Gestational Diabetes Mellitus - Experiences of pregnant women, midwives, and obstetricians and the performance of screening

Margareta Persson
‘Remember that you are facilitating another person’s process. It’s not your process. Don’t intrude. Do not control. Do not force your own needs and insights into the foreground. If you do not trust a person’s process, that person will not trust you’.

(Tao Te Ching, 600 f. Kr)

From ‘The Tao of Leadership’ by John Heider, 1986
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ABSTRACT – Gestational diabetes mellitus - Experiences of pregnant women, midwives, and obstetricians and the performance of screening

In Sweden, there is currently no consensus addressing the screening, diagnostics and treatment of gestational diabetes mellitus (GDM). In addition, there is little knowledge on the impact of GDM on the daily life of pregnant women and the experiences of health care professionals providing maternal health care to women with GDM. Using different perspectives, this thesis examines the experiences of GDM and the performance of screening for GDM in a regional context in Sweden. The studies used qualitative and quantitative methods. In the qualitative studies, grounded theory was applied in two studies and qualitative content analysis in one study. In the quantitative study, a combination of questionnaire data and data from medical records of pregnancy and birth were processed.

Surprisingly, screening for GDM was reduced despite local clinical guidelines stipulating the risk factors indicating an OGTT. Furthermore, the prevalence of the risk factors for GDM in the population investigated was almost doubled compared to previous Swedish studies. Pregnant women developing risk factors for GDM during pregnancy were found to be at substantially increased risk of giving birth to an infant with macrosomia. The experiences of pregnant women with GDM revealed that being diagnosed with and living with GDM during pregnancy might be understood as a process ‘from stun to gradual balance’. The experience comprised both negative and positive dimensions. Despite the challenges, the inconveniences and the changes involved, gradually adapting to an altered lifestyle and finding their balance in daily life was ‘the prize’ the women ‘were willing to pay’ to secure optimal maternal and foetal health. The experiences of midwives comprised managing conflicting demands providing antenatal care to pregnant women diagnosed with GDM. Most midwives felt the obligation to control and monitor the complicated pregnancy, to initiate and motivate the recommended changes in lifestyle together with providing an empowering and caring relation with the women. These assignments disclosed complex conflicting situations and the midwives appeared to choose strategy for managing the situation depending on their perception of the circumstances. The experiences of the obstetricians were understood as ‘dealing with ambiguity’. The ambiguity permeated all aspects of working as an obstetrician within the maternal health care counselling women with GDM: the role of the obstetrician, the context of the organization, balancing the multifaceted interests of the maternal and foetal conditions and the lack of consensus, recommendations and evidence-based knowledge.

The studies revealed the complexity of the situation for the affected pregnant women as well as for the health care professionals providing antenatal care to women diagnosed with GDM. Furthermore, the performance of screening of GDM in pregnant women with risk factors for GDM was insufficient in the investigated region. The findings in this thesis may be useful to increase knowledge of the experiences of pregnant women living with or managing GDM. The findings may also be useful when planning for improvements of maternal health care directed to pregnant women diagnosed with GDM during pregnancy.

Key words: gestational diabetes mellitus, pregnant women, midwife, obstetrician, grounded theory, qualitative content analysis, questionnaire, medical data, experiences, antenatal care, organization of antenatal care, maternal health care

Studierna i avhandlingen påvisade den komplexa situation som råder för de gravida kvinnorna som utvecklat GDM såväl som för den hälso- och sjukvårdspersonal som har till uppgift att tillhandahålla mödrabehållsvård till de drabbade kvinnorna. Dessutom påvisades att tillämpningen av riskfaktorbaserad screening för GDM inte fungerade tillfredsställande i den undersökte regionen. Resultaten från denna avhandling bidrar med kunskap om hur gravida kvinnor kan påverkas av att diagnotiseras och leva med GDM under sin graviditet, visar på de svårigheter som hälso- och sjukvårdspersonal upplever i handläggningen av dessa gravida kvinnor samt kan innebära ett stöd vid planering och utformning av förändringsarbete inom mödrabehållsvård för gravida kvinnor med GDM.
ABBREVIATIONS AND DEFINITIONS

ABBREVIATIONS USED IN THE THESIS

ADA The American Diabetes Association  
APT-III Adult Treatment Panel III  
BMI Body Mass Index  
CA Content Analysis  
CI Confidence Interval  
DM Diabetes Mellitus  
DM 1 Diabetes Mellitus, type 1  
DM2 Diabetes Mellitus, type 2  
FYSS Fysisk aktivitet i sjukdomsprevention och sjukdomsbehandling  
GCT Glucose Challenge Test  
GDM Gestational Diabetes Mellitus  
GT Grounded Theory  
HAPO The Hyperglycemia and Adverse Pregnancy Outcome study  
HCP(s) Health care professional(s)  
HPL Human placental lactogen  
ICD-10 International Statistical Classification of Diseases and related health Problems, version 10  
IDF The International Diabetes Federation  
IGT Impaired glucose tolerance  
LGA Large for gestational age  
MI Motivational Interviewing  
MODY Maturity-onset diabetes of the young  
MS Metabolic Syndrome  
NICU Neonatal Intensive Care Unit  
NBHW The National Board of Health and Welfare, (Socialstyrelsen in Swedish)  
OGTT Oral Glucose Tolerance Test  
OR Odds Ratio  
PCOS Polycystic ovary syndrome  
PPI Pregnancy induced hypertension  
SBU Statens beredning för medicinsk utvärdering  
SMBG Self-monitoring of blood glucose  
SRH Self-rated Health  
WHO The World Health Organisation

DEFINITIONS USED IN THE THESIS

Maternal health care Maternal health care refers to the overall maternity health care services provided to women during pregnancy and childbirth. Maternal health care comprises the antenatal, intrapartum and postpartum health care service.

Antenatal health care Antenatal health care refers to the health care provided by the midwife during pregnancy within the primary health care centres.
ORIGINAL PAPERS

The thesis is based on the following papers


Paper I is printed with the permission of Wiley-Blackwell.
INTRODUCTION

This chapter presents the theoretical background and the framework of the thesis. It focuses on the experiences of women living with gestational diabetes mellitus (GDM) and the encounters between the pregnant women and the health care professionals. Furthermore, a theoretical framework is presented that will later be used when discussing the findings.

GESTATIONAL DIABETES MELLITUS

HISTORICAL PERSPECTIVE OF GESTATIONAL DIABETES MELLITUS

During the last century, it was well recognized that women with diabetes mellitus (DM) had poor outcomes for their pregnancies. In the 1940s, women who later developed DM (years after childbirth) demonstrated abnormally high prevalence of adverse foetal outcomes and neonatal mortality (1). In the 1950s, the first definition of GDM identified the condition as a transient maternal condition that affected the foetal outcomes negatively and that abated after delivery (2). In the 1960s, it was recognised that the degree of glucose intolerance during pregnancy was related to the risk of the woman developing DM within a few years after the pregnancy. Criteria for the interpretation of the oral glucose tolerance test (OGTT) were suggested (3). During the 1980s, the cut-off values of the OGTT were adapted to modern methods for measuring blood glucose (4).

DEFINITION OF GDM

The current definition of GDM was launched during the ‘Fourth International Workshop-Conference on Gestational Diabetes’ in 1998. GDM is defined as glucose intolerance of varying degree of severity with onset or first recognition during pregnancy (5). This definition applies regardless of whether insulin therapy is necessary or the condition persists after the delivery and includes the option that unrecognised glucose intolerance may have preceded the pregnancy (5). The Swedish definition of GDM is in accordance with the international definition (6).
PREVALENCE OF GDM

Worldwide, the prevalence of GDM depends on the population being studied and the screening method used. One reason for this is that the prevalence of GDM reflects the prevalence of diabetes mellitus type 2 (DM2) within the population (7). In the USA, GDM is reported to complicate approximately 4% of all pregnancies, but the prevalence may range from 1 to 14% depending on the sub-population studied (8). International population-based studies report prevalences of GDM up to 15.5%, where Native North Americans, Bahraini women and Asian women are regarded as high-risk populations for development of GDM (7). Risk factors for GDM will be reviewed later in this chapter.

The prevalence of GDM in Sweden is regarded as low in an international perspective (7). Estimates of a prevalence of 1.2 – 2.3% of the Swedish pregnant women have been reported, describing a small increase from 2001 to 2007 (9-12). In the National Quality Register of Maternal Health Care, the reports are based on data generated by the midwives working in maternal health care services (13). Unlike the Swedish studies, the prevalence reported by the clinical midwives shows a numerical decrease in the prevalence from 1.3% in 2003 to 1.1% in 2007. An explanation for this discrepancy may be that the National Quality Register only contains about 80% of the total population of Swedish pregnant women; therefore, they are not fully representative of the total population (13).

SCREENING FOR GDM

*International perspective*

The diagnosis of GDM is based on the result of an OGTT. In 1964, O’Sullivan and Mahan proposed criteria regarding the outcome of the OGTT defining the diagnosis of GDM. The criteria were set at approximately two standard deviations exceeding the mean for the cut-off values indicating a diagnosis of GDM (3). During the last decade in the USA, the recommendations of screening for GDM included all pregnant women. In 2009, the American
Diabetes Association (ADA) stated that screening a low-risk group of pregnant women is probably not cost-effective (14). The ADA recommends several ways to determine the diagnosis of GDM. First, a screening method measuring fasting or casual plasma glucose level is used. Detecting a fasting plasma glucose level exceeding 7.0 mmol/l or a random plasma glucose exceeding 11.1 mmol/l meets the threshold for the diagnosis of diabetes. Furthermore, the OGTT may be performed in a one or two-step approach. The one-step approach is performed without prior plasma glucose screening and is suggested to be cost-effective in high-risk populations. Using the two-step approach, an initial screening using 50 g glucose load (glucose challenge test, GCT) and measuring the plasma glucose level after one hour is performed to identify the women who should perform a diagnostic OGTT. A plasma glucose threshold value of the GCT of 7.8 mmol/l identifies approximately 80% of women with GDM and when the value is set at 7.2 mmol/l, 90% of women with GDM will be detected. Diagnostic OGTTs may use the 75 g glucose load and plasma glucose values are measured at fasting, 1-hour and 2-hours, or alternatively, 100 g glucose load and the plasma glucose values are measured at four times: fasting, 1-hour, 2-hours and finally 3-hours values. For both glucose loads, at least two of the plasma glucose values have to be abnormal to obtain the diagnosis of GDM. The ADA recommendation states that the 75 g glucose load is not as validated as the 100 g glucose load (14).

In other countries, mainly European countries and Japan, the 75 g glucose load is used in accordance with the World Health Organisation (WHO) recommendations (15). The WHO recommendations for OGTT screening indicate that at least two values of blood glucose should be measured; fasting and the 2-hour glucose value. A fasting capillary plasma glucose value of < 7.0 mmol/l and 2-hour plasma glucose value of ≥ 8.9 to < 12.2 mmol/l indicates impaired glucose tolerance (IGT). Two-hour values of capillary plasma glucose ≥ 12.2 mmol/l indicate DM. Pregnant women who fulfil the WHO criteria for DM or IGT are classified as having GDM (15). However, the cut-off values for GDM diagnosis in the recommendations of the European
Association for the Study of Diabetes are not exactly the same as the WHO recommendations as values exceeding 2-hours blood glucose of 9.0 mmol/L indicate the GDM diagnosis (16).

**Swedish perspective**

Currently, there is no consensus in Sweden on how to perform screening, diagnostics and treatment of GDM in Sweden (17). However, since the 1990s Sweden has officially adopted the recommendations by the European Association for the Study of Diabetes of screening for GDM (16). The threshold values for GDM diagnosis have been adjusted to the equivalent plasma glucose values in most regions in Sweden (17). At present, there are two major national standards for screening for GDM: a general screening procedure where all pregnant women are offered an OGTT and a selective screening procedure based on risk factors in the pregnant woman’s medical history and/or risk factors developing during pregnancy as stipulated in the clinical guidelines of the local district. Each maternity health care region (mödrahälsovårdsområde) in Sweden has a local version of clinical guidelines for screening for GDM. Out of these two approaches, the selective screening method is applied in most parts of the country. Both screening methods stipulate a 75 g glucose load and the 2-hour value of plasma glucose for the diagnostics procedure. The threshold value for GDM diagnosis differs in some regions in the country (17). Most regions apply the recommendations of the European Association for the Study of Diabetes, which has been adjusted to the equivalents of plasma glucose (i.e 2-hour plasma glucose value ≥ 10.0 mmol/l indicates GDM). However, there are a few regions using the threshold value of manifest DM (i.e., 2-hour plasma glucose value > or ≥ 12.2 mmol/l) as the criteria for GDM diagnosis (17).
CONTROVERSIES IN SCREENING, DIAGNOSTICS AND TREATMENT OF GDM

*International perspective*

As described above, it is clear that controversies still exist regarding the diagnosis, management and risk of adverse maternal and foetal outcomes of GDM. According to the recommendations of the ‘US Preventive Services Task Force’ (18), the current evidence is inadequate to assess the trade-off between benefits and harms of screening for GDM. However, despite the uncertainty of potential benefit and harm, the Task Force suggests that until better evidence is available, clinicians should inform and discuss screening with their patients and perform case-by-case decision (18). Scientific reviews of the literature conclude that currently there is no evidence that treatment of GDM improves the maternal and foetal outcomes (19, 20) or that the disadvantages of diagnosing and treating pregnant women without an obvious benefit seem to be of significance (20). Accordingly, it has been suggested that screening and treatment for GDM might be suspended and that for now the threshold value for diagnosis and treatment should be elevated (20). On the other hand, there are supporters for more general screening and suggestions that the threshold for GDM diagnosis should be lower (21). The risk of adverse outcomes of pregnancy and childbirth is increased among the women performing risk factor-based screening compared to when the population is exposed to general screening and surveillance of GDM (22). Untreated GDM reveals a 2- to 3-fold higher morbidity risk in all severity levels of the condition compared to groups with treated GDM and the non-diabetic group (23).

A large international multicentre study with more than 25,000 participants is expected to bring some evidence to the problem of screening for GDM (24). The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study aims at clarifying the risks of adverse outcomes in pregnancy and childbirth associated with degrees of maternal glucose intolerance below less severe than overt DM. Their findings so far are that there is no apparent threshold
of plasma glucose at which the risks of adverse outcomes increase and that there is a strong continuous association of increased maternal glucose level and increased birth weight. Furthermore, associations with secondary outcomes and maternal glycemia have been demonstrated to increase prevalence of preeclampsia and shoulder dystocia (24). Based on the findings from the HAPO study, there has been a suggestion to lower the threshold to define GDM (21).

Swedish perspective

In Sweden, the absence of consensus regarding the screening, diagnostics and treatment of GDM was noted in the report from ‘The National Quality Register of Maternal Health Care’ in 2007 (13) and in the scientific background material to the new ‘National Guidelines of Care in Diabetes’ in 2009 (6). The National Board of Health and Welfare (NBHW) states that the reason for illuminating the issue of GDM is the increased risk of harm to unborn or newborn infants if the diagnosis is undetected or poorly treated during pregnancy. Furthermore, NBWH states that there is weak evidence regarding what is the best treatment of the GDM (6). However, results from Sweden demonstrate that in a specific region (Skåne) where all pregnant women are offered OGTT, the prevalence of GDM is doubled compared to an adjacent geographical region using random glucose level measurements as an indicator for OGTT (12). These findings agree with results of an audit of all local guidelines in Sweden where regions offering OGTT to all pregnant women identified significantly larger proportions of pregnant women with GDM compared to the regions using a risk factor-based screening performance (17). In Sweden, there was an increased risk of caesarean sections, premature delivery, large for gestational age infant or with macrosomia for women with untreated GDM (25).
METABOLIC CHANGES IN PREGNANCY WITH FOCUS ON MATERNAL CARBOHYDRATE METABOLISM

Changes in carbohydrate metabolism in normal pregnancy

Over the course of a pregnancy, the carbohydrate metabolism gradually changes to meet the increasing demands from the mother and the growing foetus (Table 1). In a non-pregnant woman, the liver is the predominant source of the endogenous glucose production. The average plasma concentration of fasting glucose is approximately 5.0 mmol/l, and there is a balance between production and consumption (26). As illustrated in Table 1, over the course of a pregnancy, fasting glucose levels decrease as hepatic glucose levels increase (27). In the normal case, the hepatic glucose production is restrained by insulin. In pregnancy, the hepatic glucose production increases despite increasing fasting insulin concentrations. This situation results in a decrease in maternal hepatic insulin sensitivity leading to a decreased suppression of hepatic glucose production (26). Normally, the β-cells of the pancreas increase their insulin secretion to balance the insulin resistance of the pregnancy (28). The mechanism of insulin resistance in pregnancy is not fully known, but the metabolic effects of elevated hormones and cytokines during pregnancy are partially related. Potential hormones for the observed effect are human placental lactogen (HPL), progesterone, prolactin and cortisol (26).

