Chapter 1:

Introduction
1. Introduction


There may be many contributory factors for such trend. Firstly "Asian-Indian phenotype refers to certain unique clinical and biochemical abnormalities in Indian which include: increased insulin resistance, greater abdominal adiposity; i.e. higher waist circumference despite lower BMI (Thin fat baby theory, C.S. Yajnik) lower adiponectin, and higher high sensitive CRP levels (Zargar AH, eta.al, 2000, V Mohan et.al, 2007).

Asian-Indians are more prone to diabetes due to phenotype. However one of drivers of the epidemic of diabetes would be the rapid epidemiological transition associated with changes in dietary patterns and decreased physical activity as evident from higher prevalence diabetes in the urban population. Early identification of at risk individuals using simple screening tools like IDRS and appropriate life style intervention would greatly help in preventing or postponing the onset of diabetes and thus reducing the Burdon on the community and the nations as a whole (Zargar AH, et.al, 2000, V Mohan et.al, 2007).

The Indian population is passing through a nutritional transition where subsistence conditions are being replaced by plentiful unhealthy food but reduced physical work and more sedentary life style due to more facilities provided by technology therefore, an understanding of the changing nutritional scene is critical.

1.1. Significance of study:

Chronic, non-communicable diseases are becoming major health problems. In recent years many patients involved with these kind of diseases, look for treatment at the very late stage, which tertiary prevention (palliative therapy) will be the only way to treat them partially. Effort for earlier investigation, in natural way of chronic disease, not only will be the screening for on-time diagnosis and treatment (second prevention), but also
will be focused more on primary real prevention. Hence it is necessary existing ways consider and make clear the background and etiology of these kinds of diseases.

There is an escalating epidemic of type 2 diabetes (Ramachandran A, et al 2001) and coronary heart disease (Gupta R, et al, 1996) in India, predominantly in urban areas. A recent survey in six cities showed that 12% of adults have diabetes and a further 15% have impaired glucose tolerance (Ramachandran A, et al 2001).

Maternal health and DOHaD is one of the recent concerns of research to prevent chronic diseases even before starting life. It shows the importance of maternal health on future health of offspring, since any problem during pregnancy like GDM is disease for two.

In diabetes atlas of the international diabetes federation has also reported that the estimated prevalence of diabetes in India in 2010 is approximately 51 million, which is likely to rise to 87 million by 2030. This differs with the earlier prediction of 57 million people with diabetes by the year 2025 (made in 1998). It suggests the rise in prevalence is significantly in excess of the projections made as recently as a decade ago. The increase in numbers is not only the consequence of increasing population but is also contributed to by an increase in prevalence. The diabetes atlas reports an adult’s prevalence of diabetes to be between 7-9 % currently and anticipates an increase to 9-12 % over the next two decades. This is consistent with secular trends reported in regional studies performed in India. From an urban prevalence ranging from 1.5-3% in the 1970’s the current prevalence of diabetes in adults from metropolitan India has risen to between 15-18% (Banerjee S, 2012).

A true increase in the prevalence of GDM, beside its adverse consequences for infants, might also reflect or contribute to the current patterns of increasing diabetes and obesity, especially in the offspring (Ferrara A, et. al, 2000). Follow ups after delivery has been suggested as well, since Crude prevalence rate of DM, among women who had GDM (52%), was 13 times higher than that in normal mothers (4%) (Yajnik CS. et al, 2003).
One of the major burdens for health economy is the rapid global rise in the prevalence of type 2 diabetes. Therefore it is crucial to identify specific risk groups, for targeting preventive strategies (V Mohan V. et.al, 2007).

Maternal nutrition intervention programs need to be examined the role of micronutrient rich foods. Interventions to improve maternal nutritional status of young girls during pre-conception may be more beneficial than those during pregnancy. (Rao, S. 2001).

To become more specific importance of antioxidant research continues to grow and emerge as new beneficial components of food are discovered. Reinforced by current research, food sources of antioxidants including fruits, vegetables and whole grains, are potentially active in reducing the risk of disease and can prove beneficial to maintain health (Tribble DL, 1999). To our knowledge there are few prospective trials have been performed in this area. Clearly, there is a need for examining several issues of nutritional significance for effective planning of interventions (Rao, S., 2001).

Most studies to understand maternal nutritional status and its relationship with fetal growth have examined maternal diets in the form of quantity (macronutrient) using the 24 h recall method, but have rarely assessed quality (micronutrients) (Rao, S., 2001).

Present prevalence of gestational diabetes is considered to be about 5% of all pregnancies, however it is increasing with rapid rate, and is associated with many complications of the pregnancy besides risk of diabetes in both mother and offspring at later age (Ben-Haroush A, et.al, 2004, Ferrara A, et.al, 2004, Silverman BL, et.al, 1995, Schaefer-Graf UM, et.al, 2005, Rowan JA et.al, 2008). Thus the women in reproductive age may be one of the ideal group for the primary prevention of diabetes. Hence this also implies that universal screening during gestation for detection and care of women with GDM may be considered as mandatory (Cosson E, et. al, 2006).

