LUND UNIVERSITY

GENERAL ORAL GLUCOSE TOLERANCE TEST DURING PREGNANCY, AN OPPORTUNITY FOR IMPROVED PREGNANCY OUTCOME AND IMPROVED FUTURE HEALTH.

Anderberg, Eva

2010

GENERAL ORAL GLUCOSE TOLERANCE TEST DURING PREGNANCY

AN OPPORTUNITY FOR IMPROVED PREGNANCY OUTCOME AND IMPROVED FUTURE HEALTH

Academic Dissertations

Eva Anderberg
Registered Nurse Midwife

Lund University
Department of Clinical Sciences
Obstetrics and Gynecology in Lund
Skåne University Hospital

LUND UNIVERSITY

LUND UNIVERSITY
Faculty of medicine

With the permission of the Medical faculty of Lund University, to be presented for public examination in Blocket, Lecture Room 1, Lund University Hospital, September 30th 2010 at 9.00 a.m.

Faculty Opponent

Registered Nurse Midwife, Professor Ingela Rådestad
Sophiahemmets University College
Stockholm, Sweden

Organization	Document name
LUND UNIVERSITY Department of Clinical Sciences Obstetrics and Gynecology Lund University Hospital Sweden	DOCTORAL DISSERTATION
	Date of issue 2010-09-30
	Sponsoring organization
Author(s) Eva Anderberg	

Title and subtitle: Generasl oral glucose tolerance test during pregnancy
an opportunity for improved pregnancy outcome and improved future health

Abstract

Gestational diabetes mellitus (GDM) is associated with a risk of adverse pregnancy outcome and is a predictor of subsequent diabetes. The aims of this work were to describe a reliable routine to diagnose abnormal glucose tolerance during pregnancy, to investigate women's opinions of the specialist care provided, to determine the prevalence of diabetes one year after giving birth, and to elucidate the effect of abnormal glucose tolerance on pregnancy outcome and on the women's future health.

Routines for a general decentralised oral glucose tolerance test (OGTT) at antenatal clinics, with high quality and high compliance of the patients are described. Perinatal outcome was determined and compared for the years 1995-1999 and 2000-2003, and in two geographical areas with different screening routines (OGTT and random glucose measurements, RGM). The routine use of OGTTs identified twice as many cases of GDM as RGM. Those not identified with RGM were as affected.

The women's opinions of the extended care programme were analysed using a questionnaire. The results showed great satisfaction with the care provided, especially the sound knowledge of the staff. However, a desire for better preparation before the OGTT, better information flow and more information on normal pregnancy was expressed.

Women delivered in 2003-2005 who had undergone an OGTT during pregnancy participated in a follow-up study 1-2 years after delivery. Different cut-off limits were used for 2-h capillary plasma glucose concentrations at OGTT during pregnancy. GDM $\geq$10.0 mmol/L, gestational impaired glucose tolerance (GIGT) 8.6-9.9 mmol/L, and a control group <8.6 mmol/L. At follow-up, 11% (n=160) of the GDM group, 4% (n=309) of the GIGT group and none of the controls had diabetes. When diagnosed with GIGT a retest was offered. Two-thirds of the women with diabetes after GIGT were found in the group diagnosed as having GDM after retest during pregnancy. Adverse pregnancy outcome was observed in both the GDM and GIGT groups compared with the controls.

Women with previous GDM were more than 3 times as likely as a group to consume health care resources in a year after delivery (odds ratio 3.5, 95% CI 2.5-5.0), leading to an average 50% higher cost ($p<0.001$). Annual excess cost was apparent up to 7 years after childbirth ($p<0.01$).

A general routine OGTT during pregnancy identifies all women with GDM, providing the opportunity to improve the pregnancy outcome and to make lifestyle changes that can improve the future health of both mother and child.

Key words: Gestational diabetes mellitus, general oral glucose tolerance test, screening, follow-up, pregnancy outcome, use of health care, postpartum, opinions on care

Classification system and/or index termes (if any):

Supplementary bibliographical information:	Language
	English
ISSN and key title: 1652-8220Lund University	ISBN 978-91-86671-03-7
Recipient's notes	Number of pages 163 / Price
	Security classification

Distribution by (name and address) Eva Anderberg, Dept. Obst Gynecol, Lund Univ. Hospital, S 22185 Lund Sweden

I, the undersigned, being the copyright owner of the abstract of the above-mentioned dissertation, hereby grant to all reference sources permission to publish and disseminate the abstract of the above-mentioned dissertation.

Signature Eva Anderberg Date 2010-07-26

GENERAL ORAL GLUCOSE TOLERANCE TEST DURING PREGNANCY

AN OPPORTUNITY FOR IMPROVED PREGNANCY OUTCOME AND IMPROVED FUTURE HEALTH

Doctoral Thesis

Eva Anderberg

LUND
UNIVERSITY

Department of Obstetrics and Gynaecology
Clinical Sciences, Lund
Lund University
Sweden

