sugar <120 mg/dl after two weeks [12].

Table 8. FIGO Recommendations for Oral Drugs in GDM.

Recommendation for pharmacological treatment in women with gestational diabetes mellitus

Recommendation	Resource setting	Strength of recommendation and quality of evidence
Insulin glyburide, and metformin are safe and effective therapies for GDM during the second and third trimester, and may be initiated as first-line treatment after failing to achieve glucose control with lifestyle modification. Among OADS, metformin may be a better choice than glyburide [109]	All	2 ⊕⊕00
Insulin should be considered as the first-line treatment in women with GDM who are at high risk of failing on OAD therapy, including some of the following factors [129]:		
1. Diagnoses of diabetes <20 week of gestation	High	2 ⊕⊕00
2. Need for pharmacologic therapy >30		
3. Fasting plasma glucose levels >110 mg/dl		
4. hour postprandial glucose >140 mg/dl		
5. Pregnancy weight gain >12		

8.1. Sulfonylureas

Titre of Glibenclamide in umbilical cord plasma is around 70% of maternal levels and is therefore linked with the higher level of neo-born hypoglycaemia and LGA (macrosomia) if we compare with Metformin or Insulin in review (28).

8.2. Metformin

Metformin was associated with a lower risk of neonatal hypoglycaemia and less maternal weight gain compare to insulin in systematic meta-analysis (2015) (28); although, Metformin increased the risk of prematurity or birth less than 37 weeks of gestation. Metformin is however not sufficient to control blood sugar less than 120 mg/dl in GDM and therefore additional insulin is needed to control blood sugar to reach target level [25].

9. Gestational Diabetes Mellitus and Type 2 Diabetes

In Nurse health study II Women with history of GDM was found to be at increased risk for future Type II diabetes but risk decreased with women with GDM who followed healthy diet & lifestyle when normalised for BMI risk was reduced but small risk still remained [21].

Postpartum weight increased was associated with bad outcomes in future pregnancies [21] and Risk for Type II Diabetes.

9.1. Postpartum Care & Lactation

Postpartum care should include OGTT (75 gm Glucose Load in fasting state) after 6 weeks of delivery [12], to know the status of Diabetes. Psychological counselling and breastfeeding are very important for provide long metabolic & Immunological advantage for mother [22] and children [22] which reduces the chances of Type II Diabetes later in life.

9.2. Pre-conception and Inter-pregnancy Recommendations (FIGO)

FIGO calls for public health measures to increase awareness and acceptance of preconception consulting and to increase affordability and access to preconception service to women of productive age, as this is likely to have both immediate and lasting benefits for material and child health.



Figure 6. Preconception Counseling.

10. Conclusion

There are around 5.5 million cases of HIP hyperglycaemia in pregnancy annually in South Asia. It is a great challenge to screen all pregnant women and manage these if needed. Furthermore, it is difficult to screen pregnant women in fasting state and the fasting blood sugar in most of South Asian women is not abnormal compared to OGTT after 2-hour of 75 gm Glucose load. Moreover, using this method of Testing is able to detect most of pregnant women with HIP (hyperglycaemia in pregnancy). FIGO and IDF therefore endorses the DIPSI test especially in resource limited settings of South Asia and other countries, whereas the IADPSG criteria is not suitable for Asian countries as pregnant Women has to go 3 times for testing which is even not practical in a European setting and large number of pregnant women do also not come in fasting state. In India two States; Tamil Nadu and Uttar Pradesh have launched Universal GDM testing and pregnant women are here detected GDM and followed-up for blood sugar control during the pregnancy and most women (90%) are managed with MNT (Medical Nutrition Therapy). The remaining group where the post prandial Blood sugar (2hour) is > 120 mg/dl after 2 weeks of MNT, receive Metformin and Insulin for GDM treatment. A large number of ANMs has been recruited to address maternal health issues like hypertension in pregnancy, anaemia, malnutrition, over-nutrition and hyperglycaemia of pregnancy. 28,000 ANMs are being trained to cater for an estimated 6 million pregnant women alone in the Uttar Pradesh. Till now, 1 million pregnant women have been screened in UP. UP is following the Tamil Nadu model, where Dr. V Seshiah; father of GDM in India started a GDM program in 2007 with the Tamil Nadu Government. Recently the Govt of India declared Dr. V Seshiah's birthday, the 10th of March as Indian GDM awareness day.

Conflict of Interest

No conflict of interest in Preparation of Manuscript involved.

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