Changes in carbohydrate metabolism in a pregnancy complicated with GDM

In most cases, women diagnosed with GDM have higher fasting glucose concentrations; however, the basic hepatic glucose production does not differ from women with normal glucose tolerance (26). In the case of GDM, there is an imbalance between tissue insulin requirements for regulation of glucose and the ability of the β-cells in the pancreas to meet the requirements (26).
TABLE 1. Changes in maternal metabolism in early and late normal pregnancy from pre-pregnant condition (26) (This table is slightly modified from Lain, KY and Catalano, PM).

<table>
<thead>
<tr>
<th>Metabolism</th>
<th>Early pregnancy</th>
<th>Late pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basal metabolism</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fasting glucose level (27)</td>
<td>→</td>
<td>↓ (0.9x)</td>
</tr>
<tr>
<td>Fasting insulin level (27)</td>
<td>→</td>
<td>↑ (1.65x)</td>
</tr>
<tr>
<td><strong>Hepatic metabolism</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basal hepatic glucose production (27)</td>
<td>→</td>
<td>↑ (1.3x)</td>
</tr>
<tr>
<td>Hepatic insulin sensitivity</td>
<td></td>
<td>↓</td>
</tr>
<tr>
<td>Glucose level suppression (27)</td>
<td>↓ (0.9x)</td>
<td>↓ (0.9x)</td>
</tr>
<tr>
<td><strong>Insulin metabolism</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulin secretion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First phase insulin response (29)</td>
<td>↑ (2.0x)</td>
<td>↑ (3.0x)</td>
</tr>
<tr>
<td>Second phase insulin response (29)</td>
<td>↑ (1.5x)</td>
<td>↑ (3.0x)</td>
</tr>
<tr>
<td>Insulin sensitivity (29)</td>
<td>↓ (0.7x)</td>
<td>↓ (0.4x)</td>
</tr>
</tbody>
</table>

AETIOLOGY AND PATHOGENESIS OF GDM

During pregnancy, two major processes regulate the glucose. Firstly, as the pregnancy proceeds, a progressive insulin resistance develops, mainly during the third trimester. This insulin resistance seems to be caused by an increasing maternal weight gain combined with the desensitizing effects the placental hormones exert on insulin. Secondly, the β cells in the pancreas normally increase their production of insulin in order to compensate for the insulin resistance, so for most pregnant women the circulating glucose levels remain normal and stable despite the changes in the glucose regulation (30, 31).

GDM may be recognised as a hyperglycaemic condition that develops as a result of inadequate supply of insulin to meet the demands of the tissues in order to acquire normal blood glucose regulation (30). In women with GDM, there are several possible processes that conspire to cause severe insulin resistance in muscle, liver and adipose tissue, such as the presence of
subclinical inflammation, the increase of placental hormones, reduced adiponectin secretion and excess lipolysis (32).

Chronic insulin resistance is regarded as a central component in GDM (26). A review study of the pathogenesis of GDM states that the detection of GDM represents a detection of chronic β-cell dysfunction rather than relative insulin deficiency. This is because women with GDM presents reduced β-cell compensation for insulin resistance in a similar matter during and after pregnancy (33). Although the disease in most women with GDM may be explained by a chronic insulin resistance, one must bear in mind that in a minor part of the diagnosed women with GDM, there are other reasons for the β-cell dysfunction. Autoimmune and monogenic dysfunctions of pancreatic β-cells have also been described in women diagnosed with GDM (31). Furthermore, some common gene mutations in the maturity-onset diabetes of the young (MODY) seem to increase the risk of GDM in Scandinavian women (34).

RISK FACTORS FOR GDM

In 1999, the WHO noted that certain individuals were at high risk for GDM: older women, women with previous history of babies with macrosomia, women from high-risk ethnical groups and women with elevated fasting or random blood glucose levels during pregnancy (15). The risk factors for the development of GDM may be divided into several subgroups, which are presented below. The maternal determinants, often referred to as “traditional risk factors”, are higher maternal age, increased body weight, higher parity, previous delivery of a macrosomic infant, and family history of DM (33).

In the 2009, the ADA noted that low-risk groups of women who fulfil all the following criteria do not need to undergo screening for GDM (14): younger than 25 years of age, normal body weight, no first-degree relative with DM, no history of abnormal glucose metabolism, no history of poor obstetric
outcome and not being member of ethnic group with high prevalence of DM. Women who do not fulfil all of these criteria should be given an OGTT (14).

Maternal risk factors

A number of maternal risk factors for development of GDM have been reported. Higher age has been described among women developing GDM compared to a reference group (11, 33, 35). Ethnicity has an impact on the prevalence of GDM and differs significantly among ethnic groups in the USA: 4.1% in Caucasians, 4.3% in African Americans, 7.0% in Latinas and 9.7% in Asians (36). Asian women living in the USA present high prevalence of GDM, where the highest risk of developing GDM has been found among women from Bangladesh, presenting an adjusted risk ratio of 7.1 compared to Non-Hispanic whites (37). In Sweden, no studies exist that estimate the prevalence of GDM among immigrants of different ethnicities. However, a study reports that 44.5% of the women with GDM were of non-Nordic origin. This group of non-Nordic women was characterised by more severe grade of GDM than the Nordic women with GDM (11). In an audit of all local clinical guidelines for screening for GDM in 2004, most regions in Sweden did not list ethnicity as a risk factor indicating need for screening for GDM (17). Higher parity has also been mentioned as maternal risk factors for GDM. Grand multiparas (i.e. women with ≥5 deliveries) had more often an insulin-dependent GDM than multiparas with 2-4 deliveries (38) and the risk of developing GDM was 2-fold compared to women with 2-3 deliveries (39).

Pre-pregnancy body weight of the woman has also been reported as a risk factor of developing GDM. Overweight and obesity are well-known risk factors for development of GDM. The risk of development of GDM is doubled at body mass index (BMI) 25.0-29.9 kg/m² and at least 6-fold at BMI ≥ 30 kg/m² compared to women with normal BMI (40). Another study reports of a more than doubled risk of developing GDM among obese pregnant women and a 4-fold risk for pregnant women with BMI ≥ 35 kg/m² compared to women with BMI less than 30 kg/m² (41).
A history of irregular menstruations demonstrates significant higher prevalence of GDM, even when BMI is used as a stratification factor (42). Women with a history of GDM have significantly higher prevalence of polycystic ovary syndrome (PCOS) compared to the reference group of women with normal glucose tolerance during pregnancy (43).

Another maternal risk factor described in the literature is short stature. Among Korean women the prevalence is highest among women shorter than 157 cm (44) and in Brazil, women shorter than 151 cm show a 60% increase in GDM than women 160 cm or more (45). Also, in Australia, women with GDM are significantly shorter and have lower leg-to-height percentage (46). Furthermore, some results indicate thyroid disease as a risk factor of GDM as thyroid autoantibodies are found in women with GDM and women with GDM show significantly lower mean free thyroxine concentrations than healthy references (47).

**Family history**

Family history of DM is described as a risk factor for development of GDM (33, 48). A family history of maternal DM2 is significantly more frequent among women with GDM than a paternal family history of DM2. Furthermore, significantly more DM2 was observed in the maternal-grandmaternal line among women with GDM compared to the paternal-grandpaternal line (49).

**Previous obstetric outcomes**

Specific outcomes in previous pregnancies are considered as risk factors for GDM in the consecutive pregnancies, such as giving birth to a child with macrosomia and previous GDM (15, 33). However, previous macrosomia as a risk factor for GDM has been debated recently as macrosomia might have other causes such as obesity, multiparity, excessive weight gain during pregnancy, and hereditary factors (50). A large proportion (79%) of the children with macrosomia is born to mothers who are not glucose intolerant (51). Recurrence rates of GDM in consecutive pregnancies are 30 to 84%
depending on ethnicity. Lower recurrence rates are found among non-Hispanic whites and higher recurrence rates of GDM in minority populations. No other risk factors consistently associated to the recurrence of GDM are found in the review (52).

Pregnancy factors

Risk factors for GDM developing during pregnancy have been identified, such as elevated fasting or random blood glucose levels (15), high blood pressure during pregnancy, multiple pregnancy, and increased iron stores (33). Accelerated foetal growth (53, 54) and polyhydramniosis (54, 55) are other conditions that may indicate an increased risk of GDM.

TREATMENT OF GDM

The treatment recommended for pregnant women with GDM is similar to the treatment of DM2. The recommended treatment does not differ significantly among countries in the western world. The treatment includes recommendations of diet, physical exercise and frequent monitoring of blood glucose levels (56). Each of these recommendations will be presented below with their international and national recommendations.

Diet

International recommendations

The medical nutrition therapy is important in prevention of DM and management of existing DM. The recent update of the ADA position statement recommend that the focus of the dietary recommendation in GDM addresses the food choices for appropriate weight gain during pregnancy, normalised blood glucose level and absence of ketonuria (57). These recommendations provide an initial carbohydrate-controlled meal plan that is subsequently modified based on the individual results of self-monitoring of blood glucose and assessment of the situation. There is a risk of ketonemia or ketonuria in obese women with too low calorie intake. Furthermore, the position statement suggests daily food records, monitoring of body weight
and ketone testing on a weekly basis as to determine the individual requirements of energy and to identify women who are under-eating in order to avoid insulin therapy (57). Carbohydrates, not less than 175 g/day, should be allocated over the daily intake. Three small-to-moderate-sized meals are recommended and an additional two to four snacks. Carbohydrates for breakfast might be less well tolerated than at other meals and an evening snack might be necessary to prevent ketosis developing over night (57). A Cochrane review concludes that the effects of dietary advice in preventing GDM are inconclusive. However, some results indicate that a low glycemic index diet may be beneficial for some outcomes of mother and child (58). Women with GDM assigned to a low-glycemic index diet are found to be significantly less likely to meet the criteria of insulin treatment. In the group of women with GDM assigned to a conventional high fibre and higher glycemic index diet, almost half of the women who met the criteria for insulin therapy avoided the therapy after changing to the low-glycemic index diet (59).

Swedish recommendations

Currently, there are no specific recommendations regarding dietary advice in GDM or in DM. An ongoing project within The Swedish Council on Technology Assessments in Health Care (SBU) addresses dietary recommendations in DM and the new dietary recommendations are expected to be presented in 2010 (60). The new national guidelines for DM do not address the issues of dietary recommendations (6). In the old version of national guidelines for DM from 1999 (61), there were some recommendations regarding diet and diet consultation, such as the dietician has an important role in educating the affected women besides the health care professionals. The importance of providing non-contradictory advice to the affected women was stressed. The diet for women with GDM should be similar to the diet of individuals with DM2 and should consist of meals evenly distributed over the day, low in fat and rich in fibres (61).
**Physical activity**

**International recommendations**

A Cochrane review evaluating randomised controlled trials investigating the effect of exercise in pregnant women with GDM on perinatal outcome and maternal morbidity concludes that there are no significant differences between exercise and diet and diet alone in all evaluated outcomes. Hence, there is insufficient evidence to either recommend or advice against enrolment in exercise programs (62). However, a recent review indicates that there is evidence for the benefit of physical activity in pregnancy due to reducing the maternal weight gain during pregnancy and improvements in cardiovascular fitness (63).

**Swedish recommendations**

The Physical activity in disease prevention and treatment (FYSS, in swedish) guidelines states that the recommendation of physical activity during pregnancy should be based on individual assessment of the status of fitness (64). There are no specific recommendations regarding physical activity for women with GDM. The general recommendation for pregnant women with no previous physical activity is to start with shorter physical activities three times a week and increase these activities to 30-45 minutes of moderate intensity physical activity three times a week. The intensity in physical activity should not exceed the talk test (i.e., being able to talk normally during physical activity). The moderate physical activity three times a week should preferably be combined with some physical activity for 30 minutes on a daily basis (64).

**Self-monitoring of glucose levels**

**International recommendations**

A review regarding the efficacy of self-monitoring of blood glucose (SMBG) in the management of GDM reveals that the efficacy regarding diet-controlled GDM is indecisive. The SMBG might be best sued as a teaching
tool to validate physical activity and dietary regime. However, SMBG might improve neonatal outcomes in a cost-effective manner without causing excessive stress (65). A 10% improvement in self-efficacy from the baseline was presented among women performing SMBG (66). Another review states that meal-based SMBG is a valuable tool to improve outcomes of pregnancy and that available clinical evidence supports testing at four times a day in diet-treated GDM; i.e., before breakfast and one hour after each meal during the day (67).

**Swedish recommendations**

In the 1990s, the frequent controls of SMBG levels were considered to be an important part of the monitoring of GDM. No differences in outcome of the pregnancy for women were reported for women who attended health care in the hospital-based specialised antenatal clinic or in the primary health care setting. The authors concluded that on the basis of frequent self-monitoring of blood glucose to detect those women in need of insulin, the health care could be provided within the primary health care level (68). This type of organisation is currently implemented in several of the regions investigated in the national audit of local clinical guidelines (17). However, the value of SMBG in DM2 has been questioned although there is some evidence indicating that systematic SMBG in individuals with DM2 may improve HbA1C (6).

**THE SITUATION OF SCREENING, DIAGNOSTICS AND TREATMENT OF GDM IN SWEDEN**

During the early stage of this research project, data collected about the screening, diagnostics and treatment of GDM in Sweden (17). All midwives serving as administrators in the maternal health care regions (n=50) were contacted by e-mail to obtain the local clinical guidelines regarding GDM; the collected guidelines were requested to be valid for the year 2004. The content of the local guidelines were analysed together with data available from The National Quality Register of Maternal Health Care in Sweden regarding 2004 (69). The local clinical guidelines for all maternal health care
regions were available for the survey. The clinical guidelines were classified into three groups depending on their stipulated indications for OGTT and the threshold value of blood glucose indicating GDM. This classification resulted in the following groups: 1) maternal health care regions performing selective OGTT based on risk factors and applying a threshold value of plasma glucose of $\geq 10.0 \text{ mmol/l}$ for GDM diagnosis; 2) maternal health care regions performing selective OGTT based on risk factors and applying a threshold value of plasma glucose of $\geq 12.2-12.3 \text{ mmol/l}$ for GDM diagnosis; and 3) maternal health care regions offering OGTT to all pregnant women and applying a threshold value of plasma glucose $\geq 10.0 \text{ mmol/l}$. The numbers of stipulated risk factors in the pregnant woman’s medical history and during pregnancy varied from 0 to 7 different risk factors indicating a performance of an OGTT. All regions that did not offer OGTT to all pregnant women performed regular random controls of maternal plasma glucose values; however, the threshold value of plasma glucose indicating performance of OGTT varied from $\geq 7.8$ to $\geq 9.0 \text{ mmol/l}$ in different regions (17).

The prevalence of women performing OGTT ranged from 1.6% to 94.5% of all pregnant women in the maternal health care regions. The prevalence of GDM differed from 0% to 4.3% of the tested women. When comparing regions with selective screening to regions with general screening, significantly more women were diagnosed with GDM when OGTT was offered to all pregnant women ($p=0.012$). This significant difference remained after excluding the regions with selective screening and the higher threshold value for GDM diagnosis ($p=0.036$) (17). Furthermore, the survey demonstrated that the organisation of maternal health care provided to the women diagnosed with GDM was divergent nationally. For some maternal health care regions, the woman was referred to the hospital-based outpatient policlinic for further management of the condition, while in other regions, the management of the woman remained allocated within the local maternal health care unit situated within the primary health care unit. Additionally, in
some regions the DM outpatient policlinic provided health care for the pregnant woman with GDM (17).

INCREASED RISK FOR ADVERSE OUTCOMES OF PREGNANCY, DELIVERY AND BIRTH

**Increased maternal risks**

GDM is associated with hypertensive disorders (70-72) with a 3-fold increased risk of preeclampsia debuting in preterm pregnancy (73). Women with GDM are more likely to be delivered by caesarean section (9, 11, 70, 71, 74) and to be exposed to induced labour (11, 71). Pregnant obese women with insulin treated GDM and poor glycemic control develop significantly more often preeclampsia compared to pregnant obese women with well controlled insulin treated GDM. The prevalence of chronic hypertension was increased 2- to 3-fold in overweight and obese women with GDM regardless the treatment of GDM or the level of glycemic control (75).

**Increased foetal risks**

The presence of GDM during pregnancy may affect the outcome of the offspring. A higher proportion of children are born with macrosomia (25, 70, 71, 76), dystocia is more common (70), and preterm birth is more prevalent in cases of GDM (25, 76) even when the condition is being treated (77). The newborn infants are affected with hypoglycaemia more frequently (71, 78) and are in need of care in neonatal intensive care units (NICU) to a larger extent (70, 79). No increased risks of congenital malformations have been revealed when GDM is detected during the third trimester (80). However, it has been reported that some specific malformations are more frequent among women with GDM, such as specific cardiac defects, oesophageal/intestinal atresia and spinal deformations (81). A Finnish study reveals that GDM may increase the risk of congenital cryptorchidism (82). A randomized clinical trial investigating whether treatment of women with GDM would reduce the risk of perinatal complications demonstrates significantly lower rates of serious perinatal complications (defined as
perinatal death, shoulder dystocia, bone fracture and nerve palsy) in the intervention group. Furthermore, the intervention group gave birth to significantly fewer large for gestational age (LGA) infants and significantly fewer infants had a birth weight of 4 kg or more (83). Regardless of glycemic control, overweight and obese women with diet treated GDM and poorly controlled insulin treated GDM were at 2 to 3-folded increased risk of giving birth to a LGA child, whereas women with well controlled insulin treated GDM gave birth to LGA infants to the same extent as women in all BMI groups (75). Furthermore, lower prevalence of LGA infants were observed when good glycemic control was obtained with insulin rather then diet treatment in overweight and obese women with GDM (75).