Coverphoto Johanna Alfvén

ISSN 1652-8220

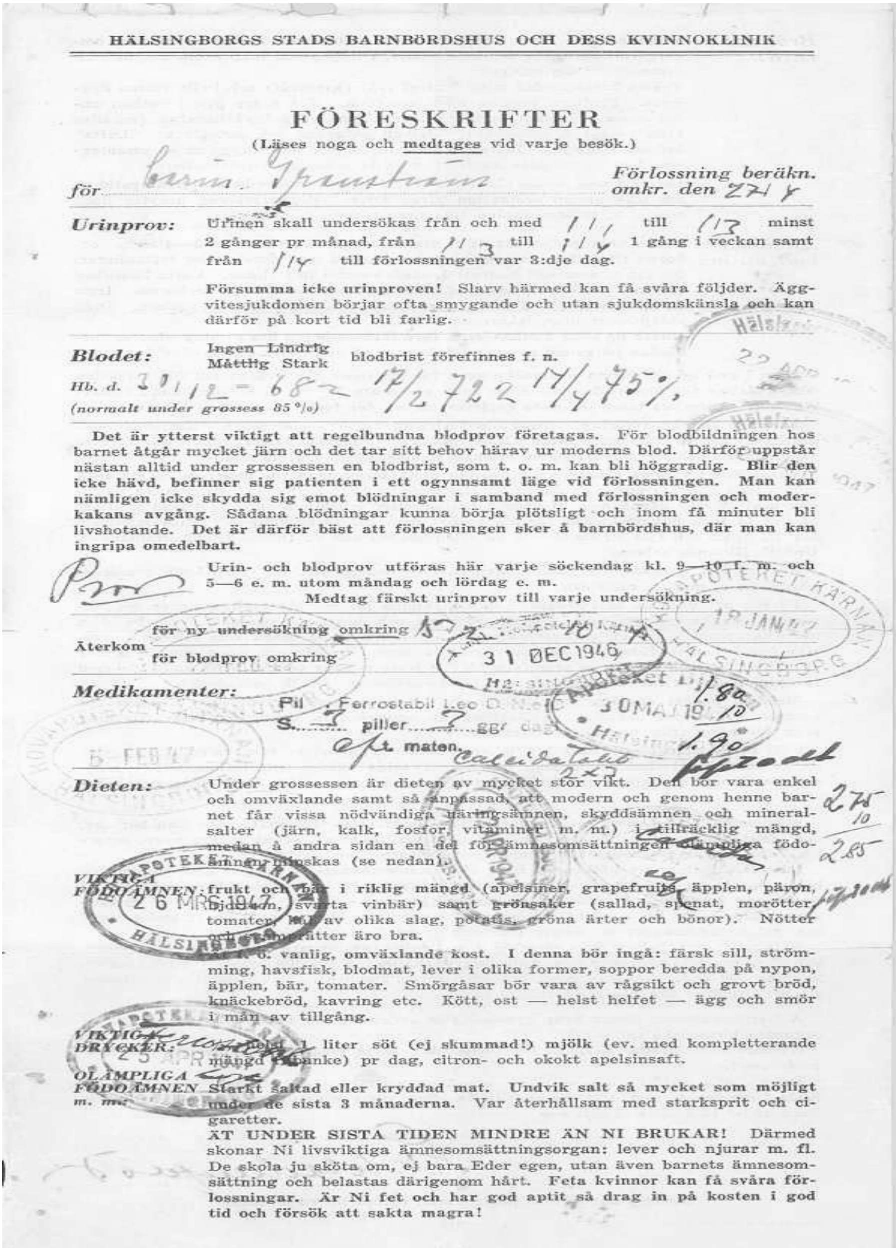
ISBN 978-91-86671-03-7

LUND UNIVERSITY, FACULTY OF MEDICINE DOCTORAL DISSERTATION SERIES 2010:87

Print by ***MEDIA-TRYCK*** Lund 2010

Do not be too afraid of imperfection or being guilty of making mistakes;
the greatest of all mistakes is to renounce the possibility to acquire experiences.
Luc de Clapiers de Vauvenargues, 1715-1747

Once upon a time, in 1947, this was the only information given to the pregnant woman and the only information recorded concerning the pregnancy, the woman's health and well-being, and the foetus, but we managed. (Reproduced with kind permission of my mother)



HÄLSINGBORGS STADS BARNBÖRDSHUS OCH DESS KVINNOKLINIK

FÖRESKRIFTER

(Läses noga och medtages vid varje besök.)

för .... *Förlossning beräkn. omkr. den* 27/4

Urinprov: Urinen skall undersökas från och med 1/1 till 1/3 minst 2 gånger pr månad, från 1/3 till 1/4 1 gång i veckan samt från 1/4 till förlossningen var 3:dje dag.

Försumma icke urinproven! Slarv härmed kan få svåra följder. Äggvitesjukdomen börjar ofta smygande och utan sjukdomskänsla och kan därför på kort tid bli farlig.

Blodet: Ingen Lindrig Måttlig Stark blodbrist förefinnes f. n.

Hb. d. 31/12 – 68 % 17/2 72 % 17/4 75 %

(normalt under grossess 85 %)

Det är ytterst viktigt att regelbundna blodprov företagas. För blodbildningen hos barnet åtgår mycket järn och det tar sitt behov härav ur moderns blod. Därför uppstår nästan alltid under grossessen en blodbrist, som t. o. m. kan bli höggradig. **Blir den icke hävd, befinner sig patienten i ett ogynnsamt läge vid förlossningen. Man kan nämligen icke skydda sig emot blödningar i samband med förlossningen och moderkakans avgång.** Sådana blödningar kunna börja plötsligt och inom få minuter bli livshotande. **Det är därför bäst att förlossningen sker å barnbördshus, där man kan ingripa omedelbart.**

Urin- och blodprov utföras här varje söckendag kl. 9—10 f. m. och 5—6 e. m. utom måndag och lördag e. m.

Medtag färskt urinprov till varje undersökning.

Återkom för ny undersökning omkring .... för blodprov omkring ....

Medikamenter: Pil. Ferrostabil Leo ... S. 3 piller 3 ggr dag. eft. maten. Calcidatabl.

Dieten: Under grossessen är dieten av mycket stor vikt. Den bör vara enkel och omväxlande samt så anpassad, att modern och genom henne barnet får vissa nödvändiga näringsämnen, skyddsämnen och mineralsalter (järn, kalk, fosfor, vitaminer m. m.) i tillräcklig mängd, medan å andra sidan en del för ämnesomsättningen olämpliga födoämnen minskas (se nedan).

VIKTIGA FÖDOÄMNEN: frukt och bär i riklig mängd (apelsiner, grapefruits, äpplen, päron, hjortron, svarta vinbär) samt grönsaker (sallad, spenat, morötter, tomater, kål av olika slag, potatis, gröna ärter och bönor). Nötter och [illegible]rätter äro bra.

I. ö. vanlig, omväxlande kost. I denna bör ingå: färsk sill, strömming, havsfisk, blodmat, lever i olika former, soppor beredda på nypon, äpplen, bär, tomater. Smörgåsar bör vara av rågsikt och grovt bröd, knäckebröd, kavring etc. Kött, ost — helst helfet — ägg och smör i mån av tillgång.

VIKTIGA DRYCKER: [illegible] 1 liter söt (ej skummad!) mjölk (ev. med kompletterande mängd filbunke) pr dag, citron- och okokt apelsinsaft.

OLÄMPLIGA FÖDOÄMNEN m. m.: Starkt saltad eller kryddad mat. Undvik salt så mycket som möjligt under de sista 3 månaderna. Var återhållsam med starksprit och cigaretter.

ÄT UNDER SISTA TIDEN MINDRE ÄN NI BRUKAR! Därmed skonar Ni livsviktiga ämnesomsättningsorgan: lever och njurar m. fl. De skola ju sköta om, ej bara Eder egen, utan även barnets ämnesomsättning och belastas därigenom hårt. Feta kvinnor kan få svåra förlossningar. Är Ni fet och har god aptit så drag in på kosten i god tid och försök att sakta magra!

Böstens vård: Bröstvårtorna böra under de sista månaderna ägnas en mycket omsorgsfull vård, för att bröstbölder, i möjligaste mån skola kunna undvikas under digivningen:
Tvätta brösten med mild neutral tvål (barntvål) och kallt vatten dagligen. Frottera brösten med frottéduk. Två à tre ggr i veckan under sista månaden ingnides bröstvårtan med **blyättiksalva** (erhålles utan recept å apoteken). Salvan avtorkas och avtvättas. **"Lufta" brösten dagligen.** Indragna bröstvårtor bör man draga ut så småningom, dock ej tidigare än fr. o. m. 6:te månaden. Brösthållare!
Fortsätt med denna skötsel av brösten även under hela digivningstiden, om icke annan ordination gives Eder. Blyättiksalvan utbytes dock mot s. k. **bröstvårtsalva** (fås utan recept. å apotek).

Angående bad m. m.: Under hela grossessen är **renlighet av största vikt.** De 3—4 sista veckorna före förlossningen ersättas karbad med dusch eller tvättningar, för att ej smutsigt badvatten skall komma in i slidan. Korta bastubad tillåtna. Sjö- och havsbad tillåtna utom sista 3—4 veckorna. Inga långa simturer! Solbada gärna. Kvartslampa bra på vintern. Inga sköljningar utan läkareordination!
Under de sista 2 månaderna före förlossningen äro samlag absolut förbjudna på grund av stor infektionsrisk samt risk för förtidsbörd.

Kom i god tid till första undersökningen för att tiden skall räcka till för effektiva förberedelser till förlossningen. Kom helst ej senare än då Ni börjar känna fosterrörelser. **Anteckna tiden för sista regleringen och för fosterrörelsernas början.**

Sörj för daglig avföring. Starka avföringsmedel äro olämpliga. Karlsbadersalt ofarligt. Vatten från Sofiakällan i Hälsingborg är utmärkt, likaså frukt i alla former (spec. päron och plommon), fikon, sviskon, dadlar, ev. linfrö eller kli.

Utför Edert vanliga arbete, om Ni ej blir trött därav, **men var under de första 4—5 månaderna stillsam under de dagar Ni eljest skulle haft reglering. Promenera dagligen ute!** Cykla gärna men ej uppför backar eller milslånga turer. Andas kraftigt ut och in med bukmusklerna för att stärka dem till förlossningen. Sista månaden bör Ni ligga och vila Er en timme på förmiddagen och en timme på eftermiddagen. **Undvik jäktande arbete!**

Använd löst sittande **klädedräkt,** men stöd livmodern med en välsittande **grossessgördel** fr. o. m. 6:te månaden.