"In animal models, experimentally induced gestational diabetes mellitus (GDM) causes increased offspring adiposity. If the offspring is female, she is likely to develop GDM herself when she becomes pregnant, perpetuating an inter-generational vicious cycle of diabetes and obesity" (Aerts, et al 2006, Plagemann A, et al 2008). Given that
obesity and diabetes are epidemic in the developed world and emerging rapidly as primary threats to health in the developing world (Wild S 2004).

Over the next two to three decades there will be 80 million reproductive age women with diabetes in the world. Of these 20 million will live in India alone creating a potential for extremely high rates of maternal and infant morbidity. A recent national survey reported the prevalence of IGT in the age groups of 20-29 and 30-39 years as 12.2% and 15.3% respectively in the general population (Ramachandran A et al, 2001).

It seems plausible that a sufficient intake of antioxidants plays an important role in protection against type 2 diabetes. However, not much epidemiological evidence is available on the role of dietary anti-oxidant intake in prevention of type 2 diabetes (Montonen, J, et.al, 2004).

So in brief, as the prevalence of diabetes continues to rise worldwide, it becomes increasingly important to identify high-risk populations and to implement strategies to delay or prevent diabetes onset (Reichard P et al, 1993, UK Prospective Diabetes Study (UKPDS) 3, 1998). Women diagnosed with GDM are at high risk for future diabetes, it has been shown that women having GDM 17%-63% develop type 2 diabetes within 5-16 years in different ethnic groups. (Kjos SL 2000) Their children, in the long term, are at increased risk of obesity and glucose intolerance (Pettit DJ, et al, 1998, Silverman BL et al, 1998, Vohr BR, et al 1999).

Although there are limitations to the interpretation of the ORAC content of foods, scientists have hypothesized in the late 1990s that high-ORAC foods may counter the harmful effects of aging that are related to free radical damage(nutrition update, 2008), but there are no data available about the effect of high ORAC foods during pregnancy especially in relation to GDM.

To our knowledge, there are very limited studies, which have directly investigated the antioxidant status in GDM; however there is broad agreement in the scientific community that fruits and vegetables play an important role in health promotion and chronic disease risk prevention, in part due to their antioxidant content (nutrition update, 2008).
In brief an urgent need for safe low cost strategies to halt the diabetes epidemic is necessary.

1.2. Research gap:

India has the highest number of patients with type 2 diabetes in the world (Kale, S.D, et. al, 2005, Wild S, et.al, 2004). In scientific literature, however not much information is available about the prevalence of glucose intolerance during pregnancy in mother and later in infant in India. Hence there is a need to study the prevalence, predictors and the risk factors of GDM in Indian mothers.

However, there is also scarcely available data on effect of optimal medical nutrition therapy for GDM mother on fetus. There is a need to assess this issue more deeply and find solutions considering to cultural, geographical, habitual variability.

Earlier study conducted to assess prevalence and risk factors of gestational diabetes in urban rural areas, in Pune city, there was retrospective. Different criteria were used and/or selection of sample matched control group was not considered. (Kale, S.D, et. al, 2005).

Despite very convincing animal studies, questions still exist concerning the long impact of intra uterine hyperglycemia in humans (Mohan V, et. al, 2007). There are not many studies in literature evaluating long term impact of intrauterine hypoglycemia. One follow up study (Mohan V, et.al, 2007) attempt to assess the long term impact of hyperglycemia on children was non-conclusive.

Diet is one of the important factors in prevention as well as treatment of disease. Earlier studies in India have examined maternal diets in terms of quantity (macro nutrients) using 24-hout diet recall method but rarely assessed quality (micronutrients). FFQ that are likely to offer estimates of habitual intake have been rarely used in studies of pregnant women (Rao, S. et al, 2001).

Alterations in fatty acid uptake, metabolism and transport are known, but no information is available for more complex lipids such as triglycerides, phospholipids and lipoprotein–cholesterol.
In brief there is a lot of hype about potential benefits of vitamin C, but not enough good scientific evidence to support a recommendation for or against taking it for diabetes prevention.

1.3. Objectives:

In depth studies were undertaken by different researchers focusing on effect of maternal dietary intakes, habits and weight gain on pregnancy outcomes (Philipps, C, 1977, Gourangie, G, 2007, Panahandeh, Z, 2009). There is enough evidence regarding role of micro and macronutrients on pregnancy outcomes. (Rao TVRK 2004, Ludvigsson JF, 2004, Oslen SF, 2007, Ahmed A 2007) but not many studies examining the influence of antioxidants on mother and fetus are available in literature. Hence this study was carried out to study the association of maternal plasma ascorbic acid concentrations on glycemic status in second trimester.

In brief this research aims to:

1. Compare clinical and nutritional characteristics of mothers with GDM with those in non-diabetic pregnancies.
2. Compare the distribution of plasma vitamin C in GDM vs. normal glucose tolerant (NGT) pregnancies.
3. Compare dietary intake of antioxidants by 24 hour diet recall and semi food frequency questionnaire (SFFQ) in GDM vs. NGT mothers.
4. Evaluate the relationship between plasma vitamin C and vitamin C intake during pregnancy.
5. Study the association between maternal dietary vitamin C intake and plasma vitamin C concentration with pregnancy outcome (Low birth weight (LBW), premature delivery).