FUTURE HEALTH RISKS FOR THE WOMAN

*Diabetes mellitus type 2*

Following the pregnancy, the risk of development of DM2 is elevated; therefore, the main focus of clinical health care postpartum should aim to reduce the risk of DM development (84). The cumulative incidence of DM2 varies from 2.6% to over 70% at 6 weeks to 28 years post partum in women with prior GDM (85). This cumulative incidence increases rapidly over the first five years and thereafter seems to reach a plateau ten years after the index pregnancy. Elevated fasting glucose levels during pregnancy are the best predictor of future DM2 (85). In a recent review and meta-synthesis study, the relative risk of developing DM2 after a pregnancy with GDM was more than a 7-folded compared to women with a normoglycemic pregnancy (86). In Denmark, 40% of women with prior GDM develop DM within ten years from the index pregnancy, an incidence that is increasing over time probably due to a parallel increase of obesity among women (87). In Sweden, 35% of women with prior GDM are diagnosed with DM2 15 years after the index pregnancy (88).

Some women with GDM are at increased risk of developing diabetes mellitus type 1 (DM1) after pregnancy. In a Swedish follow-up study, 6% of women
with prior GDM had β-cell-specific autoantibody markers. Of those autoantibody-positive women 50% had developed DM1 after the pregnancy compared to none of the GDM reference group (89). Lean patients with previous GDM appear to be more likely to develop autoimmune or monogenic forms of DM, thus often presenting a faster development of DM than overweight or obese women, who are more likely to develop DM due to chronic insulin resistance (30).

In USA, the ADA recommends measurements of fasting glucose in the immediate post partum period in order to identify women with persisting hyperglycaemia after childbirth (90). When normal blood glucose levels in the immediate postpartum period are observed, an OGTT is recommended some time during the first two to six months postpartum. If the second measurement postpartum is normal, the ADA recommends annual testing for DM (90). However, an American study found that only a third of the women underwent the ADA recommended screening (91).

In Sweden, there is no unified recommendation for the performance of the GDM follow-up postpartum; however, in the majority of the local clinical guidelines, a follow-up including an OGTT is recommended within the first year postpartum (17). In a Swedish study, women developing DM2 after childbirth gain significantly more weight after their pregnancy resulting in their first child in relation to women who do not develop DM (88). It is important to notice that Swedish women tend to regard GDM as an incentive to improve their lifestyle in order to prevent future DM, while Middle Eastern women do not incorporate this to the same extent (92).

Metabolic syndrome

Because currently there is no international consensus on the definition of the metabolic syndrome (MS), several organizations - such as the WHO (15), Adult Treatment Panel III (ATP-III)(93) and the International Diabetes Federation (IDF)(94) – have developed clinical criteria to define MS, albeit different manifestations of insulin resistance are present in all definitions.
Recently, several major organisations have jointly tried to define MS (95). The joint definition of criteria for clinical diagnosis of the MS as suggested is presented in Table 2 (95).

Table 2. Suggested criteria for clinical diagnosis of metabolic syndrome. (This table is slightly modified from the original) (95).

<table>
<thead>
<tr>
<th>Categorical Cut Points</th>
<th>Population and country-specific definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased waist circumference</td>
<td>In men: ≥ 85 - ≥ 102 cm</td>
</tr>
<tr>
<td></td>
<td>In women: ≥ 80 - ≥ 88 cm</td>
</tr>
<tr>
<td>Elevated triglycerids (or treatment)</td>
<td>≥ 150 mg/dL (1.7 mmol/L)</td>
</tr>
<tr>
<td>Reduced high-density lipoprotein cholesterol (HDL-C) (or treatment)</td>
<td>Men: &lt; 40 mg/dL (1.0 mmol/L)</td>
</tr>
<tr>
<td></td>
<td>Women: &lt; 50 mg/dL (1.3 mmol/L)</td>
</tr>
<tr>
<td>Elevated blood pressure (or treatment)</td>
<td>Systolic ≥ 130 and/or diastolic ≥ 85 mm Hg</td>
</tr>
<tr>
<td>Elevated fasting glucose (or treatment)</td>
<td>≥ 100 mg/dL (5.6 mmol/L)</td>
</tr>
</tbody>
</table>

As previously mentioned, there is an increased risk of hypertensive disorders in women with GDM including preeclampsia (70-73). One in four women with GDM had constituents of the MS prior to the pregnancy with GDM (96). The prevalence of MS increases with worsening of the glucose tolerance in a Brazilian study of pregnant women ranging from 0% in the normoglycemic group, 20.0% in the mild hyperglycaemic group, 23.5% in the GDM group and 36.4% in the overt GDM group (97).

_Foetal programming and its’ effect on the future health status_

The associations between death rates early and later in life and their possible associations with pregnancy events were first reported in the 1930s (98). The ‘foetal origins’ hypothesis’ was launched during the 1990s (59, 99). Today, this research area is commonly defined as ‘foetal programming’ (100).
Extensive epidemiological and animal model data indicate that during critical periods of prenatal and postnatal development, nutrition and other programming factors influence developmental pathways that induce permanent changes in metabolism and chronic disease susceptibility (100). During embryonic and foetal life, the functions and structures of organs undergo programming that determines the set points of physiological and metabolic responses in adult life. Alterations of available nutrition during gestation may lead to developmental adaptations, via hormonal manoeuvres by the embryo and foetus. These exercises readjust the set points (100). The adaptive measures comprise short-term benefits to the embryo and the foetus. However, these measures may generate metabolic conflicts during adult life that predispose the adult to abnormal physiological functions and eventually increase risk of disease. Consequently, foetal programming may be regarded as a part of ‘epigenetics’ (101). Strong inverse associations between foetal growth and risk for hypertension, coronary heart disease, DM2 and other chronic diseases in adulthood are reported (100). Additionally, several studies indicate an effect of foetal programming between generations, such as the association between maternal birth weight and the birth weight of the offspring (100). Furthermore, programming effects revealed as symptoms of metabolic syndrome in childhood have been reported (102).

**Future health risks for the child**

Studies have shown that maternal GDM during pregnancy may also impact the health of the offspring later in life. An increased risk of obesity is reported (74, 103) and glucose intolerance, DM in puberty or early adulthood (74) and LGA children to mothers with GDM had a more than 3-fold risk for symptoms related to the metabolic syndrome at the age of 11 years (102). Women with prior GDM report their children to be less healthy than controls three to five years after childbirth (104). Furthermore, lower school marks have been described among the offspring when the mother had DM or GDM during pregnancy (105).
MATERNAL HEALTH CARE

In Sweden, the maternal health care provided for pregnant women has two major focuses (106). Firstly, the health care addresses the medical aspects of supporting health and preventing maternal and foetal complications. Secondly, the psychological aspects of pregnancy and childbirth, such as preparations for birth and parenthood as well as lifestyle and sexuality are addressed (106). A mutual professional agreement document between midwives and obstetricians in Sweden established the responsibility of midwives and obstetricians (107). The professional area of the midwives within the maternal health care is the responsibility for the nursing actions in normal pregnancy, normal childbirth and postpartum period. Furthermore, they are expected to contribute to identifying pregnancy complications and provide care when complications are detected. The obstetricians are responsible for the maternal health care provided for complications in pregnancy and concurrent maternal diseases. Furthermore, the responsibility is to prescribe and prioritise medical measures. Collaboration between the two professional groups is regarded as essential in the maternal health care as to optimise the outcomes of the mother and the foetus (107).

NORMAL AND COMPLICATED PREGNANCY

Normal pregnancy

There is no specific definition of a ‘normal pregnancy’ available and the apprehension of a ‘normal pregnancy’ probably tends to change over time. What is regarded as normal is medically and socially defined and will change from time to time as well as scientific and technological advances have an influence on the definition (108). Based on the definition of normal birth by the WHO (109), the definition of normal pregnancy would consequently be a pregnancy fulfilling the following criteria: singleton child in vertex presentation, spontaneous birth at 37+0 to 41+6 gestational age and no medical risk factors present that may disturb the birth process at the start of delivery (110).
Complicated pregnancy

As a consequence of the impact of scientific and technological advances regarding pregnancy and childbirth, abnormality might be defined as a deviation from the average with the potential of pathology (108). Hence, a complicated pregnancy comprises any abnormality affecting the health status of the mother or the foetus during the course of the pregnancy.

A COMPLICATED PREGNANCY – PREGNANT WOMEN’S EXPERIENCES

A study comparing the factors influencing pregnant women’s perception of risk in uncomplicated and complicated pregnancies reveals that women with obstetrical complications express higher risk perceptions and more explicit risks that focus on their diagnosis and symptoms (111). In another study, being labelled ‘at risk’ during pregnancy negatively influences psychosocial status, comprised of the aspects of self-esteem, trait anxiety, depression, mastery and stress (112). Furthermore, increased feelings of being responsible for the health of their unborn baby and themselves have been reported among women with hypertension or threatening preterm birth receiving prenatal care at home or in the hospital (113). Most women express that they want to be actively involved in the decisions made concerning their care during high-risk pregnancies. The active participation by the woman includes being well informed about the options and being able to express her opinion before any decisions were made. However, some women prefer to rely on the expertise of the health care professionals (HCPs) allowing the HCPs to make decisions for them (113). Being hospitalized due to a high risk pregnancy is experienced by the woman as ‘ambivalence’, comprising a number of conflicting feelings of positive and negative nature, such as the desire to nurture and the social pressure to do so, the personal and social meaning of a family, loss of normal experience of life and childbearing, balancing the woman’s needs against the needs of the well-being of the foetus and sources of stress and strength (114).
A COMPLICATED PREGNANCY – MIDWIVES’ EXPERIENCES

The essence of care provided by midwives to women with a high risk during pregnancy has been labelled ‘Genuine Caring in Caring for the Genuine’ (115). This essence consists of three constituents: a ‘dignity-protective relationship’, ‘the embodied knowledge’ and a ‘balancing of the natural and medical perspectives’. The perceived essence reveals the nature of midwifery care and the nature of each individual woman being cared for as a unique human being (115). The experiences of midwives caring for pregnant women at high obstetric risk or pregnant women experiencing an obstetrical complication have been described in a hospital setting (116). The fundamental nature of midwifery care for women with at risk pregnancies was defined as ‘a struggle for the natural process’. The midwives struggle to encourage and preserve the natural process of physical and emotional transition, balancing between the medical and natural perspectives of pregnancy, childbirth and early parental period. Vital for this struggle is the relationship between the midwife and the woman and the embodied knowledge of the midwife (116).

RELATIONSHIP BETWEEN MIDWIFE AND PREGNANT WOMEN

Good quality of care should respect of the autonomy and integrity of the individual, promote positive contacts between HCPs and the individual and supply continuity and security in the provided health care (117). The quality of the relationship is considered essential to the quality of the maternal health care (118). Meaningful relationships may contribute to positive situations and experiences of the midwives and for the pregnant women. Furthermore, meaningful relationships contribute to effective teamwork and may also facilitate learning (118). Applied to maternal health care, the relationship between midwife and woman is characterised by six pairs of overlapping concepts, where each pair of concepts illustrates one aspect from the woman’s perspective and the responding aspect from the perspective of the midwife (119). These women-midwives-pairs of concepts are ‘surrender-availability’, ‘trust-mediation of trust’, ‘participation-mutuality’, ‘loneliness-
confirmation’, ‘differenceness-support uniqueness’, and ‘create meaning-support meaningfulness’ (119).

To our best knowledge, the relationship between the obstetrician and pregnant woman is sparsely studied. A few studies were found, mainly with focus on communication and conflicts. In visits in early pregnancy, the focus of the communication was mainly biomedical with modest psychosocial or social discussion (120). Furthermore, satisfaction with obstetricians’ emotional responsiveness and informational relationship was related to female obstetricians (120). The importance of supportive relationship between the obstetricians and the patient may reduce the possibility of being sued (121).

WOMEN’S PERCEPTION OF HEALTH AND WELL-BEING DURING AND AFTER A PREGNANCY COMPLICATED BY GDM

The knowledge of how the condition of GDM affects daily life, the perceived health and well-being of the pregnant women are obsolete and somewhat contradictory. The first papers addressing the impact of GDM on perceived health and well-being were published in the late 1980s. Pregnant women with GDM do not differ from non-GDM controls in their psychological status (122). In addition, insulin treatment does not seem to affect their psychological mood, so it has been concluded that women diagnosed with GDM readily adapt to the new lifestyle (122). Furthermore, newly diagnosed GDM does not negatively affect mood states when measured by the Profile of Mood States – Bipolar form, and intensified therapy (including insulin) is not associated with negative mood states. Higher distress is expressed by GDM women not achieving normalized blood glucose levels compared to GDM women with normalized levels of blood glucose (123). Another study describes that women with GDM report an elevated level of anxiety in the third trimester compared to women without GDM. However, there were no differences in anxiety levels before delivery and during the postpartum period between the groups. Furthermore, all participating women in that
study were (diagnosed with GDM or not) positive about being tested for GDM and desired to be tested during future pregnancies as well (124).

Interviews with women with GDM show that being diagnosed with GDM during pregnancy is merged with the perception of the woman and her child as being at risk. Four themes are identified describing the women’s experiences of their pregnancy: ‘Living a controlled pregnancy’, ‘Balancing’, ‘Being a responsible mother’ and ‘Being transformed’ (125). The worries about one’s own health is still significantly higher among GDM women than controls three to five years after the pregnancy as well as perceiving themselves as more likely to develop DM (104). There are some Swedish studies regarding the perceived effects on health and well-being during and after a pregnancy complicated by GDM. In a study comparing women with prior experiences of GDM and matched controls with no experience of GDM, women with prior GDM report significantly less well-being, vigour and psychic health during their pregnancy (126). Furthermore, a less positive experience of the pregnancy, recollecting more worries about health during pregnancy has been demonstrated. The women with prior GDM report significantly more physical health problems and worries about health after delivery than women included in the control group. Additionally, women with prior GDM are more committed to maintain the GDM diet regime after the delivery (126). Both Swedish and Middle Eastern born pregnant women with GDM express worries for the health and well-being of the baby, but they have different approaches to the management of the disease (127). The Swedish born women fear development of DM2, more often seek help, use more medication for pregnancy-related complications, are more often on sick-leave, and regard pregnancy as a disease. The Middle Eastern born women believe that the GDM will resolve after delivery, try to adapt to the disease, and perceive more pregnancy-related complications but do not receive treatment (127). The Swedish born women undertake the recommended lifestyle improvements to a further extent than the Middle Eastern born women do after the delivery (92).
Self-rated health – definition and application to GDM

The concept of self-rated health (SRH) was first presented in 1980s, suggesting that SRH was a predictor of mortality independent of the person’s objective health status. The risk of death was independently almost 3-folded for the participants describing poor SRH. This suggests that the way people regard their health is central to subsequent health outcomes (128). In the following years, there have been a large number of studies regarding SRH in many aspects of health outcomes. A review reports consistent findings of the relation between poor SRH and mortality (129).

Recently, the concept of SRH has been used in studies concerning pregnancy and childbirth. Low perceived SRH is the most important risk factor for reporting fear of childbirth during pregnancy (130). The relationship between socioeconomic status and SRH among pregnant women of various ethnicities reveals that Latinas, Asians/Pacific Islander and African-Americans report lower SRH level than Caucasians during pregnancy. However, when socioeconomic measures are taken into account, only Asians/Pacific Islander women reported lower SRH level than whites (131). Furthermore, women’s health after childbirth in relation to level of SRH has also been studied. In Sweden, low SRH level at two months and one year after childbirth are associated with various physical symptoms, such as headache, tiredness, musculoskeletal pain, dysuria and gastrointestinal problems (132). Risk factors identified contributing to low SRH level at both two months or one year after childbirth were physical symptoms (such as tiredness, musculoskeletal pain, stomach pain) and emotional problems (such as depressive symptoms) that increased the risk of poor SRH for both primiparous as well as multiparous women (133). In addition, a negative birth experience in combination with operative delivery was associated with poor SRH in primiparous and insufficient social support was associated with poor SRH in multiparous women (133). The association between SRH level and depressive symptoms postpartum has been investigated among immigrant groups and Canadian-born (134). The immigrant women report more depressive symptoms, although an association between poor SRH and
depressive symptoms is found among Canadian-born women, but not for the immigrants (134).