Försök att undvika infektioner! Sådana kunna bli mycket farliga under förlossningen och barnsängstiden. **Undvik snuviga** och hostande personer, och be dem att icke besöka Eder under barnsängstiden! **Tillåt så få besök som möjligt!** Talrika besök beröva Eder den välbehövliga vila, som Ni själv och Edra rumskamrater så väl behöva och **utgöra en stor fara för att både mödrar och barn bli smittade med förkylningsbakterier.** Sätt gärna ut i födelseannonsen: besök undanbedes.

Meddela genast om äggvita, kräkningar i samband med huvudvärk, flimmer för ögonen, svullnad i ansiktet, gulfärgning av ögonvitorna, urinträngningar, flytning eller blödning från underlivet inträffar.

Sköt tänderna väl och besök tandläkare (tänderna bli under grossessen lätt angripna av tandröta)! Lokalbedövning ofarlig! **Trasiga tänder och inflammerade halsmandlar kunna ge upphov till farliga infektionssjukdomar under förlossning och barnsäng.**

Medlemmar i sjukkassa erhålla **moderskapshjälp** (110—125 kr.). Ansökan bör ske, för Hälsingborgs stads vidkommande, å Centralsjukkassan, eljest genom resp. orters sjukkasseombud, före eller i samband med förlossningen.

Icke medlemmar av sjukkassa böra söka **moderskapspenning** (75 kr.) genom behörig **sjukkassa** om hennes och makens sammanlagda **beskattningsbara inkomst ej överstiger 2,500 kr.** Förskott å moderskapspenning — 40 kronor — och å moderskapshjälp — 60 kr. — erhålles om med intyg från läkare eller barnmorska styrkes, att havandeskapet är längre framskridet än 7:de månaden.

Vid uppenbart behov av understöd i anledning av havandeskap eller barnsbörd, kan efter särskild prövning s. k. **mödrahjälp erhållas** (högst 400 kr. — vid tvillingförlossning 500 kr.). Ansökan göres hos barnavårdsnämnden i den kommun, där kvinnan vistas, före 60:e dagen efter förlossningen.

Å Barnbördshuset finnes även **gynekologisk avdelning** för behandling av underlivsorganens kirurgiska sjukdomar.

Kvinnor som intagas å B. B. för förlossning skola medtaga åldersbetyg och livsmedelskort.

Besökstid: å enskilt och halvenskilt rum 1—2 och 6—7 e. m.; å allmän sal 1—2 e. m. **Endast personer, som fått besöksbiljetter äga utan särskilt medgivande tillträde. Barn under 15 år äga ej tillträde.**

Hälsingborgs B. B. den 20/12 1942

[signature] Wadinfeldt

Medtag denna lista jämte event. recept till varje besök!

SCHMIDTS BOKTR. A.-B. HBG. 45/307

ABSTRACT

Gestational diabetes mellitus (GDM) is associated with a risk of adverse pregnancy outcome and is a predictor of subsequent diabetes. The aims of this work were to describe a reliable routine to diagnose abnormal glucose tolerance during pregnancy, to investigate women's opinions of the specialist care provided, to determine the prevalence of diabetes one year after giving birth, and to elucidate the effect of abnormal glucose tolerance on pregnancy outcome and on the women's future health.

Routines for a general decentralised oral glucose tolerance test (OGTT) at antenatal clinics, with high quality and high compliance of the patients are described. Perinatal outcome was determined and compared for the years 1995-1999 and 2000-2003, and in two geographical areas with different screening routines (OGTT and random glucose measurements, RGM). The routine use of OGTTs identified twice as many cases of GDM as RGM. Those not identified with RGM were as affected.

The women's opinions of the extended care programme were analysed using a questionnaire. The results showed great satisfaction with the care provided, especially the sound knowledge of the staff. However, a desire for better preparation before the OGTT, better information flow and more information on normal pregnancy was expressed.

Women delivered in 2003-2005 who had undergone an OGTT during pregnancy participated in a follow-up study 1-2 years after delivery. Different cut-off limits were used for 2-h capillary plasma glucose concentrations at OGTT during pregnancy. GDM $\geq$10.0 mmol/L, gestational impaired glucose tolerance (GIGT) 8.6-9.9 mmol/L, and a control group <8.6 mmol/L. At follow-up, 11% (n=160) of the GDM group, 4% (n=309) of the GIGT group and none of the controls had diabetes. When diagnosed with GIGT a retest was offered. Two-thirds of the women with diabetes after GIGT were found in the group diagnosed as having GDM after retest during pregnancy. Adverse pregnancy outcome was observed in both the GDM and GIGT groups compared with the controls.

Women with previous GDM were more than 3 times as likely as a group to consume health care resources in a year after delivery (odds ratio 3.5, 95% CI 2.5-5.0), leading to an average 50% higher cost ($p<0.001$). Annual excess cost was apparent up to 7 years after childbirth ($p<0.01$).

A general routine OGTT during pregnancy identifies women with GDM, providing the opportunity to improve the pregnancy outcome and to make lifestyle changes that can improve the future health of both mother and child.

Gestational diabetes mellitus, general oral glucose tolerance test, screening, follow-up, pregnancy outcome, use of health care, postpartum, opinions on care

ABBREVIATIONS

ADA	American Diabetes Association
BMI	Body mass index (weight/length^2)
CI	Confidence interval
DM	Diabetes mellitus
G-ANC	General antenatal clinic
GCT	Glucose challenge test
GDM	Gestational diabetes mellitus
GIGT	Gestational impaired glucose tolerance
GIGT-GDM	GIGT at the first test and GDM at retesting during pregnancy
GIGT-GIGT	GIGT at the first test and GIGT at retesting during pregnancy
GIGT-GNGT	GIGT at the first test and GNGT at retesting during pregnancy
GNGT	Gestational normal glucose tolerance
IADPSG	The International Association of Diabetes and Pregnancy Study Groups
IGT	Impaired glucose tolerance
LGA	Large for gestational age
OGTT	Oral glucose tolerance test
OR	Odds ratio
PASIS	Patient administrative system in the county of Skåne
PRS	Perinatal Revision South, a population-based database.
RGM	Random glucose measurements
S-ANC	Specialist antenatal clinic
SBU	The Swedish Council on Technology Assessment in Health Care (*Statens beredning för medicinsk utvärdering*)

ORIGINAL PAPERS

This thesis is based on the following papers, which will be referred to in the text by their Roman numerals. The papers are appended at the end of the thesis.

