Prevention of Gestational Diabetes Mellitus (GDM)

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Abstract

Prevention of Gestational diabetes mellitus holds the key to prevention of the diabetes and metabolic syndrome epidemic sweeping the world. This review discusses prevention of gestational diabetes and provides a scientific framework for the study of this topic. It classifies prevention in various ways, and suggests strategies which fit the different levels of prevention of gestational diabetes. The review also cites recent evidence and best practices to support the feasibility of prevention of gestational diabetes.

Keywords: Primary prevention, Primordial prevention, Secondary prevention, Tertiary prevention, Quaternary prevention, Lifestyle modification.

Introduction

The Dhaka Declaration (2015) highlights gestational diabetes mellitus (GDM) management as a challenge, as well as opportunity, for both public health and clinical medicine.[1] GDM is a form of pre-diabetes, which punches far beyond its weight, causing acute, chronic, and trans-generational impact. Similar to rate limiting step in chemistry, which may be hastened with enzymes, or delayed by inhibitors, GDM can be worsened by mismanagement, or prevented by appropriate measures. Action at this level will have downstream consequences, not only for the woman in question, but for her unborn offspring, and for the community she lives in. Hence, prevention of GDM is of paramount importance.

Levels of Prevention

Prevention can be classified according to levels (primordial, primary, secondary, tertiary and quaternary);[2,3] targets (all girls and women, women in preconception, antenatal, postnatal, and inter-conception phases); and intervention (non-pharmacological, pharmacological) (Tables-1, 2).

Scope of Prevention

Primordial prevention refers to the avoidance of risk factors of a particular condition. Primordial GDM prevention includes maintenance of weight, appropriate nutrition, physical activity and lifestyle for all girls and all women in the reproductive age group or even during childhood. This attenuates the effect of modifiable risk factors on insulin sensitivity, and on the pathogenesis of GDM. Primary prevention implies the correction of risk factors that are already in play, but which have not yet led to the actual disease. From a GDM perspective, primary prevention focuses on healthy lifestyle, including medical nutrition therapy and exercise, in high risk antenatal women, to prevent GDM onset. Breast feeding can be classified as primordial prevention, when applied to all post-partum women, and as a primary prevention strategy if encouraged in women with history of GDM.

Secondary prevention of any medical condition, including GDM, encompasses screening, early diagnosis and treatment, whether non- pharmacological or drug-based. The aim is to arrest the natural history of the disease at an early stage, and prevent medical, obstetric, and paediatric complications. Targeting antenatal women with poor antenatal care- seeking behaviour, to achieve behaviour change and seek timely antenatal care, will also be included in secondary prevention.

Table-1: Classification of prevention of GDM: levels, targets.

Level	Life phase	Target	Activity
Primordial	Pre puberty / puberty	All young girls	Prevention of risk factors
Primary	Preconception	All adult women	Correction of risk factors
Secondary	Early antenatal	All women with GDM	Early screening, diagnosis; lifestyle modification; management
Tertiary	Antenatal/ Inter conception	All women with complicated GDM; their offspring	Medical, obstetric, neonatal management
Quaternary	All	All women at risk of/with history of GDM	Avoid over diagnosis, over treatment

Tertiary prevention refers to management of complications encountered in GDM, so as to minimize their impact on feto-maternal and neonatal health. All medical and obstetric management in the antenatal, postnatal and interconception period, as well as neonatal

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and paediatric management of the offspring, is part of tertiary prevention.

One should be aware of quaternary prevention, which describes the need to avoid over-diagnosis, over-labelling, and over-treatment of any medical condition. The psychosocial impact caused by a label of 'diabetes' in a young women, especially in Asia,[4] underscores the need to practice quaternary prevention in GDM. This is done by following validated means of screening and diagnosis. Quaternary prevention also encompasses the need to follow simple [yet sensitive] means of screening and diagnosis, as well as avoid over-treatment. For example, unnecessarily treating an antenatal woman with mild uncomplicated dysglycaemia, when she is diagnosed with GDM a few days or weeks prior to delivery, may be projected as a case fit for quaternary prevention.

Lifestyle Modification

Data is emerging regarding the role of physical activity, medical nutrition therapy, and weight management, during inter-conception, pre-conception, antenatal, and postpartum phases.