SRH among women with GDM has been investigated during pregnancy and postpartum. The SRH is assessed four times during the period from pre-pregnancy to postpartum among women with GDM, pregnancy induced hypertension (PIH) and women with neither of the conditions (135). Women with GDM and PIH recall their SRH level as poorer prior to pregnancy than women without these conditions although the women with GDM do not report any significant decline in their overall health status. For women with GDM, there is a greater decline in SRH level from the pre-pregnancy level to the third trimester level of SRH than among unaffected women, but this effect does not persist in the postpartum period (135). In a study of health-related behaviour among women with and without a history of GDM, women with prior GDM demonstrate lower level of SRH than women with no GDM history (35).

PREVENTIVE MEASURES FOR THE FUTURE

*Life style change as a prevention of future diabetes mellitus*

Interventions aimed at increased physical activity combined with dietary regime have revealed decreased incidence of DM2 in high-risk groups with IGT or metabolic syndrome (136). However, despite worries of developing DM after a pregnancy with GDM, more women gain weight than lost weight after their pregnancy complicated by GDM and their exercise level does not change after pregnancy (137). Despite the awareness of the increased risk of developing DM2 after a pregnancy with GDM, only a minor part of the women believe that they are at high risk for DM. Women with three to five servings of fruits and vegetables each day demonstrate significantly lower odds of moderate/high risk reception (138).

The Swedish NBHW recommends preventive measures regarding lifestyle and systematic follow-ups that check body weight, blood glucose levels and cardiovascular risk factors after a pregnancy complicated by GDM. However,
no studies address general counselling of lifestyle after GDM. Still, there is strong evidence that counselling of high-risk individuals with IGT may reduce their risk of DM (6).

QUALITATIVE AND QUANTITATIVE RESEARCH IN OBSTETRICS AND GYNAECOLOGY

There has been a long tradition of performing quantitative research based on testing of a hypothesis in obstetrics and gynaecology. However, recently the use of qualitative research has increased. Qualitative research generally starts with a broad question and without pre-identified concepts, uses an exploratory approach and is hypothesis-generating rather than hypothesis-testing (139). A review addressing qualitative research in obstetrics and gynaecology reports that qualitative studies are almost always text-based, represent different theoretical approaches, explore the research question to investigate from the point of view of those studied and often focuses the process by which things happen (140). Furthermore, qualitative researchers cannot detach themselves from their pre-understanding, so this has to be acknowledged to interpret the content of the data (140). Qualitative research may have the power to influence positively the clinical practise; for example, the knowledge obtained from these studies reveals experiences of women and their perceptions and understanding of the phenomena studied, stimulates debate and inspires to further qualitative and quantitative research (140).

Clearly, the question of how to screen and whom to screen for GDM has been debated for almost half a century. Furthermore, it is clear that the condition of GDM may impact the future health status of the woman and her child. Few studies have addressed the qualitative research field exploring the experiences of the pregnant women, the effect of the disease on their daily life and the experiences of the HCPs providing maternal health care to women with complicated pregnancies.
THEORETICAL FRAMEWORK

The findings in this thesis will be discussed in the light of two theoretical concepts: the 'concept of empowerment' and the 'concept of power and knowledge' as discussed by Michel Foucault. The concepts were chosen as they may illuminate and further provide an understanding of the research questions for this thesis. The concept of empowerment is congruent with the recommendations of health care in the Swedish legislation. The concept of power/knowledge incorporates the Panopticon, and the ‘gaze’ which may be applied to illustrate medical power. In maternal health care, technological achievements, such as ultrasound examinations and other screening techniques may confer even more power onto the surveillance. Some research studies apply the concept of power/knowledge by Foucault, for example to study how power operates in medical encounters with pregnant women (141), and to discuss perspectives of midwifery power (142).

A short introduction to the theoretical concepts will be presented and further methods to support the counselling of the women will be demonstrated. The method may provide a tool for the HCPs in their counselling of women with GDM and may uncover empowering strategies.

Empowerment

The philosophy of empowerment

The word ‘empowerment’ is derived from the Latin word for power, ‘potere’ meaning ‘to be able’. The prefix of ‘em’ means ‘cause to be or provide with’ (143). The concept of empowerment is widely used, as the concept has been adopted to promote the rights for ethnic and sexual minorities, in education and training programs, in organizational development programs and by the feminist movement (144). The concept of empowerment has at least three different perspectives (145). The first perspective of empowerment is as a promotion of resistance against different types of repression in the structural issues of the society. The second perspective of empowerment is regarded as an opportunity for each individual to form the society, a user-friendly
alternative for the individual. The third aspect of empowerment is in relation
to a therapeutic perspective and this perspective has been widely used within
health care. The concept ‘empowerment’ in health care has been applied
regarding patient education, compliance, sense of coherence, and health
promotion (145). The philosophy of empowerment in nursing suggests that
the nurse-patient interaction should be reciprocal. This implies a number of
realities to be addressed: treating individuals as equals, providing
individualized care plans (created in partnership), reciprocal teaching and
learning, empathetic understanding as to facilitate empowerment of the
individual, perceived locus of control, perceived self-efficiency and health
value (143).

Empowerment in diabetes care and GDM health care

The term ‘empowerment’ in diabetes care was introduced in the early 1990s,
using the definition of empowerment as ‘the discovery and development of
one’s inherent capacity to be responsible for one’s own life’ (146). Empowerment has been defined as a process whereby patients have the
knowledge, skills, attitudes and self-awareness necessary to influence their
own behaviour in order to improve the quality of their lives. Medical health
care workers may be considered as the expert on DM, but the individual is
the expert on living with the condition (146). There has been a suggestion
that the concept of empowerment consists of at least five features:
acceptance, affect, autonomy, alliance and active participation (147).
‘Acceptance’ refers to the acceptance of the goals the individual may want to
set and it includes valuing the individuals for what they are and what they
want to become. ‘Affect’ refers to the emotional content of the counselling, a
content essential to discovering the emotions that may reinforce and
enhance the motivation of the individual. ‘Autonomy’ relates to the
involvement and participation of the individual who is responsible for the
decision made regarding the disease. Autonomy also implies that the
individual has to accept the consequences of his/her decisions. ‘Alliance’
refers to the alliance of the HCPs and individual. This is achieved by HCPs
trying to help the individuals make informed choices about their disease,
lifestyle and treatment. The final feature is the ‘active participation’. The most important role of the HCPs is to listen actively and by asking questions to help the individual identify the issues he or she prefer to change (147). By using Diabetes Empowerment Scale, an instrument designed to measure an individual’s perceived self-efficacy, an increase in self-efficacy was demonstrated among women with GDM performing SMBG (66). In Sweden, the recent published new guidelines for DM care recommend that the care should promote ‘empowerment strengthening’ activities. However, the guidelines regarding education of the individuals do not address the condition of GDM (6).

Motivational Interviewing as a method to improve empowerment

Motivational Interviewing (MI), a method for counselling clients, was first described by Miller in 1983 to describe counselling experiences with clients who abused alcohol. These experiences were later developed into a theory with descriptions of a clinical procedure by Miller and Rollnick (148). The theory has been influenced by the client-centred phenomenological perspective of Carl Rogers, emphasizing empathetic understanding and radical acceptance as triggers for change. Furthermore, inspiration was also found in the cognitive dissonance and self-perception theory, based on the idea that people are more likely to follow through with behaviour change that they have verbally justified (148). The ‘spirit’ of MI has been described as collaborative, evocative and respecting the autonomy of the patient. These characteristics are important to have in mind when initiating a dialogue concerning behavioural changes. In practice, MI uses four guiding principles: (a) resist the righting reflex, (b) explore and understand the patient’s own motivation, (c) listen with empathy and (d) try to empower the patient, support hope and optimism. These principles are also known by the acronym RULE – resist, understand, listen and empower (149).

Motivational interviewing might be a useful intervention strategy in the treatment of lifestyle problems and disease. A review study indicates that MI effectively helps clients to change their behaviour in 74% of the included
studies and that even short encounters, less than 20 minutes, have effect in 64% of the studies. Furthermore, the likelihood of an effect increases with the numbers of encounters (150).

Motivational interviewing in DM and GDM

MI has been used as part of programs that counsel people with DM. In a study of overweight women with DM2, women in the MI group lost more weight at six and 18 months than women in the reference group (151). The MI group had significantly greater improvements in glycemic control at six months, but not at 18 months. However, African-American women were found to be less successful in their weight loss in relation to white women, so MI may not be as beneficial for all women (151). A review study states MI to be effective for improving lifestyle (e.g., diet regime and exercise) among individuals with DM (152). In Sweden, a recently published report of patient education in diabetes care concluded that there is insufficient evidence regarding MI as a method of improving outcomes in diabetes (153).

The concept of power/knowledge - Michel Foucault

The French philosopher Michel Foucault (1926-1984) argued that society grants power people who possess specialized, that is knowledge confers power. For Foucault, power and knowledge are synonymous; where power is exercised, knowledge is created. Taking charge of this knowledge reinforces power, securing the continuation of exercising power, leading to more knowledge and so on (154).

Foucault uses Panopticon, a term coined by Jeremy Bentham to describe prison design, to illustrate how surveillance – “the gaze” imposes the power of the observer on the observed (155). The Panopticon induced in the inmate a condition of conscious and permanent visibility that guaranteed the automatic exercise of power. As a result of surveillance, Foucault argues that the individual generally behaves in a desired manner as to avoid punishments for non-compliant behaviours or to gain rewards for docile behaviours (155). This surveillance is the basis of the disciplinary power, a
system of power that adjusts the behaviour of the individuals in a social context. Discipline describes how power enforces the complex systems of surveillance. An increase in the surveillance leads to an increase in disciplinary power. The disciplinary power is usually not visible until there is resistance. Wherever there is power, there is always the possibility of resistance (154).

MY OWN PRE-UNDERSTANDING

My first interest in this research area started in the early 1990s when I worked as a midwife in antenatal care. Often, I provided antenatal care for women diagnosed with GDM and these encounters made me consider the situation of these women. During the last decade, my encounters with women diagnosed with GDM provoked me to reflect on the situation of the women and furthermore, my own roles as a HCP providing health care to these women. What is the experience of being ‘forced’ to change your lifestyle? Does the increased risk of future illness motivate these women or do they prefer to suppress the fact of future risk of illness as their focus is on childbirth and motherhood? Furthermore, are the HCPs supporting or aggravating the situation?

That was the starting point of my research journey, and today at the point of the defence of my thesis I am somewhat wiser in some aspects and still ignorant in others. Maybe a suitable take-off for a curious person; there is always something new to consider.

RATIONALE FOR AND AIMS OF THE THESIS

Internationally as well as nationally, there is no current consensus in the screening, diagnostics and treatment of GDM. In addition, there is little knowledge available on the impact of GDM on daily life of pregnant women and the experiences of HCPs encountering and providing health care to these women. Using different perspectives, this thesis examines how the different actors experience GDM and investigates the performance of screening for GDM in a regional setting in Sweden.
The following list presents the specific aims for the studies included in the thesis:

i) To describe pregnant women’s experiences of acquiring and living with GDM during pregnancy (Paper I).

ii) To investigate the compliance with local guidelines of screening for GDM and the outcomes of pregnancy and birth in relation to risk factors of GDM and whether or not the women are exposed to OGTT (Paper II).

iii) To explore the experiences of midwives providing antenatal care and counselling to pregnant women diagnosed with GDM (Paper III).

iv) To describe the obstetricians’ experiences providing health care to pregnant women with GDM (Paper IV).

METHODS

GROUNDED THEORY

Developed by Glaser and Strauss, Grounded Theory (GT) builds theory from data by using a method of constant comparison (156). The methodology represents theoretical constructs that derive from qualitative analysis of empirical data. This inductive approach generates a theoretical explanation of the phenomena or process under study (139).

GT has its roots in symbolic interactionism and pragmatism (139). Symbolic interactionism is based on several principles (157). People have the capacity of thought that is formed by social interaction and they learn the meanings and the symbols so as to exercise their capacity for thought. People modify the meanings and symbols they use in action and interaction based on their interpretation of a particular situation. People make modifications due to their ability to interact with themselves, examine possible courses of action, assess the positive or negative aspects and then choose one course of action. The intertwined patterns of action and interaction is the basis of groups and
societies (157). The pragmatic principles that are important for GT are that reality is actively created as people act in the world. Furthermore, people base their knowledge of the world on what has proven to be useful (157): what no longer works will be altered, hence if we want to understand the individual, we must base our understanding on what an individual actually does.

CONTENT ANALYSIS

Content Analysis (CA) analyses the manifest and latent content of a body of communicated material. This is achieved by classification, tabulation and evaluation of the major symbols and themes to determine its meaning and feasible effect (158). Primarily, CA was applied in quantitative media research, but over time CA has also been used in various research fields with a qualitative approach. The qualitative approach of CA has its roots in literary theory, the social sciences and critical scholarship (158). Qualitative CA focuses on the subject and the context, highlighting the differences between and similarities within codes and categories. The method addresses the manifest as well as the latent content in the text analyzed (159).

DESIGN OF THE RESEARCH PROJECT

This project uses both qualitative and quantitative methods to investigate the research topics from several perspectives and through different scientific approaches. Table 3 presents the design of the studies in the research project.

A qualitative approach on the research questions enabled a deeper exploration of the experiences of GDM: the perspectives by the pregnant woman living with GDM as well as the perspectives by the HCPs who provided maternal health care to the women. The quantitative approach enabled statistical comparisons of outcomes between groups of women. The research project was approved by the Regional Ethical Board, Umeå University, Sweden (Dnr 05-020M).
Table 3. A presentation of the study designs of the papers in the thesis.

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participants</th>
<th>Setting</th>
<th>Method</th>
<th>Data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Interview study</td>
<td>10 pregnant women</td>
<td>Västerbotten County, Sweden</td>
<td>Grounded Theory</td>
<td>In-depth interviews</td>
</tr>
<tr>
<td>II</td>
<td>Cross-sectional population-based retrospective study</td>
<td>822 women, newly delivered</td>
<td>Umeå University Hospital, Umeå and Sunderby Hospital, Sunderbyn</td>
<td>Parametric and non-parametric statistical analysis</td>
<td>Questionnaire and excerption of data from medical records</td>
</tr>
<tr>
<td>III</td>
<td>Interview study</td>
<td>12 midwives providing antenatal health care to women with GDM</td>
<td>Three counties in the northern region of Sweden</td>
<td>Grounded Theory</td>
<td>In-depth interviews</td>
</tr>
<tr>
<td>IV</td>
<td>Interview study</td>
<td>17 obstetricians providing maternal health care to women with GDM</td>
<td>National sample, Sweden</td>
<td>Qualitative manifest and latent Content Analysis</td>
<td>In-depth interviews</td>
</tr>
</tbody>
</table>

**Settings, participants and procedure**

**Settings**

Three studies (paper I-III) were conducted in the northern region of Sweden. The northern region comprises the counties of Norrbotten, Västerbotten, Jämtland and Västernorrland. The region covers rural areas sparsely populated and towns with about 110,000 inhabitants (160). At the time of the design and planning of the project (2004), there were about 8400 deliveries within the whole northern region (161). Based on the estimation that approximately 2% of all pregnancies were complicated with GDM, the
HCPs in the northern region provide maternal health care to about 170 women diagnosed with GDM each year.

The main part of the antenatal health care was provided by midwives working at the health care centres, often situated in the immediate neighbourhoods where the pregnant women live (106). Depending on the size and location of the local health care centre, the organisation consisted of one part-time midwife or many full-time midwives working at the same antenatal care centre. Usually, the women encountered the same midwife during most of the visits. The antenatal services provided were free of charge and financed by taxes and the vast majority of women attended antenatal care. There are national guidelines for the surveillance of the normal pregnancy, recommending eight to nine visits for the primiparous women and seven to eight visits for multiparous women (106). In an agreement document between Swedish midwives and obstetricians regarding guidelines for the professions, it is stated that midwives are responsible for the nursing actions associated with normal pregnancy and normal birth and the postpartum period (107). Furthermore, the midwives are responsible for detecting possible complications and the need of health care due to intercurrent disease. The obstetricians are responsible for the health care related to complications during pregnancy, delivery and concurrent maternal diseases, and prescribing and prioritizing the medical measures. It is considered essential for midwives and obstetricians to collaborate to provide good maternal health care in accordance with the aims of the maternal health care services in Sweden (107). In the case of GDM, because most women are not in need of hospitalization or intensive surveillance, antenatal care provided during the pregnancy is a situation where the collaboration between midwives and obstetricians is necessary for securing good antenatal health care.

A national sample was used for paper IV. This design was chosen as a previous study by the authors (not included in the thesis) demonstrated that there were substantial national differences in the local guidelines for
screening, diagnostics and treatment of women with GDM (17). That is, a national sample representing various approaches of GDM health care would address the research question in a more appropriate matter. Furthermore, a regional sample might have made it possible to identify the individual informants as there are a restricted number of obstetricians providing antenatal health care to women with GDM on a regular basis in the northern region of Sweden.