I Anderberg E, Källén K, Berntorp K, Frid A and Åberg A
A simplified oral glucose tolerance test in pregnancy: compliance and results. *Acta Obstet Gynecol Scand* 2007;86:1432-1436*

II Anderberg E, Berntorp K and Crang-Svalenius E
Diabetes and pregnancy: women's opinions about the care provided during the childbearing year. *Scand J Caring Sci.* 2009;23:164-70**

III Anderberg E, Landin-Olsson M, Kalén J, Frid A, Ursing D and Berntorp K
Prevalence of diabetes mellitus after pregnancy with gestational diabetes mellitus using different cut-off criteria for abnormal glucose tolerance (Submitted)

IV Anderberg E, Källén K and Berntorp K
The impact of gestational diabetes mellitus on pregnancy outcome comparing different cut-off criteria for abnormal glucose tolerance (Submitted)

V Anderberg E, Steen-Carlsson K and Berntorp K
Use of health care recourses after gestational diabetes mellitus. – A longitudinal case-control analysis (Submitted)

CONTENTS

ABSTRACT 7

ABBREVIATIONS 9

ORIGINAL PAPERS 10

INTRODUCTION 13

BACKGROUND 14

The EU health programme 15

Definition of gestational diabetes mellitus 15

Insulin resistance 15

Risks associated with GDM 16

Cost of health care 17

Effects of changes in lifestyle 18

Screening methods 19

Cut-off limits for the diagnosis of diabetes 21

Ethical considerations 21

AIMS 23

DESIGN OF THE STUDIES 24

Overview of the designs 24

Diagnostic routines 25

METHODS AND PARTICIPANTS 27

OGTT in pregnancy, compliance and results (Paper I) 27

Diabetes in pregnancy, women's opinions on care (Paper II) 27

GDM in Skåne – the Mamma-study (Paper III) 32

Perinatal outcome in the Mamma-study (Paper IV) 34
Health care utilisation after GDM (Paper V)..... 34

RESULTS..... 36
General oral glucose tolerance test (Paper I) 36
Opinions on care during the child bearing year (Paper II) 37
Results at follow-up 1-2 years postpartum (Paper III)..... 40
Perinatal outcome for mothers and children (Paper IV)..... 42
Use of health care postpartum (Paper V) 43

DISCUSSION..... 46

CONCLUSIONS 53

SUMMARY IN SWEDISH 54
Svensk sammanfattning..... 54

ACKNOWLEDGEMENTS 56

REFERENCES 58

APPENDIX 1 67

APPENDIX 2 70

INTRODUCTION

Pregnant women in Sweden have been offered antenatal care free of charge since the late 1930s. The original purpose of this was to identify the conditions of preeclampsia and anaemia, and to give advice concerning the health of the mother and child. The midwives offered free iron and vitamin tablets, and made house calls to establish whether any extra measures were needed due to inadequate social or hygienic standards. Antenatal heath care has been expanded since then, and now includes also parental support and public health of the same importance as good sexual and reproductive health and tests, e.g. for gestational diabetes mellitus (GDM) (1).

Pregnancy exposes the female body to a kind of 'stress test', which can reveal the propensity for future illnesses. Routine oral glucose tolerance test (OGTT) has been offered to all pregnant women in Skåne, the southernmost county of Sweden, since 1995, to identify GDM (2). The results of these tests identify the women at risk of subsequently developing type 2 diabetes. During my earlier work at the specialist antenatal clinic in Lund a deeper interest on questions around this group arouse.

BACKGROUND

In 1906, Leopold Meyer wrote the following in his book "Svangerskabets patologi for læger og studerende" (Pregnancy pathology for doctors and students) (3):

> "Real diabetes seldom complicates pregnancy because in connection with this disease the genital organs atrophy fairly early and stop functioning."

(p. 120, the author's translation from the Danish). In other words, women with diabetes seldom become pregnant. He continued by saying that if a woman with diabetes does become pregnant, the prognosis is very poor for both the mother and the foetus, with intrauterine death, premature delivery and high death rates among the newborn. He also claimed that the condition of the mothers became rapidly aggravated, including sepsis, coma and pulmonary problems, and that mortality rates were over 75%.

Mayer also stated that temporary diabetes may occur during pregnancy, which disappeared after delivery, and then re-occurred during following pregnancies. Today, this condition is called gestational diabetes mellitus, GDM. However, he questioned whether this really was diabetes. At that time, diabetes mellitus was diagnosed by measuring the concentration of glucose in the urine, and his hypothesis was:

> "Milk sugar seems to be formed from glucose, plenteously just before delivery. If the amount is greater than the organ (the lacteal gland) can transform into milk sugar, glucose will be secreted into the urine."

(p. 120-121, the author's translation from the Danish).

Insulin was identified in 1921, which led to a revolution for women with diabetes; they could now have children, pregnancy was no longer life-threatening, and extreme diets were no longer necessary. However, the rate of intrauterine death did not improve up to 1940. Later women with a medical history similar to type 1 diabetes were delivered by caesarean section, at the latest in week 38 of their pregnancy, reducing the foetal death rate (4).

During the 1970s, obstetricians, diabetologists, paediatricians and midwives in Copenhagen, Denmark and in Sweden, with a special interest in diabetes during pregnancy, formed teams and drew up guidelines for a health care programme for pregnant women with diabetes before pregnancy and with GDM. This had the same revolutionary effect on the survival rate of the child, as insulin had previously had for the mothers (4, 5).

The EU health programme

In 2007 the European Parliament and Council ratified a programme of action in the field of health for the period 2008-2013, including some very important and fundamental issues. Health was to be integrated in all policies, with the aim of preventing health problems from an early age, and promoting preventive measures. Citizens' rights to make their own decisions on matters concerning their health were acknowledged, as was their access to preventive health care and medical care, on equal terms (6).

The number of years an individual was expected to be in good health was established as a key factor for economic growth, not just longevity. The cost of health was considered an investment, and direct and indirect costs resulting from poor health and inadequate investment were recognized as unnecessary expenditure. On average, only 3% of the total health care budget in the OECD countries is invested in preventive measures (6). In March 2008, the Swedish Government presented its new health policy (7) in line with the EU document. Eleven focus areas were identified, including health-promoting care, physical activity and improved eating habits.

Definition of gestational diabetes mellitus

Gestational diabetes mellitus is defined as a carbohydrate intolerance resulting in hyperglycaemia of varying severity, with onset or first recognition during pregnancy, which often disappears after delivery. It does not exclude the possibility that the glucose intolerance may antedate pregnancy, but was not previously recognized. The definition applies irrespective of whether or not insulin is used for treatment during pregnancy, or the condition persists after delivery (8).

Insulin resistance

From mid-pregnancy and through the third trimester there is a progressive increase in insulin resistance in all pregnancies, resulting in a progressive increase in blood glucose levels (9, 10). In parallel, the β-cells in the pancreatic islet undergo a long-term up-regulatory change in response to the increased demand for insulin, which is associated with a 3.0- to 3.5-fold increase in insulin response by weeks 34 to 36 of pregnancy (11). The increase in insulin resistance takes place concomitantly with hormone changes during pregnancy, especially placental hormones, such as human placental lactogen, human placental growth hormone and corticotrophin-releasing hormone (10, 12, 13). These hormones are present in the plasma of pregnant woman; the levels increasing during pregnancy. They disappear rapidly at delivery when the

placenta is delivered, coinciding perfectly with insulin resistance, and from the day of delivery the glucose tolerance returns to that before pregnancy (14).

The cause of GDM is in most cases considered to be inadequate insulin secretion that cannot compensate for the physiologically increased insulin resistance that occurs during pregnancy (9, 15, 10, 16). Available evidence suggests that the beta cell defects in GDM result from autoimmune disease, monogenic causes and insulin resistance, i.e. the same factors that cause beta cells defects in general (17).

Risks associated with GDM

GDM is associated with adverse pregnancy outcome (18-21). In a previous Swedish study on women with GDM, a subgroup was identified with an increased risk of embryopathy, probably due to overt, undiagnosed diabetes before pregnancy (22). Glucose can pass through the placenta by facilitated diffusion (23, 24), but the insulin molecule is too large (25). The foetus must thus increase its own insulin production to cope with high glucose levels. An increase in the amount of glucose and foetal insulin, the latter being a growth-factor, result in macrosomia (birth weight $\geq$4.500 grams) and an increased risk of hypoglycaemia after birth (26). This implies increased risks of problems during delivery for both mother and child, and the need for neonatal intensive care (21, 22, 27-30). Increased perinatal mortality and morbidity rates have been found among children born to women with type 2 diabetes (18, 22, 27) and untreated GDM (29, 30, 31,) and these children also require more medical care during their first ten years of life (32).