Non-Pharmacological Prevention

The Finnish Gestational Diabetes Prevention trial (REDIEL) enrolled 293 women with a history of GDM and/or a pre-pregnancy BMI of $\geq$30kg/m^2, at <20 weeks gestation. These women were randomized to a control group, which received standard antenatal care, or an intervention group, which also received individualized counseling on diet, physical activity and weight control.[5]

The incidence of GDM, as diagnosed by a 75g, 2 hour oral glucose tolerance test conducted at 24-28 weeks gestation, was 21.6% in the control and 13.9% in the intervention group (p= 0.044) (39% difference) Gestational weight gain was lower in the intervention group (-0.58kg; P=0.037), whose subjects also reported improved quality of diet and increased physical activity during leisure time.

Similar findings were reported from a Chinese study,[6] which sampled 74 women with a BMI. 24kg/m^2 at convenience. While both interventional and control groups received standard antenatal care and exercise, dietary and weight counseling at weeks 8-12, the intervention group also received counseling session every month during the 2nd trimester, and weekly follow up on telephone or via e-mail. These subjects had a much lower incidence of GDM and weight gain at the end of the 2nd trimester (28.1% vs 55.9%, p=0.023 and 6.86 $\pm$ 3.84kg, p=0.000) than the control group.

The role of energy, nutrients, foods and dietary patterns in the development of GDM has been the subject of many studies. A detailed systematic review suggests that GDM risk is associated with higher fat, cholesterol, hence iron, red processed meat and egg consumption. A diet rich in fruit, vegetables, whole grains and fish, and low in red and processed meat, refined grains and high-fat dairy products is beneficial.[7] A prospective cohort study, including 15632 women from the Nurses' Health Study II (1991-2001) reports that women who consumed more potatoes before pregnancy had higher rates of GDM.[8] Substitution of 2 servings a week of potatoes with other vegetables, legumes and whole grain foods led to a 9-12% lower risk of GDM. While the authors did not infer a causal risk, this study underscores the effectiveness of dietary modification as a preventive strategy.

On the other hand, the GI baby 3 Study, a randomized controlled trial, found no benefit of a low glycaemic index diet on pregnancy outcomes, including incidence of GDM, in women at high risk of the condition.[9]

Physical activity is another aspect of lifestyle which has been supported as a means of preventing GDM. A recent prospective cohort study showed that participation in vigorous intensity exercise helped reduced the odds of excessive gestational weight gain by 54% in women with recently diagnosed GDM. No such association was noted for moderate intensity exercise.[10]

Stress is a (partly) modifiable component of lifestyle as well. A cross-sectional, prospective study included 146 women who were exposed to the Hurricane Katrina, which hit Louisiana, during or just before pregnancy. Stress perception and use of denial coping style was found to significantly predispose to GDM (adjusted odds ratio 1.13, p=0.03 and 2.25, p=0.02 respectively).[11]

Pharmacological Prevention

Pharmacological preventive strategies, including the Chinese traditional medication Zuogui Wan, and myo-inositol, have been used in GDM.[12,13] However, data in support of their use is limited.

Drugs are best utilized in tertiary prevention. While the drug of choice is insulin, metformin and glibenclamide have also been accepted for use in certain situations. The bio-psycho social model of health has been used to create pragmatic indications for the use of metformin.[14] These include GDM detected during the late third trimester, poor adherence to insulin, poor self-management skills for injectable therapy, GDM refractory to high dose insulin, unwanted weight gain with insulin, and psychological or social resistance to insulin.

Postpartum Prevention

Postpartum follow up is a key element of GDM management step for prevention of further episode of GDM, as well as future diabetes.[15] The components of GDM postpartum follow up are encapsulated in the mnemonic ABCDE (Assessment Breast feeding Contraception, Diet and Exercise).[16] Breastfeeding, as a preventive strategy for GDM and diabetes, has been reviewed earlier in the JPMA.[17]

Barriers and Solutions

Universal or high-risk screening strategies, followed by appropriate treatment, are being used as secondary preventive interventions, to achieve safe glycaemic control and prevent complications in GDM. Women with GDM are being followed up post-delivery, to ensure accurate risk stratification, and appropriate lifestyle/pharmacological interventions. The efficacy of such follow up programmes can be improved if they are made concordant with existing child health schemes

Best Practices from South Asia

Major strides have taken place in the prevention and management of GDM and its associated complications. In Bangladesh, qazis deliver health education related to GDM prevention while solemnizing marriages. In India, gynaecologists offer preconception education material printed on 'shagun' envelopes in which gifts are given to newlywed couples.

Such best practices need to be replicated across the world, to help arrest GDM, and the diabetes pandemic. The current supplement of JPMA, too, is a means of achieving this goal.

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