**Participants and recruitment procedure**

In *paper I*, the informants comprised ten pregnant women diagnosed with GDM within the county of Västerbotten. As the aim was to recruit women with various experiences, the inclusion criteria for the study were informants being diagnosed with GDM in the current pregnancy independent of whether GDM occurred in a previous pregnancy and the ability to communicate in the Swedish language without the need of a language interpreter. Another inclusion criterion was that the PhD student in the research project (MP) had not been involved as a HCP in relation to the informant.

The eligible informants were identified by the midwives working at the local antenatal care clinics (*n* = 32 clinics) in the county of Västerbotten. All midwives in Västerbotten were informed about the study and were to initiate the first information and contact with the women with GDM. When a woman was interested in participating, the midwives forwarded the telephone number to the first author. After additional information about the study was provided to the potential informant and after informed consent was secured, arrangements were made for an interview. Oral and written information about the study was provided. All informants were assured of confidentiality and protection of their identities before and after the interviews.

The mean age of the participants was 31.5 (±5.6) years and they had, on average, experienced 1.9 (±1.0) pregnancies complicated with GDM. Five of the women had experienced GDM for the first time when included in the study, and the remaining informants had experienced one or two previous
pregnancies with GDM. In one woman, the clinical situation was aggravated and insulin therapy was necessary during pregnancy. All the women but one were employed or full-time students. One woman was on parental leave with her first child. One woman was an immigrant but had lived in Sweden since her teens; she was fluent in the Swedish language and fulfilled the criteria for participation.

In the second study (paper II), the participants were to give birth during 2002 at one of the two largest hospitals in the northern region of Sweden, the Sunderby Hospital (SH) with 1713 deliveries during 2002 and Umeå University Hospital (UUH) with 1420 deliveries (161). Inclusion criteria for participation in the study were birth after 23 gestational weeks and proficiency in the Swedish language. A total of 1114 women gave birth during this period. Forty-three women were excluded due to language problems, leaving 1071 eligible participants for the initial study. As this study was an extension of a previous study that investigated low back pain and pelvic pain during pregnancy, the initial recruitment procedure has been reported elsewhere in detail (162-164). The initial data was assembled from January 1, 2002 to April 30, 2002. A total of 981 women accepted the questionnaire, which was distributed within the first 24 hours after delivery and in most cases assembled before discharge from the hospital. For the women who had not completed the questionnaire by discharge, a pre-paid envelope was provided. The final sample in the initial data collection included 891 women of the eligible population of 1,071 women (83.2%) giving birth at the two recruitment hospitals during the study period.

As this study intended to use data from the questionnaire together with data gathered from medical records, all 891 women participating in the initial study were sent a letter with information on the extended study. All participants were assured of confidentiality concerning their participation. If they were not prepared to participate in the extended study, a note with a prepaid envelope saying that they declined further participation was sent back to the research team. Of the 891 eligible women, 20 returned the pre-
paid note declining further participation and 22 women had emigrated, had unknown addresses or protected identities and could not be reached with the information about the extended study. During the further data collection, 22 women were found to have incomplete or missing medical records; they were excluded despite their acceptance to participate. All but one of the missing or incomplete medical records were from the SH recruitment area as all medical records were only available as hardcopies. The UUH recruitment area used computerised medical records of pregnancy and birth. The missing medical record at UUH was due to non-attendance of antenatal care during pregnancy. Finally, five women were excluded because they had a pre-pregnancy diagnose of DM1 or DM2. The final sample for this study consisted of 822 women, 73.8% of the total population giving birth in the recruitment areas during the study period. There were 418 (51.9%) women participating from the SH and 404 (49.1%) women from the UUH catchment area. There were no significant differences regarding proportions of primiparas and multiparas or maternal age between the two catchment areas.

Socio-demographic characteristics of the participating women are presented in table 4. The average maternal age was 29.6 (±4.9) years. The maternal age ranged from 17 to 44 years. Approximately one in five women were smokers prior to pregnancy; however, the majority ceased smoking during pregnancy as only 7.5% of all women reported smoking during pregnancy. There was a substantial amount of dissatisfaction with pre-pregnancy body weight as 44% of the participants reported that they were dissatisfied with their pre-pregnancy weight. The prevalence of obesity (BMI ≥ 30 kg/m²) was 12.4% among the participants. Some available data in the initial data collection allowed comparisons between participants and non-participants. The 69 non-participants in this study did not differ significantly from the participants concerning maternal age, parity, educational level, and gestational age.
Table 4. Some characteristics of the participants in paper II

<table>
<thead>
<tr>
<th></th>
<th>Participants in paper II (n=822)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maternal age, mean (± SD)</strong></td>
<td>29.6 (± 4.9)</td>
</tr>
<tr>
<td><strong>Maternal age at birth of first child, mean (± SD)</strong></td>
<td>26.4 (± 4.6)</td>
</tr>
<tr>
<td><strong>Age at menarche, mean (± SD)</strong></td>
<td>12.8 (± 1.3)</td>
</tr>
<tr>
<td><strong>Parity, mean (± SD)</strong></td>
<td>1.9 (± 1.0)</td>
</tr>
<tr>
<td><strong>Highest educational level</strong></td>
<td></td>
</tr>
<tr>
<td>Compulsory school/ folk high school</td>
<td>50 (6.1%)</td>
</tr>
<tr>
<td>High school</td>
<td>388 (47.2%)</td>
</tr>
<tr>
<td>University</td>
<td>375 (45.6%)</td>
</tr>
<tr>
<td><strong>Smoking before pregnancy</strong></td>
<td>157 (19.1%)</td>
</tr>
<tr>
<td><strong>Use of alcohol before pregnancy, once a week or more</strong></td>
<td>259 (31.5%)</td>
</tr>
<tr>
<td><strong>Physically active on a regular basis</strong></td>
<td>657 (79.9%)</td>
</tr>
<tr>
<td><strong>Satisfied with pre-pregnancy weight</strong></td>
<td>460 (55.9%)</td>
</tr>
<tr>
<td><strong>Perceived problem with actual or previous overweight</strong></td>
<td>226 (27.5%)</td>
</tr>
<tr>
<td><strong>Ever been on diet</strong></td>
<td>433 (52.6%)</td>
</tr>
<tr>
<td><strong>Maternal body weight at first antenatal visit, kilograms, median, (25 – 75 quartiles)</strong></td>
<td>66.5 (60.0-75.0)</td>
</tr>
<tr>
<td><strong>Maternal Body Mass index (BMI) at first antenatal visit, median, (25-75 quartiles)</strong></td>
<td>24.0 (21.8-27.0)</td>
</tr>
<tr>
<td><strong>Body Mass Index (BMI) groups</strong> (according to WHO definitions)</td>
<td></td>
</tr>
<tr>
<td>Underweight, BMI ≤ 18.4</td>
<td>13 (1.6%)</td>
</tr>
<tr>
<td>Normal weight, BMI 18.5 – 24.9</td>
<td>470 (57.2%)</td>
</tr>
<tr>
<td>Overweight, BMI 25.0 - 29.9</td>
<td>234 (28.5%)</td>
</tr>
<tr>
<td>Obesity, BMI 30.0 – 34.9</td>
<td>71 (8.6%)</td>
</tr>
<tr>
<td>Extreme obesity, BMI ≥ 35.0</td>
<td>31 (3.8%)</td>
</tr>
</tbody>
</table>
In paper III, the informants constituted midwives working at the local antenatal care clinics in the northern region of Sweden. The recruitment process aimed at achieving a purposive sample from various size and settings and with a mixture of working experiences in order to create a heterogeneous sample. Inclusion criterion included having experiences providing antenatal care on a regular basis for women with GDM. As the first author was working in maternal health care at the time, she was familiar with the organisation in that county. For the other counties, information about organization and suitable midwives to be contacted were obtained from the midwives serving as administrators within each county. Fourteen midwives were approached by the first author who informed them about the study and asked for participation and informed consent. Two midwives declined participation. Oral and written information of the study was provided. Confidentiality and protection of identities were assured. Of the two non-participants, one worked in a rural setting and was the only midwife in a vast area and the second midwife worked in a town setting together with one colleague in an antenatal health care centre. The non-participants were not requested to report the cause of their decline. The final sample consisted of 12 midwives providing care to pregnant women with GDM on a regular basis. As the first author was familiar with the midwives working in the same county, the second author (ÅH) performed the interviews in that geographic region.

In the study region at the time of the study (2006), 639 midwives were registered (161) and approximately 100 full-time midwife employments were available within antenatal health care clinics in the region in 2007 (13). All participating midwives were registered nurse-midwives and most of the midwives had experienced, and worked as midwives for a median of 20 years (range: 1 – 35 years). The median age of the midwives was 51 years (range: 33 – 62 years), and eight of the participants had other specialist nursing education or an academic degree in addition to their midwifery exam.
In paper IV, obstetricians with experience counselling pregnant women with GDM on a regular basis were approached. As there are no current consensus of the screening, diagnostics and treatment of GDM during pregnancy (17), the aim was to recruit a sample of obstetricians with experiences of the various ways available to survey the disease. Twenty-six potential informants were consecutively approached by email and/or telephone. They received written and oral information about the study. Confidentiality and protection of identities were assured and no reason for non-participation was asked for when the potential informant declined participation. Nine informants declined participation leaving 17 informants who were included in the study.

All informants were working in hospital-based maternal health care counselling pregnant women diagnosed with GDM. The participants worked in different sizes of hospitals, ranging from small hospitals to large university hospitals. A purposive sample of informants from regions with various local clinical guidelines were recruited as were various ways of organizing the health care provided to pregnant women with GDM. Most of the obstetricians had considerable work experience; however, the work experience ranged from an informant with a recent graduation as a specialist in obstetrics and gynaecology to an informant with 32 years of work experience in the field. Eleven of the participants (64.7%) were females. The male obstetricians had more work experience than the female obstetricians.

Data collection

In-depth interviews

For paper I, III and IV, the data were collected by performing in-depth interviews. All informants were allowed to choose the place for the interview. The vast majority of the interviews of the pregnant women were performed in the home of the pregnant woman. Most of the interviews of the midwives and obstetricians were conducted in the office of the informant or in a conference room at the clinic. Before and after each interview, the informant
and the interviewer talked briefly about the aim and procedure of the study (165). Before each interview started, the informant was again assured of confidentiality and protection of the identity and permission to record the interview was obtained.

In paper I, the interviews were performed during an extended period. The initial five interviews were performed in late 1998 to 2000 and the additional five interviews were performed in 2006 in order to further investigate the issue under study and to reach saturation of the material. No interview guide was used for the first five interviews as to provide an opportunity for the participants to feel free to speak about whatever they considered was important about being diagnosed with GDM and its’ impact on their daily lives. The interviews started with questions like ‘Tell me what it’s like to be diagnosed with GDM’. Further questions were asked in order to probe and advance the descriptions. After the initial analysis of these five interviews, a semi-structured interview guide was developed to probe the identified topics in the further investigation (Appendix I). After each of the subsequent interviews, an initial analysis was made and if necessary, adjustments of the interview guide were made as to enrich and advance the following interviews. Discussions within the research team addressed the content of the interviews and whether the saturation of the data was obtained. After eight interviews, new substantial information was not obtained; however, another two interviews were performed in order to make sure that no new major information was reported. All interviews were tape-recorded with the permission of the informant. The interviews ranged from 28 minutes to 84 minutes. Most interviews lasted for 40-50 minutes.

The interviews for paper III were performed from November 2005 to August 2007. For these interviews a semi-structured interview guide was created to address the topics of interest (Appendix II). After each interview, the first and second author made a preliminary analysis of the interview. The interview guide was revised if necessary so as to probe and advance the topics in addition to discussing the matter of saturation. The second author
performed six interviews in the county where the first author was familiar and one interview in an adjacent county. All interviews were tape-recorded with the consent by the informants. Most interviews lasted for 40-45 minutes, ranging between 25 to 50 minutes. After ten interviews, new major topics were not detected. In order to confirm the saturation of the data, two additional interviews were performed in another part of the region and no further important information was obtained.

In the third qualitative study (paper IV), an interview guide with semi-structured questions was created for this study (Appendix III). During the interviews, probing questions were used to advance the descriptions by the informant. Each interview lasted 30 to 60 minutes, most of them approximately 40 minutes. The tape-recordings from three interviews were found to be of poor technical quality and therefore could not be transcribed. However, memory notes on the content of the interview were taken immediately after each interview, also providing information of the contents of these interviews. Fourteen interviews were complete and were transcribed verbatim for the data analysis. All interviews were performed by the first author and the contents of the interviews were discussed as to adjust the interview guide if necessary.

Data collection by questionnaire and from medical records

In paper II, the study comprised data from a questionnaire combined with medical data collected from medical records of pregnancy and birth. The questionnaire was initially created for a study addressing low back pain and pelvic pain during pregnancy. The questionnaire included approximately 80 different items focusing on low back pain and pelvic pain, physical activity, lifestyle, level of education, self-rated health and questions addressing the experience of childbirth among others. For this study, the data collected from the questionnaire mainly addressed the background characteristics and some lifestyle questions (Appendix IV). The internal and external validation of the questionnaire has been discussed extensively elsewhere (162-164). For the purpose of evaluation of internal validity, 25 women completed an
identical questionnaire two to three weeks after the initial questionnaire. The consistency between the two sets was high, with total agreement in the majority of questions (162-164). In the questionnaire, a Visual Analogue Scale (VAS) was used to estimate experiences of pain and experience of childbirth. The VAS has been validated addressing pain measurement. A review article has compared different scales for pain measurement; VAS is one of these scales, reporting validity, reliability and clinical suitability for all investigated scales (166). Furthermore, for example, VAS has been used to assess pain during labour and experiences of delivery (167).

Medical data were manually collected from all 822 medical records of pregnancy and childbirth. In the UUH region all medical data was computerized, thus easily accessible. The data was obtained from paper records in the SH region, which also influenced the number of missing medical records. All but one participant excluded were from the SH region. The exclusions were due to missing or incomplete medical records. From each medical record, 75 items representing maternal characteristics and pregnancy outcomes were collected and added to the questionnaire data (Appendix V). Items of interest were presence of risk factors prior or during pregnancy as stipulated in the local clinical guidelines of GDM screening, medical outcomes of pregnancy and birth, and medical diagnoses using International Statistical Classification of Diseases and Related Health Problems, version 10 (ICD-10). All data excretion was performed by the first author.

The internal validity of data from the medical records was controlled by performing a reinvestigation of 50 randomly selected medical journals. This reinvestigation was performed by the first author. Of the 3,750 items controlled, five items (0.1%) of incorrect data excretion were found and corrected.
Local clinical guidelines for screening for GDM in the study region

The local clinical guidelines addressing the risk factors requiring screening for GDM were obtained for both catchment areas before the collection of medical data. A compilation of the local guidelines is presented in Table 5.

Table 5. Criteria indicating oral glucose tolerance test (OGTT) screening for gestational diabetes mellitus (GDM) and cut-off threshold value for GDM diagnosis according to the local guidelines 2002 within the two catchment areas.

<table>
<thead>
<tr>
<th>Criteria indicating OGTT screening for GDM</th>
<th>Umeå University Hospital (UUH)</th>
<th>Sunderby Hospital (SH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk factors in medical history</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family history of diabetes mellitus (parents and siblings)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Previous pregnancy with GDM</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Previous child with birth weight ≥ 4 500 g</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Maternal body weight before pregnancy (kilos)</td>
<td>≥ 90</td>
<td>≥ 90</td>
</tr>
<tr>
<td>Body Mass Index, BMI (kg/m²)</td>
<td>No</td>
<td>≥ 30</td>
</tr>
<tr>
<td>Risk factors developed during pregnancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Randomly controlled blood glucose level at any antenatal check-up during pregnancy (mmol/l)</td>
<td>≥ 8.0</td>
<td>≥ 7.1</td>
</tr>
<tr>
<td>Accelerated fetal growth</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Polyhydramniosis</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cut-off threshold at 75 g OGTT indicating GDM diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 hours blood glucose value (mmol/l)</td>
<td>≥ 9.0</td>
<td>≥ 8.9</td>
</tr>
</tbody>
</table>

The majority of the criteria were identical. According to the local clinical guidelines, the OGTT should be performed in early pregnancy in women with prior GDM and repeated at 28 gestational weeks if the first OGTT was normal. For pregnant women with all other risk factors the OGTT was recommended to be performed at 28 gestational weeks. Blood glucose levels were measured irrespective of last meal of the pregnant woman or
presence of glucosuria, at four times regularly during pregnancy in the SH catchment area, and at five to six times regularly during pregnancy in the UUH area. The random measurements of blood glucose level started in early pregnancy throughout the pregnancy. Whenever high blood glucose values were detected, the OGTT was recommended to be performed as soon as possible irrespective of gestational age.

Analysis

The methodologies applied for the analysis of qualitative data were GT for two papers (paper I and III) and qualitative CA for paper IV. The theoretical underpinnings of these methods have been described previously in this chapter.