Opinions as to whether treating women with GDM is of any clinical importance in improving the perinatal outcome are divided (29, 31, 33-35). However, recently two large randomized studies have shown that treatment of GDM significantly improve the outcome of pregnancy compared to routine prenatal care (33-34). Furthermore, Crowther and co-workers reported a lower rate of depression and improved health status three months postpartum in women receiving treatment (34).

GDM is a strong risk factor for the development of diabetes, especially type 2 diabetes, later in life (18, 36-39). A cumulative incidence of 50% within 5 to 10 years postpartum has been demonstrated (33). According to a systemic review by Goldon et al. published in 2009, elevated levels of fasting glucose, 2-h OGTT glucose and the OGTT glucose area under the curve were strong predictors of subsequent type 2 diabetes after GDM (40). In another recent systematic review and meta-analysis, by Bellamy et al., who investigated the development of type 2 diabetes 6 weeks or more postpartum, was shown that women with previous GDM had an at least seven-fold increased risk of developing type 2 diabetes compared with women who had been normoglycaemic during pregnancy (41). GDM and type 2 diabetes share many risk

factors as family history, increased BMI, increased age and non European origin, suggesting overlapping causes between the two disorders (37). One of the studies included in the analysis by Bellamy et al. was a study from our own group (36), concluding that maternal age >40 years, a high 2-h OGTT glucose value during pregnancy and insulin treatment during pregnancy predicted diabetes and impaired glucose tolerance at follow-up one year after GDM.

The metabolic syndrome occurs more often after GDM and these women are more likely to have risk factors for cardiovascular disease and to experience cardiovascular events, which also occur at a younger age (42). Moreover, a Danish study showed a three-fold higher prevalence of the metabolic syndrome in women with previous GDM, and if the woman in addition was obese (BMI>30kg/mm^2) a seven-fold higher prevalence (43).

Pregnancy thus provides a golden opportunity to identify previously undiagnosed diabetes, or to identify women with a predisposition to diabetes, making it possible to start early treatment and to prevent the development of the disease and its complications. Intensive glucose-lowering treatment to patients with newly identified type 2 diabetes results in a decreased risk of cardiovascular disease and prevents damage to the eyes. The treatment of this group is easy, the risk of side effects is small, and the treatment is cost-effective (44).

Cost of health care

Type 2 diabetess, is a chronic progressive disease leading to long-term complications and placing a heavy burden on the individual and their family, as well as society (45-49). Chronic illness increases the risk of unemployment and other financial difficulties (50, 51). Type 2 diabetes is associated with more sick-leave, early retirement (52, 53) and premature death (50, 54). The annual health care cost for a person with diabetes mellitus in Sweden was estimated to be 61,700 SEK (roughly 6000 EUR) in 2001 (55). Treatment and support provided by local and regional health care authorities, together with the efforts of relatives account for about 60% of this cost, and loss of productivity for the remaining 40% (52). The cost of inpatient care was almost 60% of the medical cost in 2004, and is increasing (55). If co-morbidity is included, the cost increases by between 10 and 90%, depending on the number and type of co-diagnoses (37, 48, 52, 54, 46, 57, 66). If dialysis is required, the cost is increased by 11 times (57).

Effects of changes in lifestyle

It is not possible to change an individual's predisposition to diabetes, but it is possible to postpone or even prevent the debut of the condition. Any form of physical activity, preferably a combination of several kinds, improves glycaemic control (58). Toumilehto and co-workers showed that the risk of diabetes debut could be significantly reduced, and even prevented, in a high-risk intervention group by changes in lifestyle over a mean follow-up time of 3.2 years (59). The risk of developing diabetes in this group was reduced by 58%. This group received long-term, individualized counselling on weight reduction, dietary changes and physical activity (59, 60). Pan and co-workers reported a significant reduction in diabetes, between 31 and 42%, for groups given similar treatment during a 6-year study, including counselling at intervals from weekly up to every 3 months, during the whole study (61).

Stage et al. carried out a survey using a mailed questionnaire 11-42 months (mean 24 months) after delivery, on lifestyle changes, weight gain or loss, and concerns about developing diabetes (62). All the women had been informed on lifestyle changes by a diabetes nurse and a dietician during pregnancy. More women gained weight than lost weight, and the weight gained was higher than that lost, and exercise levels were not changed after delivery. Despite this, only 14% were not worried about developing diabetes.

Health beliefs have been defined as, "the personal convictions that influence health behaviour", and health behaviour as, "an action taken by a person to maintain, attain or regain good health and to prevent illness" (63 p 784). These factors were studied by Jones et al. (64) in women who had previously had GDM. They found that there was no lack of knowledge, but that there was a gap between knowledge and health behaviour. Only 16% of the women believed they had a risk of developing diabetes, despite the fact that they knew the risk was 90% and recognized GDM as a risk factor. Women with previous GDM worried more about their health, but this did not result in any changes in lifestyle and self-efficacy was low in these women. They also experienced less social support and were also less interested in physical activities. Jones et al. drew the conclusion that concentrating on the need for increased risk awareness, and promoting self-efficacy and accurate risk perception, should improve health beliefs and health behaviour, considerably promoting good health.

Screening methods

Definition

Screening means testing people who have no symptoms, for a particular and uncommon disease, with tests designed to be highly sensitive but not as specific with the purpose to identify everyone with the disease. Individuals found to have the disease are then subjected to further tests with higher specificity. Screening is only justified if there is some sort of treatment or amelioration available (Nationalencyklopedin, www.ne.se/screening, cited 2010-02-19).

Tests used for diagnosing GDM

GDM is a condition without any subjective symptoms, and is therefore difficult to detect without testing. Several different tests are in use worldwide. Screening for risk factors at the first antenatal visit is widely employed, followed by a diagnostic test if risk factors are identified. This is however, not reliable as compliance for the routine and specificity are low (65-67); furthermore, the cost-efficiency is poor (68). Glycosylated haemoglobin is not recommended by the American Diabetes Association (ADA) because of its low sensitivity (69) (70). The sensitivity of HbA_{1C} is dependent on the method used; when using the Swedish Mono S method, Ekelund et al. showed it to be a predictor of subsequent diabetes after GDM (71). Glucosuria is a normal result of the lowered kidney glucose threshold during pregnancy and is therefore not useful. As macrosomia is one of the most common findings associated with GDM, attempts have been made to use the foetal abdominal circumference for screening, but without success (72).

Neither fasting glucose levels (73, 74) nor random glucose measurements (RGM) are recommended by the ADA as screening tests owing to a lack of conclusive data (70). Some women with GDM have normal fasting levels, but elevated postprandial levels, and would thus be missed. When the capillary blood glucose limit for OGTT is 8.0 mmol/L, random glucose measurements detect less than 50% of GDM cases, with a specificity of 97%, but a sensitivity of only 48% (28, 35). When the blood glucose limit was increased, the sensitivity decreased considerably (29). The glucose challenge test (GCT), involves the intake of a 50 g glucose solution in the non-fasting state, and glucose values are measured after 1 h, but there is no consensus concerning cut-off levels (68, 75). The GCT has also been reported to give many false-positive results due to its low sensitivity (75). The GCT is mostly used in the United States, and if elevated the diagnostic test recommended is a 100 g OGTT, with fasting, 1-, 2- and 3-h blood samples.

The OGTT

When the OGTT was first introduced in 1964 by O'Sullivan and Mahan as a diagnostic test for GDM, it was designed to identify women susceptible to diabetes later in life. The recommended limit defining GDM was equivalent to just over two standard deviations above the mean (76). In 1985, the World Health Organisation, WHO, recommended routines for glucose tolerance testing and set values for diagnosis (77). Limits for the diagnosis of diabetes were based on results obtained by Klimt et al. (78), in which individual glucose doses of 40 g /m^2 body surface had been used. This resulted in different limits for GDM from those given by O'Sullivan and Mahan (76).

The OGTT has been criticized for its relatively low reproducibility, probably due to factors such as variation in gastrointestinal glucose absorption (79). The reproducibility of the test in pregnant women has been reported to be at best 78% (80). The intra-individual variation is highest in the 2-hour plasma glucose concentration, especially in the impaired glucose tolerance range. As glucose levels increase, the diagnostic impact of the variation in 2-hour glucose concentrations decreases. Due to the poor reproducibility of the OGTT a repeat test could be recommended to confirm the results. However, during pregnancy the time factor is a limitation and retesting is time consuming (81, 82).

The ADA low-risk group

In 2007, the ADA recommended that those not in need of screening for GDM, as defined below, be classified as a low-risk group, for reasons of cost-effectiveness (83). The recommendation was renewed in 2010 (84), however, no information was given on the number of women estimated to be affected by this decision. A pregnant woman was classified as low-risk if she fulfilled all the following criteria.

- <25 years of age
- Normal body weight
- No family history of diabetes
- No history of abnormal glucose metabolism
- No history of poor pregnancy outcome
- Not a member of an ethnic-racial group with a high prevalence of diabetes

Cut-off limits for the diagnosis of diabetes

Outside the United States, the most widely used criteria for the diagnosis of GDM are those recommended by the World Health Organisation (WHO) for diabetes mellitus in non-pregnant adults, based on a 75 g OGTT (77). As the definition of screening test implies a two-step procedure this is thus not completely fulfilled, but the term is still often used.

In 1991, the International Association of Diabetes and Pregnancy Study Groups (IADPSG) of the European Association for the Study of Diabetes suggested a 2-hour capillary blood glucose concentration of ≥9.0 mmol/L, corresponding to the 95th percentile, to be the diagnostic criterion for GDM (85). With some exceptions, this recommendation has been followed in Sweden, but the clinical approach to the screening and detection of GDM differs in different parts of the country. In 1999, the WHO recommended that pregnant women meeting the criteria for diabetes mellitus and impaired glucose tolerance (IGT) in adults should be classified as having GDM, meaning a 2-hour capillary blood glucose value of >7.8 mmol/L (8).

In Sweden, glucose concentrations were expressed as blood glucose up till 2004, when the routine changed to plasma glucose, using the transformation factor 1.11%, based on recommendations from the Scientific Division of the International Federation of Clinical Chemistry and Laboratory Medicine (86). New cut-off values were established.

It has not been possible to identify plasma glucose thresholds at which the risk of adverse pregnancy outcome increases dramatically. The risk seems to increase continuously with plasma glucose level, even at non-diabetic values (87, 88).

Recently, the IADPSG made recommendations (91) based on the results of the international Hyperglycaemia and Adverse Pregnancy Outcome (HAPO) study (87, 88), in an effort to achieve as uniform worldwide routines as possible. A 75 g OGTT at 24-28 weeks' gestation was recommended, including the fasting plasma glucose concentration, and those at 1 and 2 hours. The recommended thresholds were: 5.1 mmol/L for fasting plasma glucose, 10.0 mmol/L at 1-h hour and 8.5 mmol/L at 2 hours. At least one of these thresholds must be equalled, met or exceeded for the diagnosis of GDM (85).

Ethical considerations

All health care is voluntary. According to Swedish legislation (92) all persons should be given information on health care offered and should be aware of the right to decline participation, also in so called routine tests. The possibility of test results being positive shall be clearly outspoken (93). Marteau and co-workers (94) pointed

out that the following five conditions should be met to ensure that a decision is not contrary to the patient's interest. Information should be given before any examination or screening on the following:

- the purpose
- alternative results positive and negative, false or true
- risks attached
- possible implications
- follow-up plans

AIMS

The aims of the work presented in this thesis were to investigate a reliable routine for the diagnosis of abnormal glucose tolerance during pregnancy, to investigate the women's opinions on care provided during the childbearing year, to determine the prevalence of diabetes one year after delivery, and to demonstrate the effect of abnormal glucose tolerance on pregnancy outcome and the women's future health.

Specific aims

- To evaluate general oral glucose tolerance test as a one-step screening-programme for gestational diabetes mellitus, to estimate compliance to the method, and to compare the severity of the cases of gestational diabetes identified with oral glucose tolerance test with the severity of cases diagnosed using random glucose measurements (**Paper I**).
- To investigate the opinions of women with diabetes mellitus and gestational diabetes mellitus regarding care during pregnancy, childbirth and the post-natal period (**Paper II**).
- To determine the incidence of diabetes after gestational diabetes mellitus, as defined by the WHO (1999) using different cut-off levels for abnormal glucose tolerance during pregnancy (**Paper III**).
- To examine pregnancy outcomes in relation to different categories of glucose tolerance during pregnancy (**Paper IV**).
- To investigate whether gestational diabetes mellitus was associated with a subsequent increase in the utilisation of health care resources after delivery, by comparing cases and controls (**Paper V**).

DESIGN OF THE STUDIES

Overview of the designs

All the methods used were quantitative. Different designs and methods have been used and will be described below (Table 1).

Table 1. The methods used in the studies, their design and the populations

	Design and method	Participants	n=	
Paper I	Explorative, descriptive study. Information from PRS.	All women with GDM diagnose in Skåne County and HLV 1995-2003.	Skåne 1342 GDM 99913 controls	HLV 249 GDM 27639 controls
Paper II	Evaluation study. A 4-part, anonymous, questionnaire covering the childbearing year. Lickert scale, yes/no, open-ended questions.	Women with DM or GDM attending the S-ANC during October 1st 2002 till October 31st 2003.	51 DM 102GDM	
Paper III	Prospective, explorative study, the Mamma-study, Skåne County Sweden.	Pregnant women undergoing a correctly performed OGTT 2003-2005 and accepting participation in follow-up.	160 GDM 309 GIGT 167 GNGT	
Paper IV	Retrospective, explorative, descriptive study. Information from PRS.	Pregnant women undergoing a correctly performed OGTT 2003-2005 and from start accepting to participate.	306 GDM 744 GIGT 329 GNGT	
Paper V	Explorative register study with a descriptive, longitudinal case-control design.	All women with GDM during 1995-2001 in Lund and Malmö.	597 GDM 1131 Controls	

PRS (Perinatal revision South), HLV (Halmstad-Ljungby-Växjö), DM (diabetes mellitus), OGTT (oral glucose tolerance test), GDM (gestational diabetes mellitus), GIGT (gestational impaired glucose tolerance), GNGT (gestational normal glucose tolerance), S-ANC (specialist antenatal clinic).

Diagnostic routines

Since 1995 all pregnant women in the County of Skåne, southern Sweden, have been offered a 75 g OGTT. The OGTT is performed in week 28 of pregnancy, and in those with a family history of diabetes or previous GDM, also in week 12 to detect overt pregestational diabetes. HemoCue blood glucose meters (HemoCue AB, Ängelholm, Sweden) were used for immediate analyses, and the tests were performed at each general antenatal clinic (G-ANC). All the meters were controlled weekly with a medium of known glucose concentration, and every month with an unknown test medium. The test results were analysed at the Clinical Chemical Laboratory of the University Hospital in Lund, and found to have a coefficient of variation of 3.1-3.7% which is the same value as the accredited Clinical Chemical Laboratory at the Lund University Hospital, and is considered sufficient for diagnostic purposes (95).

The taking of specimens

The information given before the OGTT followed the recommendations of O'Sullivan and the ADA (78). The women were instructed to carry on with their normal, everyday life during the days before the test, and to avoid stress and physical activity such as cycling or running on their way to the antenatal clinic for the test. After an overnight fast, during which the women were asked not to smoke or use snuff, they were given a solution of 75 g anhydrous glucose, dissolved in 300 mL water and asked to drink it within 5 minutes. A simplified OGTT was used, omitting the initial fasting blood glucose measurement (26, 96).