Analysis in paper I, III and IV

All interviews were transcribed verbatim. The analysis followed the basic steps of GT and in a similar manner for both papers (paper I and III). In the first stage, the text was read thoroughly and open codes were created in close relation to the text. Memos of ideas and reflections about the data were documented during the whole process of analysis. During the process of open coding and constant comparison, clusters of codes emerged. These clusters of similar codes formed categories. The categories represent new concepts described by the codes. During the process of analysis, a core category was identified. The core category was related to the most prominent categories that could be traced through the data. The entire data were analyzed repeatedly in search for additional codes and properties of the categories in order to achieve a description as complete as possible of the phenomena investigated. After identifying the core category and the main categories of the data, the theoretical coding was initiated as to link the categories, create a model to visualize the findings, and explore links to pre-existing theories (139, 156, 168). To improve the credibility of the analysis, the categories and coding was discussed during the whole period of analysis within the research team. Furthermore, in paper III, the first and second
author coded the same text, made comparisons of the coding, and discussed the codes with all authors to reach consensus.

In paper IV, the texts were analysed using qualitative manifest and latent CA. The analysis was performed in several steps. First, the text was read thoroughly in order to achieve a sense of the whole and identify the content areas. Second, the text was divided into meaning units addressing the aim; i.e., words, sentences or paragraphs related to each other by content or context. These meaning units were condensed and labelled with codes. Third, the codes were continuously compared for similarities and differences resulting in three categories and one theme. According to Graneheim and Lundman (159), a theme can be regarded as a thread of an underlying meaning throughout the condensed meaning unit, codes or categories, on an interpretative level. A theme may be regarded as an expression of the latent content of the text (159). To seek agreement and validate the findings, the steps of the analysis were discussed in the research group until consensus was achieved.

Statistical analysis of paper II

The statistical analyses for the study presented in paper II were performed using the statistical software package (SPSS, version 16.0)(169). The following analyses were performed: the Chi-square-test for categorical variables and the Fischer’s test for small samples. For continuous variables with a normal distribution, the Student’s t-test and analysis of variance [ANOVA] were performed. The Bonferroni procedure was applied to control for multiple testing. For continuous variables with a skewed distribution, the Kruskal-Wallis and Mann-Whitney test were performed. The level of significance was set at $p = 0.05$.

For the statistical calculations, the women were categorised into four risk factor groups depending on the presence of risk factors in medical history and developed during pregnancy. The following groups were created.
1. Risk factor group 1, R1: women with risk factors in medical history and additional risk factors developing during pregnancy.
2. Risk factor group 2, R2: women with risk factors in their medical history.

Furthermore, a fourth group of women with absence of any risk factor in their medical history or during pregnancy (normal group, NG) was also recognized.

Univariate and stepwise multivariate logistic regression analyses were performed to investigate the associations between exposures before and during pregnancy and outcomes of pregnancy and childbirth. These analyses were performed in a two-step manner. First, all exposure variables were tested one by one in separate univariate analyses. Second, all statistically significant variables in the first step of analysis were tested performing multivariate logistic regression analysis. Significant variables were entered in a stepwise manner. Results from the final model are presented as odds ratios (ORs) with 95% confidence interval (CI).

Three models were tested. Model 1 comprised the group of women fulfilling the criteria of OGTT being correctly exposed to the test and the normal group of women with no GDM risk factors in their medical history and during pregnancy. Model 2 was based on the group of women fulfilling the criteria of OGTT and not being exposed to the test and the normal group of women with no GDM risk factors in their medical history and during pregnancy. Model 3 consisted of the women who fulfilled the criteria for OGTT, but were not exposed to an OGTT and the women fulfilling the criteria for OGTT and correctly exposed to the test.
Ethical considerations

For the qualitative studies (paper I, III and IV), an important issue to address was the protection of the identity and confidentiality of the informants. As the condition of GDM affects about 2% of pregnant women in Sweden, the number of the pregnant women affected is not large in a region. Furthermore, the midwives and obstetricians encountering and counselling these women may easily be identified. These aspects of protection were vital for the informants as many of them were outspoken and revealed personal experiences on the matter. Addressing these issues, we chose not to present the characteristics of the informants in detail. Furthermore, the presented quotations have been selected to demonstrate the content of the data as well as to secure that the identity of the informant could not be revealed by the content of the quotation. The informants received oral and written information of the study before the decision of participation. Informed consent was achieved before the interview and all informants agreed to a tape-recoding of the interview. The informants were also assured that they could at any time withdraw their participation by contacting the authors. For the informants in paper I, there was a possibility to provide contact with the welfare officer or an obstetrician in case anxiety was detected during or after the interview. As the first author was working as a midwife in antenatal health care at the time of the data collection (paper I and III), and no invitations to participate were offered to the pregnant women diagnosed with GDM receiving antenatal health care by the first author.

Performing research within one’s own profession might pose some ethical dilemma. For the study regarding midwives, the first author was familiar with some of the informants in the region where she worked. This issue was addressed in the way that the second author (ÅH) performed the in-depth interviews in the region the first author was working. However, all informants were aware of the situation that MP was the first author and was going to perform the main analysis of the data set. The recruitment of informants in paper IV was mostly performed by the first author who was unknown by the potential informants. However, in a few cases, there was no
answer to the first invitation by the first author, and the contact was established by the main supervisor (IM). All further contacts addressing extended information of the study and arrangements for the interview were performed by the first author. Since she was a colleague, she may have been recognized; however no personal or professional collaborations were established with these potential informants at that time.

All eligible participants (n = 891) in paper II were approached with an information letter of the extended study and the collection of medical data concerning the outcomes of pregnancy and childbirth. The information letter provided a pre-paid envelope to return if declining further participation. The participants were assured that their identities would be protected, and individual data would only be presented as parts of a larger sample. This consideration was made for two reasons: to protect the identity of the individual as rare complications would enable recognition of the individual and rare conditions do not fulfill statistical power in a data collection of this size, so the risk of harm to the individual exceeds the benefit such procedures would achieve.

**MAIN FINDINGS**


In this paper, the focus was on the experiences of pregnant women diagnosed with GDM during pregnancy and the impact this unexpected disease had on their daily life. The core category emerging was labelled ‘From stun to gradual balance’. The core category emphasized the process initiated by the unexpected diagnosis of GDM and how the women gradually as time passed found her individual balance as how to handle her situation. Women with previous experience of GDM were not as stunned by the notification of GDM in the current pregnancy as they had already though about the potential of having GDM when they planned for a new pregnancy.
The experience of women with previous experience of GDM could be understood as the process of gradual balance. For each pregnancy with GDM the adoption and the struggle for balance in her daily life became easier. The core category was related to nine categories presenting the challenges the woman had managing her daily life. A short presentation of the categories will follow.

The category 'Struck by lightning' addressed the feelings and experiences regarding the sudden and unexpected knowledge that she had an ‘invisible’ disease with demands on the daily lifestyle of the woman. The second category ‘Having a personal responsibility’ described the daily life of the woman as soon as she realised that her adaptation to the recommended treatment would affect the status of the foetus. The woman felt responsible for making healthy choices. This responsibility also embraced the fact that some women felt guilty as they had not had a healthy lifestyle before the diagnosis. The category ‘Being under surveillance’ revealed that the woman experienced that she was monitored, not only by the HCPs but also by her spouse and relatives. This situation of surveillance exposed opposite emotions; on one hand, the medical surveillance provided a sense of security; on the other hand, the surveillance might detect deterioration and a need for insulin. The surveillance could also increase feelings of uncertainty and failure as her actions and compliance was sometimes questioned. ‘Struggling for protection’ was the category that addressed the foetus. Because a mother-to-be is expected to be protective of her foetus, losing control, falling for temptations or failing to fulfil the recommendations caused anxiety and guilt. The category ‘Feeling socially apart’ exposed the experiences of being unusual, not like other pregnant women. As the diet regime was a vital treatment, this caused problems in social occasions when food was often part of the event. The women had to deal with eating without elevating their blood glucose and/or informing the host about her diet restrictions, causing an awkward situation. Another issue for the women to handle was presented in the category ‘Being sufficiently supported’. Most women expressed that they received support on a daily basis from people in
their neighbourhood, but not all women felt supported, which made them feel more vulnerable and their situation was more difficult to handle. As a result of the diagnosis of GDM, the women were expected to make changes in their daily lives. This experience was captured in the category ‘Changing the self-image’. The altered health situation implied that good health could not be maintained. There was a necessity for maintaining healthy habits and the disease caused obstacles that had to be mastered. The identity of being a healthy person living a spontaneous life was shattered. Gradually, the situation improved as the category ‘Adapting to a new situation’ indicated. As time passed, the situation was easier to handle as the women found their balance with a regular lifestyle. The improved well-being also made it easier to adapt and follow the recommendations. Finally, the baby was due and this was the moment they all dreaded to some extent. The category ‘Waiting for the moment of truth’ addressed this situation. Now the truth would be revealed; Were the efforts made during pregnancy enough? Would the baby be affected by the disease? Would the disease be resolved? The women did not know what to expect despite the efforts made.

In summary, the experiences of pregnant women acquiring and living with GDM during their pregnancy may be understood as a process ‘From stun to gradual balance’, filled with challenges, inconveniences and changes of lifestyle involved. Although this experience comprised positive and negative dimensions, gradually adapting and altering one’s lifestyle and balancing the every day life challenges is the prize most of these women were willing to pay to secure the health and well-being of their foetus and themselves.


A total of 822 women participated in this study. The findings demonstrated that one in five (20.7%) of the pregnant women in the two catchment areas had at least one of the risk factors for GDM in their medical history.
stipulated in the local clinical guidelines. The most frequent risk factor in medical history was DM in the close family (61%). The participants with risk factors of GDM in their medical history reported more problems related to lifestyle, such as more often smoking before pregnancy and less physical activity, and had lower educational level than the participants without risk factors in their medical history. During pregnancy, 132 participants (15.9%) developed at least one of the stipulated risk factors. Forty-five of these women had already at least one risk factor in their medical history. The most frequent risk factor developed during pregnancy was accelerated foetal growth (59%).

A sample of 257 pregnant women (31.3%) had risk factors for GDM in their medical history or developed risk factors for GDM during pregnancy, fulfilling the criteria of performing an OGTT during pregnancy. However, only 84 women were exposed to the OGTT and five of these did not have any indication for an OGTT noted in their medical records. Seventy-nine women were correctly exposed to the OGTT and seven women were diagnosed with GDM. Women with risk factors in their medical history and during pregnancy (R1) were significantly more obese than other risk factor groups despite obesity ≥ 90 kg being one of the risk factors.

The mean birth weight was significantly higher in R1 and R3 compared to women with no risk factors (NG). Women developing risk factors during pregnancy (R1 and R3) were significantly more often disposed to induced labour compared to women in R2 and NG. No significant differences between the sub-groups were demonstrated concerning the outcomes of delivery nor were any significant differences noted concerning jaundice or hypoglycaemia of the newborn infant. The increased risk of giving birth to a child with macrosomia was related to the following determinants: previous infant with macrosomia and maternal body weight ≥ 90 kg. Women in R1 had a 9-fold risk of giving birth to a child with macrosomia and women in R3 close to 13-fold risk of giving birth to a child with macrosomia compared to women without risk factors (R1: OR 9.33, 95% CI 2.65 – 32.87 and R3: OR
12.96, 95% CI 1.33-126). Adjusting for all risk factors stipulated in the local guidelines, women with the lowest educational level had an increased risk (OR 6.19, 95% CI 1.58-24.27) of not being correctly exposed to OGTT when fulfilling the criteria compared to women with university education. Both women fulfilling criteria and correctly exposed to OGTT and women fulfilling criteria however not exposed to OGTT gave birth to children with macrosomia significantly more often than the NG women. Comparing the outcomes of pregnancy and birth of women fulfilling criteria and correctly exposed to OGTT and women fulfilling criteria however not exposed to OGTT, only the decreased risk of developing proteinuria among the women fulfilling criteria but not exposed to OGTT remained significant after a stepwise multiple regression analysis.

Summarizing the findings in paper II, surprisingly low compliance with the local clinical guidelines for screening for GDM during pregnancy was found. The prevalence of the risk factors of GDM in the present study was almost doubled compared to previous Swedish studies. The pregnant women developing risk factors of GDM during pregnancy showed a significantly increased risk of giving birth to an infant with macrosomia.


The findings in the third paper of this research project addressed the experiences of midwives providing antenatal care and counselling to pregnant women diagnosed with GDM. The core category emerging from the data was labelled ‘Balancing fear of failure’. Four categories were related to the core category: ‘A snake in paradise’, ‘The caring companion’, ‘The medical guardian’ and ‘The moral keeper’. A short abstract of the core category and the related categories is presented below.
The core category emerging from the empirical data was labelled ‘Balancing fear of failure’. This fear of failure was activated when the condition of GDM was detected. The midwives described the demands and obligations of medical surveillance of the pregnancy; to initiate and motivate the necessary changes in lifestyle and to create and provide an empowering relationship with the women. Because of their fear of failing, the midwives chose strategies to balance the conflicting situations attributed to counselling.

The category ‘A snake in paradise’ explained the situation perceived by the midwives when the condition of GDM was detected. The pregnancy was no longer normal and the midwives perceived that the disease obscured the women’s experience of being pregnant. The midwives were aware of the necessary changes of lifestyle the women had to perform as a result of the condition and that the condition may not resolve after pregnancy. After the detection of GDM, the situation of providing antenatal health care to the pregnant women was altered. The midwives described three alternative strategies to balance their fear of failing in their function. The category ‘The caring companion’ addressed the strategy of maintaining a good relationship with the woman. The health care provided was focused on the autonomy of the pregnant woman and the midwife provided information and support for initiation of the necessary changes of lifestyle. The midwives preferred an evasive approach as not to confront the woman or jeopardise the relationship.

On the other hand, there was the strategy of surveillance and monitoring of the health of the mother and the foetus. This strategy is understood by the category ‘The medical guardian’. The guarding of the maternal and foetal health was expressed as one major objective of the antenatal health care provided. A stress of overlooking aggravations of the condition had to be managed. By regarding themselves as experts, the midwives decided what they considered were appropriate measures for the women to perform. This expertise rationalised the paternalistic approach sometimes applied in the counselling and surveillance of the pregnant woman.
An explicit assessment by some informants was that pregnant women have a moral obligation towards the foetus to make healthy choices. Occasionally, the midwives perceived that there were women with GDM who did not follow the recommendations or were reluctant to perform the necessary changes, hence behaved in an irresponsible manner. The strategy of addressing the moral obligations of the mother-to-be was demonstrated in the category ‘The moral keeper’. The irresponsible behaviour by some mothers-to-be caused frustration and the midwives tried to improve the moral standard of the pregnant woman. Using the well-being of the foetus was a way of trying to convince or force the women to improve her standards of healthy choices.

A brief summary of the findings in paper III indicate that the experiences of midwives providing antenatal health care and counselling to pregnant women diagnosed with GDM may be understood as ‘Balancing fear of failure’. The midwives described conflicting encounters and the fear of failing to fulfil the assignments because the condition of GDM made the midwives choose alternative strategies to handle the conflicting encounters.

**PAPER IV** “Dealing with Ambiguity” - The role of obstetricians in gestational diabetes mellitus. Submitted.

The experiences of obstetricians providing maternal health care to pregnant women with GDM reveal ambiguity in most aspects of the organisation and management. The findings address three categories including sub-categories resulting in the theme ‘Dealing with ambiguity’.

The category ‘Participating in supportive and non-supportive organizational structures’ addressed the way the organisation functions. Some obstetricians described an organisation centred on teamwork and collaboration between different HCPs in a way that enabled a comprehensive approach to care. In the teamwork organisation, the obstetrician felt supported in difficult situations. Others had experiences from a
compartmentalized health care organisation where each HCPs provided health care for ‘their part’ of the condition. In these organisations, the obstetricians felt less involved in the health care and sometimes had to rely on the pregnant woman to inform them about the measures taken by other HCPs.

The ambiguity also addressed the pregnant woman and her foetus. The category ‘Balancing multifaceted interests’ demonstrated the considerations and assessments used to manage the care. The majority of pregnant women with GDM seldom caused obstetrical problems; however, it was not possible to predict which women would have problems. When insulin therapy was initiated, the surveillance and the assessment of the development of the pregnancy were intensified to balance the situation of the woman and the foetus. The monitoring of foetal development was important in all pregnancies with GDM so as to detect the children who might develop macrosomia. Counselling the non-compliant pregnant women with GDM was experienced as a troublesome situation. The third area of ambiguity was addressed by the category ‘Using contradictory information’. The informants expressed their frustration with the absence of evidence-based recommendations regarding the treatment of the GDM, yet they managed the absence of consensus in their encounters. Searching for information was regarded as an individual responsibility despite the lack of relevant information.