After 2 hours rest, duplicate 5 μL samples of capillary blood were taken and immediately analysed to determine the glucose concentration. If the divergence between the samples exceeded 0.3 mmol/L a third sample was taken, and if the difference again exceeded 0.3 mmol/L the test was deemed unreliable, and a second OGTT was offered. The diagnosis was based on the higher of the two samples. If the glucose concentration was between 7.8 and 8.9 mmol/L the OGTT was repeated within a week and the woman was referred to a dietician for advice. If the repeat OGTT was normal, no more tests were performed, unless it was an early OGTT (week 12) indicated by risk factors, in which case the OGTT was repeated in week 28.

Cut-off limits used

The limits used for the different diagnoses were:

- Gestational normal glucose tolerance (GNGT): 2-h capillary plasma glucose concentration <8.6 mmol/L (capillary blood glucose <7.8 mmol/L)
- Gestational impaired glucose tolerance (GIGT): 2-h capillary plasma glucose concentration 8.6-9.9 mmol/L (capillary blood glucose between 7.8 and 8.9 mmol/L)
- Gestational diabetes mellitus (GDM): 2-h capillary plasma glucose concentration of ≥10.0 mmol/L (capillary blood glucose ≥9.0 mmol/L)

METHODS AND PARTICIPANTS

OGTT in pregnancy, compliance and results (Paper I)

The prevalence of GDM in Skåne, using the 75 g OGTT to diagnose GDM was compared to that in the southern Swedish towns of Halmstad Ljungby and Växjö where a method with RGM was used. GDM prevalence for the years 1995-1999 and 2000-2003 was compared.

Perinatal outcome was defined by the diagnoses 'large for gestational age' (LGA) and 'premature delivery' (<37 weeks of gestation) in women with GDM, and compared with corresponding findings in non-GDM pregnancies. Information was gathered from Perinatal Revision South (PRS), a population-based database. The values for Skåne were compared with those from Halmstad, Ljungby and Växjö.

Risks were expressed as the odds ratio (OR). The data were stratified by year of birth, maternal age (5-year classes), and parity (1,2,3,4+). Ninety-five percent confidence intervals (95% CI) were estimated. When comparing two stratified ORs, two-tailed z tests based on the log ORs were carried out, using the same variance as that used to estimate the 95% CI.

The patient records for all deliveries in Skåne during May 2003 were inspected to ascertain whether OGTT had been carried out and if not, the reason why.

Routines for random glucose measurements

Halmstad-Ljungby-Växjö used a method with random glucose measurements (RGM) as a first step to identify women qualified for step two in the screening test, the OGTT. Results were compared to Skåne using a general OGTT. The RGM tests were performed 4 times during pregnancy, predetermined to weeks 9, 23, 31 and 36. Early during pregnancy all the women were informed about the basic pregnancy health care programme involving RGM. Obesity, BMI >30, hereditary factors and previous GDM were risk factor indicating the need for OGTT.

Diabetes in pregnancy, women's opinions on care (Paper II)

All participants in this study were from the catchment area of the University Hospital in Lund, and therefore the health care programme during pregnancy with GDM in that area was more thoroughly described. The OGTT was performed at each participants' general antenatal clinic. Women diagnosed with GDM and women with

GIGT and GDM at retesting (GIGT-GDM) were referred to the specialist antenatal clinic at the hospital. A specialist programme (Table 2) for increased supervision at the hospital during the rest of the pregnancy was offered as a consequence of the increased risk of adverse pregnancy outcome.

At the first appointment at the specialist antenatal clinic evaluations were made by a midwife, a gynaecologist, diabetologist, and if not done earlier also by a dietician, resulting in an individual care plans for each woman. A personal glucose meter was given to the women. Apart from blood glucose tests, carried out 6 times daily by the women themselves, the programme involved more frequent visits to the midwife and doctor to ensure good foetal and maternal supervision. Blood and urine samples, together with blood pressure measurements, were used to identify preeclampsia, and ultrasound scanning and cardiotocography were used to identify risk factors for the foetus.

Table 2. Health care programmes during pregnancy, Lund

Normal pregnancy. General antenatal clinic																
Completed weeks of pregnancy	8-12	17	24	28	31-32		33-34		35-36		37-38		39-40		41-42	
Visit to the doctor	●															
Visit to the nurse-midwife	●		●	●	●		●	●	●	●	●	●	●	●	●	●
Ultrasound scan		●			●											
Gestational diabetes mellitus GDM. Specialist antenatal clinic																
Completed weeks of pregnancy	12-14	17	20	24	28	30	32	34	35	36	37	38	39	40	41	42
Visit to the doctor	●					●						●				
Visit to the nurse-midwife	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Ultrasound scan		●	●				●				●				●	
Foetal blood flow (OGTT>12.2 mmol/L)					●		●			●		●	●	●	●	●
Tests in addition to routine tests Hb, HbA_{1C}, Alb clearance, urine culture	●		●			●										
If OGTT is pathological in week 12, an ultrasound scan and foetal heart examination will be done in week 20																

A 4-part questionnaire was constructed by midwives with long experience of pregnancies and GDM. Each part covered a specific period of the health care provided. The questionnaire parts were distributed at specific times by the author, not working at any of the care divisions. The questionnaire consisted of 117 questions and is presented in Appendix I (in Swedish).

A six-point Lickert scale (97) was used for 80 questions with statements giving scores from 0 (poor) to 5 (excellent), mainly concerning satisfaction with information (relevant, adequate and given at the right time), and treatment (adequate time given, accessibility and kind of reception). Yes or no were the alternatives for 27 questions on whether information was given. There were 10 open-ended questions.

During the investigation period 53 women with diabetes and 103 with GDM were registered at the specialist antenatal clinic. Three declined to participate, two due to language problems, one from each group, and one for other reasons.

Additional questions on the structure of the questionnaire were distributed with the first ten questionnaires to check whether the questions were understandable and relevant, or if something was missing. These comments did not lead to any changes.

The aim was to describe women's opinions during the investigated period and it was not important to cover the complete duration of each pregnancy. The period of the investigation defined participation. Therefore, some women were given the last two parts, others all four, and others only the first as shown in Figure 1.

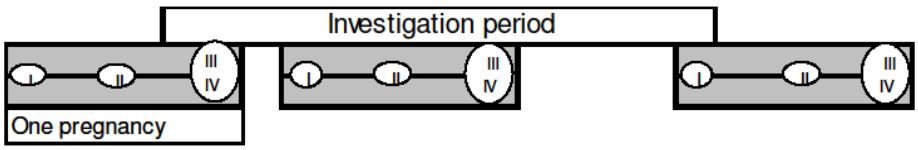


Figure 1. Illustration explaining the distribution of the various parts of the questionnaire during the course of the study.

A total of 297 questionnaire parts were distributed and 278 (94%) were returned. Of these, 83 were given to women with diabetes and 72 (87%) returned. The remaining 214 questionnaires were distributed to women with GDM, and 206 were returned (96%).

Neither the questionnaires nor the envelopes they were returned in were marked in any way. The study was thus completely anonymous. It was possible to include more participants, and to obtain more comments, using a questionnaire than using the interviews. The response rate of over 90% and over 300 comments to the open-ended questions support this.

Descriptive statistics was used to describe the Lickert scale answers (97). Median and mean scores were determined for each question and deviating results were identified. Questions concerning the same period of care were analysed together, as were questions referring explicitly to specific health care units. The answers from women with diabetes before pregnancy, and from women with GDM, were analysed separately.