The experiences of the obstetricians providing maternal health care to pregnant women with GDM were characterised by ambiguity. This ambiguity permeated all aspects of the role as an obstetrician within the maternal health care: dealing with the organisational settings, balancing the multifaceted interests of the mother and the foetus, and dealing with the lack of national consensus, recommendations, and evidence-based knowledge.
THE EXPERIENCES OF PREGNANT WOMEN, MIDWIVES, OBSTETRICIANS AND THE PERFORMANCE OF SCREENING – A PRESENTATION OF A MODEL INTEGRATING DIFFERENT PERSPECTIVES ABOUT THE MANAGEMENT OF GDM

This model incorporates the experiences of the pregnant women, the midwives, the obstetricians providing maternal health care and the performance of screening for GDM (Figure 1).

The frames of the situation are formed by the context of the woman’s daily life and the organisation of maternal health care, contexts that inform each other and the content of the health care provided. However, the framework of the organisation is not completely comprehensive, as some women with potential GDM and infants with macrosomia may remain undetected. After ‘the initial stun’, the woman proceeds along the ‘bumpy road’ of pregnancy trying to avoid the major potholes that may jeopardize the outcome of the pregnancy. The birth of the infant will reveal ‘the crossroads’ encountered in the future; if the baby is healthy, and if the woman will remain healthy or has to accept future chronic illness. The HCPs provide antenatal health care for the woman empowering and supporting her along the bumpy road through pregnancy or monitoring, correcting and reprimanding her journey. The midwives try to achieve a balance between their fear of failure and providing adequate care for both the foetus and the mother-to-be. The midwives perceived that their main focus is to protect the health and wellbeing of the mother and the foetus. To fulfil this responsibility, the midwives strived to balance empowering strategies and measures that provide medical and moral surveillance. The obstetrician has the power to facilitate the process. By acting in a team with HCPs, the obstetrician is supported by members of the group, hence the balance of the maternal health care provided is easier to obtain. Providing care in compartmentalized maternal health care will be more difficult to obtain.
DISCUSSION

The experiences of the pregnant women with GDM may be understood as a process ‘from stun to gradual balance’. The experience comprised both negative and positive dimensions. Despite the challenges, the inconveniences and the life style changes involved, gradually adapting to an altered lifestyle and finding their balance in daily life was ‘the prize’ the women ‘were willing to pay for’ in order to secure optimal maternal and foetal health. The performance of screening for GDM was found to be surprisingly low despite local clinical guidelines stipulating the risk factors indicating an OGTT. Furthermore, the prevalence of the risk factors in the population investigated was almost doubled compared to previous Swedish studies (10). Pregnant women developing risk factors during pregnancy were found to be at substantially increased risk of giving birth to an infant with macrosomia. The experiences of midwives revealed conflicting encounters providing antenatal care to pregnant women diagnosed with GDM. Most midwives felt the obligation to control and monitor the complicated pregnancy, to initiate and motivate the necessary changes in life style together by providing an empowering and caring relationship with the women. These assignments revealed complex conflicting situations and the midwives seemed to choose a strategy for handling the situation depending on their perception of the

Figure 1. A model presenting the different perspectives about the management of GDM
circumstances. The role of the obstetricians in GDM maternal health care may be understood as dealing with ambiguity. This ambiguity permeated all aspects of working as an obstetrician within the maternal health care: the role of the obstetrician, the context of organization, the multifaceted interests to balance and furthermore, the situation of absence of consensus, recommendations and evidence-based knowledge.

The synthesized model describing the management of GDM illustrates the importance of balancing the organization of maternal health care, including the performance of OGTT, and the actions, the strategies and the measures taken by the HCPs in their aim to support and secure the maternal and foetal health during the pregnancy and in the future. Motivating and empowering the woman’s mastery of her own situation should be in balance with the necessary medical surveillance of the pregnancy. Furthermore, using motivational strategies in cases of non-compliant behaviours might improve the outcome of the condition as well as the relationship between the health care professionals and the woman with GDM.

THE PERFORMANCE OF SCREENING

The performance of screening of GDM was insufficient in the studied geographical region and improvements are necessary as to fulfil the intention of the screening. However, there is reason to believe that similar situations may exist in other regional settings as the reported performance of OGTT in this region does not differ much from other regional settings performing risk factor-based OGTT (13). An important result for the clinical practice is that the women developing risk factors during pregnancy are at increased risk of giving birth to an infant with macrosomia. Identifying these women at risk for complications during childbirth due to a large infant may contribute to improving the experiences of childbirth as well as may reduce the risk of birth trauma. Active management of delivery by induced labour or planned caesarean sections among women with GDM reveal lower birth weights compared to expectant management of labour in women with GDM (170). A review concludes that there is an association between macrosomia and pelvic
floor trauma (171), a situation that may contribute to pelvic floor problems in the future.

Less than one in three women with risk factors for GDM actually performed the OGTT as stipulated in the local clinical guidelines, a significant non-compliance rate with respect to the local clinical guidelines. There may be several hypothesized reasons for this low compliance to the guidelines for screening of GDM related to the midwives and the women. On behalf of the midwives, obesity might be a very sensitive topic for the midwives to approach, a situation that might contribute to the low compliance. The risk of developing GDM during pregnancy is 6-folded increased for women with obesity compared to women with normal body weight (40). Still, paternalistic counselling of obese women may have occurred, complicating the counselling and provision of antenatal health care. Obese pregnant women describe experiences of humiliating treatment by both midwives and physicians, where the health care professionals are perceived as rude, angry, abrupt, moody and neglecting their needs (172). Other possible reasons contributing to the low compliance in our study, based on the actions of the women, may be that they preferred not to perform the oral glucose tolerance test, hence did not attend to the arrangements made by the midwife; i.e., this can be seen as a form of resistance to the prescribed measure. However, an Australian study indicates that despite increased anxiety in the beginning of the third trimester by women with GDM, women with GDM and a reference group of normal women are positive about being tested for GDM and wish to be tested in future pregnancies (124).

Applying Foucault’s theoretical framework to the poor compliance of local guidelines reveals that individuals (as a result of their perceived activity or behaviours) may be regarded as an expression of power by the midwives. However, the poor compliance to the clinical guidelines may also be an act of resistance from the perspectives of the midwives, indicating that there may be features within the organization of health care not functioning properly. This resistance, for example, could be the result of a lack of strategies and support
that address sensitive topics such as obesity and unsuccessful counselling or organizational difficulties with the performance of OGTT leading to decreased compliance.

THE PREGNANT WOMEN WITH GDM

The women with GDM unexpectedly found themselves in a situation where they were presupposed to perform the recommended changes of lifestyle. They did not decide the time and the extent of the changes. Rather, HCPs decided on these changes due to a medical complication during the pregnancy.

In the light of the theoretical framework, the situation experienced by the women was pervaded by the power of the medical knowledge (cf. Foucault, 154). When the condition of GDM was detected, most women did not challenge the power-knowledge of the health care professionals, as they did not experience having the appropriate knowledge to challenge the recommendations given. Most women were in a position where they did what they were told to do, as they did not want to put their foetus at risk by acting non-compliantly, ignoring the recommendations of the medical experts. Furthermore, the medical surveillance of the condition implied that the HCPs collated information on the woman’s activities and performance. This gathered information further reinforced exercise of power as the woman would be judged and evaluated based on her compliance to the recommended regime, a form of disciplinary measures that regulated the behaviours of the woman during pregnancy.

As time passed during the course of the pregnancy, the women expressed this regulation as their own increased knowledge about managing the condition and experienced their daily life as easier to manage. This situation may be coherent with the concepts of empowerment. As the women gained mastery of the situation, their own power increases, reinforcing the decrease in the significance of the recommendations by the HCPs. Furthermore, as the knowledge and experiences of the condition increased, their daily life was increasingly easier to manage for the women in the study. Women with prior
experiences of GDM found it easier to manage and gain mastery for each pregnancy as their knowledge and experience of their way of balancing the condition was increased.

Studies of educational approach (i.e., individual counselling and empowerment groups) in diabetes care report that patients with DM2 reveal that the relationship in the individual counselling is perceived as a one-way communication by the health care professionals acting as superiors and patients acting as subordinates and describe the learning as a compliance (173). The control of the disease is experienced as external, which makes it difficult for the individual to take responsibility and control of the self-care. The participants in the empowerment groups characterize the counselling as mutual communication and trust. They perceive the disease as serious but manageable, a view that contributes to their self-care (173). Other studies have found that when patients with DM2 perceived a HCP as acting as a superior, they were less satisfied with their care; when HCPs treated them as equal and autonomous, they were more likely to feel satisfied with the care they received (174). Four major orientations towards DM and its management are identified: ‘acceptors’, ‘identity acceptors, consequence resistors’, ‘resistors’ and ‘identity resistors, consequence accepters’ (175). No studies were found investigating empowerment education in GDM; however, these results of empowerment education in DM may explain some of the experiences of the women with GDM in the present thesis. The unexpected disease required changes in many aspects of the pregnant woman’s life. The perception of the information and support provided may affect the experiences and the acceptance of the disease and improve or counteract the compliance of the recommended regime.

Some pregnant women with GDM were open to others about their condition while other pregnant women preferred to conceal their disease. This behaviour of women presenting their condition to others may be understood by using the concept of preventive disclosure (176) in combination with the concept of empowerment. Some women with the ‘invisible’ condition of GDM preferred to tell people around them of their condition. By informing others, the
individual may counteract the stigmatization in social contacts and may also ensure support in their management of the disease. This approach of openness of an invisible condition may improve their empowerment, as the individual would share her experiences, receive useful information and support from those around them. On the other hand, it might be speculated that the women concealing their condition to those around them may find more difficulties gaining mastery of their condition. Furthermore, they might be more vulnerable to the power-knowledge of the HCPs as they have to try to adjust to the recommendations while not wanting to draw attention to their condition, a strategy that may keep them from receiving support from others.

Another important issue for women with GDM is the potential risk of developing DM. Women with prior GDM are more likely to keep a diet regime than controls after pregnancy (126). Swedish women are more prone to change their lifestyle after pregnancy so as to prevent future development of DM than women of Middle Eastern women (177). However, studies have indicated that the compliance with the recommended regime decreases after the delivery for many women with GDM. Most women with previous GDM do not increase their physical activity or lose weight after birth. In fact, significantly more women with prior GDM gain weight after birth (137). Although the majority of the women recall receiving counselling on lifestyle modifications, postpartum physical activity and the daily intake of fruit and vegetable is suboptimal within five years after the pregnancy (178). Furthermore, 15 years after the pregnancy with GDM, women who have developed DM2, have gained significantly more weight than women without developing DM. Additionally, more than half of the women with GDM report that they have not received any information about their increased risk of developing DM in the future (88). Finding appropriate ways of empowering women with GDM to continue a healthy lifestyle or improving the lifestyle after the delivery is crucial. Counselling these women about future risk is of major importance in the preventive measures for future health of women with GDM.
THE MIDWIVES

The midwives’ experiences of providing antenatal health care to women diagnosed with GDM were characterized by ‘balancing fear of failure’. The findings revealed that the midwives experienced balancing between using the empowering strategies based on a relationship characterized by autonomy, equality and support and the paternalistic approaches of surveillance and correction.

The fundamental feature of the quality of maternal health care, clinical safety and experiences of the women and the caretakers is nurturing a quality relationship (118). Some central concepts in the relationship between the midwife and the woman have been described (119). The behaviour of the midwife could be described using the concepts of availability, trust, mutuality, confirmation, support uniqueness and support meaningfulness (119). A similar concept is the ‘balanced exchange’, where midwives experience the balance of giving and taking in the relationship with the pregnant women. The midwives’ contributions to the relationship are appreciated by the pregnant women and the midwives are in control of the exchanges in the relationship (179). These concepts are similar to the aspects of empowerment in nursing suggesting that the empowering interaction should be based on treating individuals as equals, providing individualized care plans created in partnership, reciprocal teaching and learning, empathetic understanding so as to facilitate psychological empowerment of the individual, perceived locus of control, perceived self-efficiency and perceived health value (143). However, not all situations in midwifery relationships are described as supportive and empowering. There are three patterns of reciprocity in midwife- mother relationship recognized, characterized as ‘out of balance’ and are experienced as emotionally difficult (179). The first ‘out of balance’ pattern is the ‘reverse exchange’ characterized by feelings of that some behaviour threatens personal boundaries of the midwife. The woman is perceived as providing support to the midwife, hence perceived as ‘too familiar’ and the midwife is not in control of the situation. The second ‘out of balance’ pattern is named ‘unsustainable exchanges’. This pattern involves the woman having unrealistic expectations on the practical or
emotional aspects of the care provided by the midwife. The third situation of ‘out of balance’ patterns is labelled ‘rejected exchanges’, where the midwife finds the woman to be ‘difficult’ and not accepting her counselling. The midwife perceives the woman as obstructing her work performance. These situations are addressed by using strategies of distancing, focusing on completing the task and putting up a façade of professional detachment (179). The third pattern of ‘rejected exchange’ is coherent with the strategies used by the midwives in the present study in situations where they experienced that the women were non-compliant to the provided recommendations.

In the current study, the strategies used by ‘the medical guardian’ and ‘the moral keeper’ were seen as contradictory to an empowering approach for women with GDM. Applying the theoretical framework of Foucault (154, 155), these strategies are consistent with exercised discipline using the power of the medical knowledge to make sure that the woman is subordinated. The various ways of surveillance of the mother and the foetus during the pregnancy complicated by GDM enforced the discipline of the individuals’ activity and behaviour. Foucault argues that wherever there is a power relation, there is resistance (154). This concept may be applied in the case of the perceived ‘non-compliant’ women in our studies. The midwives might lack the knowledge of alternative strategies for promoting changes of lifestyle, increasing the frustration. A lack of an alternative strategy to use in the efforts to induce change of lifestyle of the non-compliant women may result in repetitions of the same pattern of providing information and recommendation. The more the midwife pushed, recommended, supervised and assessed the performed changes of lifestyle, the higher resistance from the woman. Furthermore, it has been suggested that patients may be defined as good or bad as a consequence of the interaction between health care professionals and patients (180). A possible way of increasing the empowerment at the same time as decreasing the surveillance may be to introduce empowerment education to the women with GDM (181). Providing education and professional support to the midwives in the use of Motivational Interviewing might further improve the situation (149).
THE OBSTETRICIANS

The experiences of the obstetricians revealed that the role of obstetricians in GDM maternal health care was characterized by ambiguity. This ambiguity permeated all aspects of working as an obstetrician within the maternal health care: the role of the obstetrician, the context of the organization, and the balance of the multifaceted interests regarding the maternal and foetal condition and the lack of consensus, recommendations and evidence-based knowledge concerning GDM.

In the light of the theoretical framework of empowerment and power-knowledge, the focus of the obstetrician in maternal health care for women with GDM is mainly the surveillance and monitoring of the condition based on the specific medical knowledge. The status of the condition had to be evaluated, although the evidence of best practice might be questioned. This inconsistency in evidence-based knowledge was not generally communicated to the woman with GDM, which may be regarded as an aspect contributing to the protection of the medical power-knowledge. When the maternal health care was performed as part of a team-based approach, the role of the obstetrician might empower the woman or discipline her behaviour depending on the specific matter. In a compartmentalized organization of GDM health care, the role may be marginalized. The control of the blood glucose levels, the insulin therapy and the adjustments of the treatment counselling were entrusted to the specialist in internal medicine.

A close relationship with the woman with GDM was mainly provided by the midwife or the diabetes nurse although the obstetrician might provide support to the midwife/nurse in the empowering situations or when situations of non-compliance were detected. The situation of medical surveillance and support agrees with the mutual professional agreement document between midwives and obstetricians regarding the responsibilities (107). Furthermore, the obstetricians, sometimes in collaboration with a specialist in internal medicine, may have the power to decide about the organization of maternal health care to women with GDM.
Some studies address a teamwork organization mainly from the perspectives by women with GDM. Most women are satisfied with the provided care independent of the organization of maternal health care (92, 182, 183). However, an organization of teamwork and collaboration between physician colleagues and other health care professionals is suggested to reduce errors and increase the patient satisfaction (121). The obstetricians’ situation may be improved by introducing national standards for organization maternal health care directed to women with GDM, preferably an organization of team care with representatives of various health care professionals. Furthermore, the need of national guidelines is crucial for providing recommendations to the obstetricians in their management of women with GDM and providing maternal health care in an equal manner to all women with GDM in Sweden.

METHODOLOGICAL CONSIDERATIONS

In the collaboration between the authors with experiences from different research fields, the pre-understandings of the authors was actively explored and challenged. Especially in qualitative research, there is a need for some serious reflection on how the pre-understanding may affect the interpretation of the findings. However, a completely objective understanding and interpretation is not possible.

Strengths

The strength of the qualitative studies (paper I, III and IV) was their strategic purposive sampling of the participants to address the credibility of the data. Furthermore, during the research process peer debriefing by colleagues at seminars and conferences has enabled input from those outside the research process. In paper I, pregnant women with broad experiences of acquiring and living with GDM were recruited. The sample consisted of newly diagnosed women with a first time experience of GDM to women experiencing their third pregnancy with GDM. As the sample included various experiences of pregnant women and the interviews were performed by the end of the pregnancy, the women’s experiences did not focus on the
detection of the condition; the women conveyed experiences of living with the condition on a daily basis, experiences that enriched their descriptions. In paper III, the midwives were recruited to represent small rural antenatal care settings where the midwife worked on her own to larger care settings where the midwife was part of a team of midwives. Furthermore, the recruitment addressed the working experiences of midwives covering the novice midwife with one year of experience as a midwife to a very experienced midwife with 35 years working experience. This broad spectrum of work experience contributed to the quality of the data. In paper IV, a national sample of obstetricians was recruited. A selective purposive sample was recruited to cover the various approaches of screening, diagnostics and treatment of GDM in Sweden. Additionally, gender, age and a broad range of work experience was addressed as to capture as heterogeneous experiences as possible. The strategic purposive sample may also have contributed to the transferability of the findings in the qualitative studies. Each informant was selected to represent a heterogeneous perspective of the condition, hence contributing to the findings. The information achieved from these studies may be applicable beyond the informants in our studies to similar situations and health care settings.

The dependability and the confirmability of the findings presented in the qualitative paper should be assessed. As the data collection was performed over time, these issues were addressed by making memos addressing the process of research. Furthermore, the authors had experiences of professions and research fields that contributed to the analysis. Being an outsider of the profession may contribute to the objectivity and challenge the pre-understanding of the insiders in the project. In paper III, the coding of some interviews was made independently by two authors; after coding, further discussions were held within the research group to reach consensus. In papers I and IV, there were repeated discussions among the authors to reach consensus on the analysis.
The strength of the quantitative study presented in paper II was the accuracy of data obtained by manually excerpting data from the medical records together with the validity of the data collection. As the study design had a population-based approach, it was of importance to investigate the non-participants as to validate the representability of the findings. The non-participants in the initial data collection have been described extensively elsewhere (162-164), and the non-participating women in the extended study design did not differ from the participating women in the study. Hence, the findings may represent the population in the two catchment areas.

**Limitations**

In paper I, a limitation of the study might be the prolonged data collection. As time passes, there may be changes in the social context that affects the conditions investigated. To our best knowledge, there was no focus on GDM in the media, nor were there any intermediate courses for the HCPs addressing GDM that might have influenced the experiences of the pregnant women during the prolonged data collection period.

The data in paper II depend on the accuracy of the medical records by the midwives and the obstetricians. An advantage was that all medical records in the UUH area were computerised resulting in standardised and typed records. In the SH area, the medical records were handwritten standardised formulary, hence some records might be difficult to read or could be missing. However, some evidence indicates that medical records by midwives have higher accuracy of recorded conditions than the physicians (184).

The limitations in paper III and IV may address the issue of performing research in a well-known setting. As to address the pre-understandings of two of the authors (MP and IM), the contributions of the other members of the research group (ÅH and AW as ‘outsiders’) were important as to challenge the pre-understandings of the authors. Furthermore, the second author (ÅH) performed the interviews among the midwives in the county (Västerbotten) where the first author was working. However, the informants
were aware of the fact that the first author would perform the main analysis of the data in collaboration with the other members of the group, which might have influenced the experiences expressed. A potential factor that might have contributed to non-participating in these studies could be an unwillingness to reveal the experiences and perceptions of management of GDM to colleagues within the profession.

CONCLUSION

This thesis addresses the experiences of GDM from different perspectives and the performance of screening for GDM in a regional setting and resulted in the following conclusions.

- Pregnant women experienced the detection of GDM during pregnancy as stun, but most women gradually adapted to the situation and found their own balance in managing the demands and challenges of GDM in their daily life. Most women were prepared to 'pay the prize' to secure the well-being of the foetus.
- The performance of risk factor-based screening for GDM was insufficient in the studied regions. Women developing risk factors during pregnancy demonstrated a considerable increased risk of giving birth to an infant with macrosomia. No major significant differences in the maternal or foetal outcomes were found among women fulfilling criteria for OGTT screening for GDM but not exposed and women fulfilling criteria and correctly exposed to the OGTT.
- The experiences of midwives providing antenatal care and counselling for pregnant women with GDM may be understood as a complex situation, balancing the provision of support and empowerment at the same time as performing the medical surveillance of the pregnant woman. Increased frustration was experienced when the pregnant woman with GDM was perceived as unwilling to adapt to the recommended regime.
The clinical performance of the obstetrician in maternal health care managing pregnant women with GDM might be interpreted as dealing with ambiguity, which permeated all aspects of the clinical work: the role as an obstetrician, the organisation of maternal health care services, and the multifaceted interests regarding the maternal and foetal condition. Furthermore, the absence of recommendations and evidence-based knowledge made the situation more ambiguous.

Establishing national guidelines regarding GDM could provide structure and support to HCPs and contribute to equal maternity health care directed to pregnant women with GDM regardless of geographical location in Sweden.

**IMPLICATIONS FOR PRACTICE**

The results of this thesis may contribute to the following implications for practice.

- The necessity to develop national guidelines for the management of GDM is crucial.
- Implementing supportive health care organisations with a focus on collaboration between HCPs and empowerment of the pregnant woman with GDM may improve the situation.
- Increasing the knowledge of the condition of GDM among HCPs by providing further training, seminars and lectures should help.
- Improving compliance to local clinical guidelines for screening for GDM may be achieved by performing the OGTT within the antenatal care services.
- Implementation of empowering strategies in the maternal health care services that may provide the midwives and obstetricians with useful tools to stimulate changes in lifestyle should improve care.
- Implementing support organisation within the health care services that provides coaching sessions for HCPs as a way to decrease the situations of unsuccessful counselling should improve care.
Encouraging pregnant women with GDM to participate in educational classes addressing the condition of GDM should improve care.

RESEARCH FOR THE FUTURE

Future research addressing this research area should involve the following studies:

- Investigating the health, well-being and quality of life a couple of years after the index pregnancy with GDM in a cohort of women with GDM and women with normal pregnancy and birth.
- Identifying the factors contributing to adaptation to healthy lifestyle during and after pregnancy in obese pregnant women with GDM.
- Investigating physical activity and eating habits during pregnancy in women with normal and excessive weight gain during pregnancy.
- Comparing the maternal and foetal outcomes of pregnancy and childbirth in an intervention group regarding physical activity and dietary regime and a reference group.
- Exploring the experiences of specialists in internal medicine regarding the condition of GDM.
- Exploring the experiences of the partner of the pregnant woman diagnosed with GDM.
- Investigating the effect of educational classes for pregnant women with GDM in relation to empowerment and self-efficacy.
ACKNOWLEDGEMENTS

Dessa studier har genomförts vid Enheten för obstetrik och gynekologi, Institutionen för klinisk vetenskap, Umeå Universitet. Studierna har möjliggjorts genom anslag från Svenska Diabetesförbundet, anslag från Västerbottens Läns Landsting samt Regionala ALF-anslag. Att som doktorand genomföra ett projekt som utmynnar i en avhandling är inget som man utför på egen hand, och därför vill jag så här i doktorandtidsen slutspurt passa på att tacka alla som på olika sätt bidragit till att detta projekt kunnat genomföras.


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Jag vill även rikta ett varmt TACK till Kvinnekliniken, NUS – mina chefer Per-Åke Holmgren och Anette Lundqvist som både beviljat mig tjänstedigt när anslagen funnits och lät mig jobba när forskningspengarna lyste med sin frånvaro. Tack också till alla kollegor och jobbarkompisar inom sluten och öppen vård som uppmuntrat mig, men dessutom stött ut med att jag ibland har varit lite ‘off’ när jag har varit på jobbet!

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REFERENCES


Appendix I

Interview guide for pregnant women with GDM (paper I)

TOPICS OF INTEREST

• Background and characteristics

Age? Family situation? Parity? Occupation? Sick leave? Development of pregnancy? Other diseases? Detection of GDM? Why do you think you have developed GDM? What is it like to have GDM?

• Recommended regime due to GDM

How does the diet regime work? What are the major changes in lifestyle? Own food – food of the family? Support regarding diet regime – from whom? Physical activity – now and prior to pregnancy?

• Psychosocial effects

GDM and recommendations from HCPs – how does that fit into your daily life?

• Reactions from family/ friends/ neighbourhood

What are the reactions of the family and close neighbourhood (partner/close family) and among others (for example, at work, friends, and relatives)?

• Support

What does your support look like? Which persons are the major sources of support? Which person is the most important source of support? Enough support? What constitutes good support?

• Health and well-being

Health status – physical and mental? What are your feelings and thoughts regarding the forthcoming birth? What are your concerns regarding the forthcoming birth? What do you consider as good health during pregnancy? What do you consider as poor health during pregnancy? What are the ideal situations of pregnancy considering weight gain, well-being, and health?
• **Self-monitoring of blood glucose in daily life**
  Daily life with SMBG? High/low blood glucose values – feelings, thoughts and reactions?

• **Positive/ negative with GDM**
  What has been positive or negative in your daily life since the detection of GDM?

• **Contacts with HCPs**
  Satisfactory and unsatisfactory encounters? Your perception of knowledge among HCPs? Access to HCPs when there are questions you would like to ask? Support from HCPs? Resources? How do you experience the HCP’s understanding of your situation living with GDM?

• **Future**
  What do you think about the future – your health and well-being? Does GDM have consequences for your future lifestyle? In what way? Future pregnancies?
Appendix II  Interview guide for midwives (paper III)

TOPICS OF INTEREST

• Background and characteristics

Age? No of years as midwife? Other speciality or academic degree? Organisation of GDM care? Own experience of GDM? Frequency of encounters with pregnant women with GDM?

• Knowledge

Further training regarding GDM? Where do you find knowledge? Knowledge among other HCPs?

• Experiences

GDM as a complication of pregnancy – what are your experiences? How do you experience this group of pregnant women? What type of help and support do they need? What is easy and what is difficult in the encounters and counselling of these women? How do you perceive their situation – physically and mentally? What about their future? Where do you find support on your behalf?

• Health

What is considered good health and poor health during pregnancy?

• Follow-up of women with GDM

What happens after childbirth? Your professional role?

• Organisation of health care in GDM

What is good and bad in your organisation of care for women with GDM? Collaboration? With whom?
TOPICS OF INTEREST

- **Background and characteristics**
  
  Age? No of years as a specialist in obstetrics and gynaecology? Academic degree? Organisation of GDM health care? Own experience of GDM or partner with experience of GDM? Frequency of encounters with pregnant women with GDM?

- **Knowledge**
  
  Further training regarding GDM? Where do you find knowledge? Knowledge among HCPs?

- **Experiences**
  
  GDM as a complication of pregnancy – what are your experiences? How do you experience this group of pregnant women? What type of help and support do they need? What is easy and what is difficult in your encounters and counselling of these women? How do you perceive their situation – physical and mental? How about their future health situation? Where do you find support on your behalf? Assessment of medical condition- maternal and foetal? Aggravation to insulin therapy – your role?

- **Health**
  
  What do you consider as good health and poor health during pregnancy?

- **Follow-up of women with GDM**
  
  What happens after childbirth? Your professional role?

- **Organisation of health care in GDM**
  
  What is good and bad in your organisation of maternal health care for women with GDM? Collaborations? With whom? Your role in the maternal health care organisation?
Appendix IV Questions used from questionnaire (paper II)

1. What is your overall experience of childbirth?
   (Indicate your experience with an X on the line)

<table>
<thead>
<tr>
<th>Very bad</th>
<th>Neither good nor bad</th>
<th>Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>I--------</td>
<td>----------------------</td>
<td>-----------</td>
</tr>
</tbody>
</table>

2. If you have given birth before, at what age did you have your first child?

3. What is your highest educational level?
   □ compulsory school  □ folk high school  □ high school  □ university

4. Which of the descriptions fits the best with your work?
   (You may have more than answer)
   □ mainly sedentary work
   □ mainly active work
   □ alternate sedentary/ active work
   □ physically heavy work
   □ physically light work
   □ alternate heavy/ light work
   □ mentally stressing work
   □ not mentally stressing work
   □ alternate mentally stressing/ not mentally stressing work
   □ intellectually stimulating work
   □ not intellectually stimulating work
   □ alternate intellectually stimulating/ not intellectually stimulating work
5. At what age did you have your first menstruation? ..........................

6. Have you ever been physically active on a regular basis?
   □ yes □ no

7. Were you satisfied with your body weight prior to this pregnancy?
   □ yes □ no

8. Do you have or have had problems with overweight?
   □ yes □ no

9. Have you ever been on diet regime?
   □ yes □ no

10. What is the status of your family situation?
    □ married □ cohabiting □ live-in partner □ single parent

11. How did you perceive the relationship between you and your partner before this pregnancy?
    □ very good □ good □ neither good or poor □ poor □ very poor

12. How did you perceive your sex-life with your partner before this pregnancy?
    □ very good □ good □ neither good or poor □ poor □ very poor

13. Did you smoke before pregnancy?
    □ yes □ no

14. How often did you drink alcohol three months before this pregnancy?
    □ more than once a week □ once a week □ seldom/never
### Appendix V

**Examples of medical variables excerpted from medical records**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variable</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age</td>
<td>Gestational week at highest diastolic blood pressure</td>
<td>Colour of amniotic fluid – twin no. 2</td>
</tr>
<tr>
<td>Family history of diabetes mellitus</td>
<td>Proteinurea</td>
<td>Birth &lt; 37 gestational weeks Yes/No</td>
</tr>
<tr>
<td>Which family member with diabetes mellitus and type of diabetes</td>
<td>Highest level of proteinurea</td>
<td>Completed gestational weeks at birth</td>
</tr>
<tr>
<td>Previous child with birth weight ≥ 4500 g</td>
<td>Gestational week at highest level of proteinurea</td>
<td>Sphincter damage Yes/No</td>
</tr>
<tr>
<td>Overweight as stipulated in local clinical guidelines</td>
<td>Fulfils criteria for OGTT Yes/No</td>
<td>Degree of sphincter damage</td>
</tr>
<tr>
<td>Risk factor in medical history No/Yes</td>
<td>OGTT performed Yes/No</td>
<td>Birth weight</td>
</tr>
<tr>
<td>Numbers of risk factors in medical history</td>
<td>Value of fasting blood glucose in OGTT</td>
<td>Birth weight – twin no. 2</td>
</tr>
<tr>
<td>Body weight</td>
<td>Value of 2-hour blood glucose in OGTT</td>
<td>pH of umbilical cord</td>
</tr>
<tr>
<td>Length</td>
<td>GDM Yes/No</td>
<td>pH of umbilical cord - twin no. 2</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>Pre eclampsia Yes/No</td>
<td></td>
</tr>
<tr>
<td>Highest blood glucose level during pregnancy</td>
<td>ICD-10 Main maternal diagnosis</td>
<td>Apgar score 1 minute</td>
</tr>
<tr>
<td>Gestational week at highest blood glucose level</td>
<td>ICD-10 Additional maternal diagnoses (a maximum of 18 additional diagnoses were recorded)</td>
<td>Apgar score 5 minutes</td>
</tr>
<tr>
<td>Lowest blood glucose level during pregnancy</td>
<td>Parity</td>
<td>Apgar score 1 minute - twin no. 2</td>
</tr>
<tr>
<td>Gestational week at lowest blood glucose level</td>
<td>Duplex pregnancy Yes/No</td>
<td>Apgar score 5 minutes - twin no. 2</td>
</tr>
<tr>
<td>Accelerated foetal growth Yes/No</td>
<td>Maternal weight gain during pregnancy</td>
<td>Apgar score 10 minutes</td>
</tr>
<tr>
<td>Polyhydramniosis Yes/No</td>
<td>Mode of delivery</td>
<td>Neonatal care Yes/No</td>
</tr>
<tr>
<td>Developing risk factors during pregnancy Yes/No</td>
<td>Instrumental birth (vacuum extraction or forceps) Yes/No</td>
<td>Number of days in neonatal care</td>
</tr>
<tr>
<td>Number of risk factors developed during pregnancy</td>
<td>Caesarean section (planned CS, emergency CS)</td>
<td>ICD – 10 Main foetal diagnosis</td>
</tr>
<tr>
<td>Blood pressure at first antenatal visit</td>
<td>Induction of labour Yes/No</td>
<td>ICD – 10 Main foetal diagnosis – twin no 2</td>
</tr>
<tr>
<td>Highest blood pressure during pregnancy</td>
<td>Placental weight</td>
<td>ICD – 10 Additional foetal diagnoses (a maximum of 9 additional diagnoses were recorded)</td>
</tr>
<tr>
<td>Highest systolic blood pressure during pregnancy</td>
<td>Foetal presentation</td>
<td>ICD – 10 Additional foetal diagnoses – twin no 2 (a maximum of 9 additional diagnoses were recorded)</td>
</tr>
<tr>
<td>Gestational week at highest systolic blood pressure</td>
<td>Haemorrhage (ml)</td>
<td></td>
</tr>
<tr>
<td>Highest diastolic blood pressure during pregnancy</td>
<td>Colour of amniotic fluid</td>
<td></td>
</tr>
</tbody>
</table>