All comments in the responses to the open-ended questions were first categorized into different groups using occasional words or the implication of the sentence (manifest content analysis) (98). The following themes were identified and considered when analysing the material:

- Knowledge
- Information and preparation
- Consequences for the women with centralized specialist care
- Treatment and accessibility
- Participation, responsibility and personnel respect for opinions

Reliability coefficient

The Spearman-Brown prophecy formula was used to measure the reliability of the test as an indicator of the quality of the instrument.

$$r^1 = \frac{2r}{1+r}$$

r^1 = the estimated reliability of the entire test

r = correlation coefficient, computed on different splits

The formula measures correlations between different items on the same test using the split-half method, testing the internal consistency (98). Three different splits were used, odd patient numbers vs. even numbers, the first half of the test vs. the second half, and 2 groups of random samples selected by SPSS 16.0 giving the results r^1 = 0.86, 0.98 and 0.99, respectively. For comparisons between groups, a factor of 0.70 is sufficient but 0.80 or more is desirable.

Limited options

According to Swedish legislation, patients have the right to be offered other equivalent forms for treatment when they are not satisfied with their current treatment. In this study only one programme was recommended as the alternatives were considered inferior. Hence, the women's opinions on the care provided were the main subject of interest, not following each pregnancy per se.

If the rate of perinatal mortality had been lower than usual during the period of the investigation, this could have influenced the answers in a positive direction. No difference in mortality rates was found. However, the perinatal mortality is low which makes the results susceptible to variations. The study period was from October 1st 2002 and including October 31st 2003.

Table 3. Perinatal mortality in Lund University Hospital 1996-2008

Year	Number of newborn	Number of dead	Percent
1996	2659	14	0,53
1997	2827	24	0,85
1998	2785	16	0,57
1999	2911	24	0,85
2000	2920	16	0,55
2001	2965	28	0,94
2002	3194	15	0,47
2003	3085	18	0,58
2004	3094	15	0,48
2005	3383	17	0,50
2006	3588	20	0,50
2007	3567	16	0,45
2008	3787	19	0,50

Distribution of questionnaires

The distribution routine and the number of questionnaires distributed were not sufficiently described in Paper II. The total questionnaire consisted of four separate parts and each part was distributed on different occasions. The first at

Table 4. Number of participants and questionnaire parts (the whole study period)

					Women getting different sets of questionnaires		
	Women asked for participation	Drop outs	Questionnaires handed out	Questionnaires answered n (%)	Part 1	Part 2	Part 3 & 4
DM	51	2	83	72 (87)	31	10	8
GDM	102	1	214	206 (96)	58	8	35
Total	153	3	297	278 (94)	89	18	43

specialist antenatal clinic (S-ANC) during pregnancy (concerning the time before S-ANC), the second at the perinatal ward (concerning S-ANC), and the third and fourth was distributed after the post-partum check-up at the S-ANC (concerning delivery ward, care after delivery and postpartum check-up). Table 4, shows the number of each questionnaire-part that were distributed during the study period. It does not show how many women were given which part.

GDM in Skåne – the Mamma-study (Paper III)

On their first visit to the antenatal clinic pregnant women due to give birth during the years 2003-2005 in the County of Skåne, were given information, both written and verbal, about the OGTT and invited by the midwives to participate in a 5-year follow-up study, called the Mamma study. At the delivery department information was given again, and the women were invited to sign a consent form for participation. The inclusion criterion was a correctly performed OGTT during pregnancy. The results of the OGTTs were continuously sent to the author from all the general antenatal clinics for control of the sampling results, allowing 0.3 mmol/L differences at the most. Women with GDM and GIGT were identified from these results. Every 24th woman with GNGT from each delivery department was chosen from among those who had signed a consent form, comprising a control group. The women identified were then again invited to participate in the study, and special information was sent to each group, together with a new consent form. If no answer was received, two reminders were sent out. All information forms are shown in Appendix 2 (in Swedish).

Participants and drop-outs

A flow chart over the study population is shown in Figure 2. One thousand and six women met the inclusion criterion and the final cohort consisted of 636. The prevalence of diabetes and IGT after pregnancy was investigated. The protocol used at follow-up is presented in Appendix 2. All post-partum tests were performed at respective endocrinological clinic. An OGTT, including fasting, 1- and 2-h values was performed, and blood samples were taken at the same time for the determination of insulin levels. The participant's BMI was calculated, and information was obtained on family history of diabetes, ethnic affiliation and earlier pregnancies, as well as tobacco use and physical activities during working hours and leisure time. Blood samples were taken for DNA analysis.

Data in the Mamma-study were presented as means ± SD, or as the median and interquartile range. ANOVA was used to test for differences between group means (symmetrically distributed variables), and the Kruskal-Wallis test was used to test for differences between medians (non-symmetrically distributed variables). Fisher's exact test was used for comparison of group frequencies.

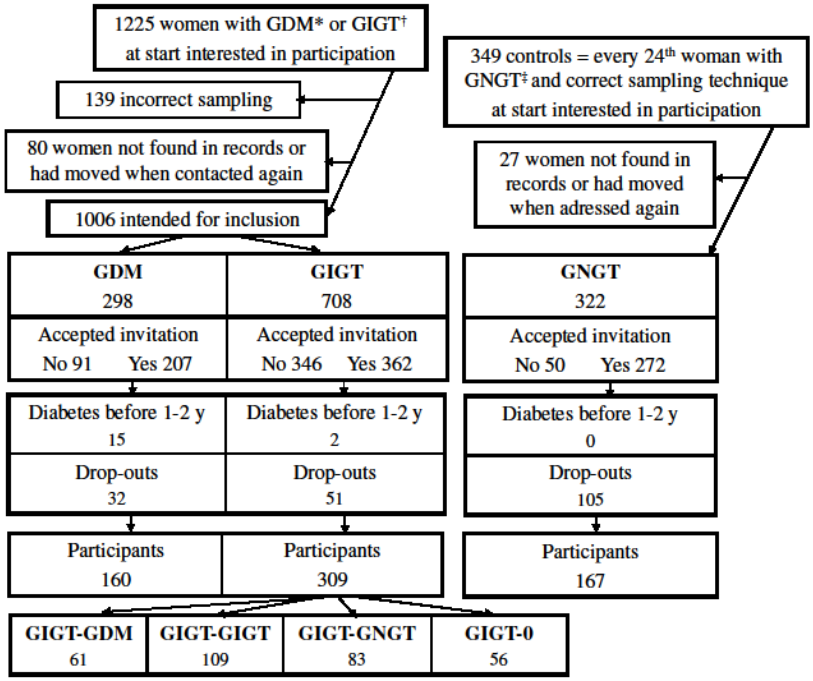


Figure 2. Flowchart of the study population in the Mamma study

Perinatal outcome in the Mamma-study (Paper IV)

Results of the perinatal outcome, of all women who initially agreed to participate in the Mamma-study, was described by identifying the following factors from PRS: hypertension (including essential hypertension, pregnancy-induced hypertension and preeclampsia), induction of labour and instrumental deliveries. The diagnoses of LGA and small for gestational age (SGA), premature delivery (<37 weeks of gestation), Apgar score <7 at 5 min, and the need of neonatal intensive care unit >1 day were also studied. In addition, information was collected on foetal mortality and malformation, foetal hypoglycaemia and hyperbilirubinaemia, and birth trauma. The results were shown in relation to the results of the OGTT during pregnancy.

Odds ratios and 95% CI for dichotomous outcomes were calculated using multiple logistic regressions. Adjustments were made for maternal age, parity, and when specified, labour induction and infant birth weight. In order to determine the best multivariate models the following steps were taken. First, the best model for each investigated variable (linear, quadratic, or divided into designed class variables) was determined by investigating the level of significance and goodness of fit. It was revealed that maternal age was most efficiently represented by three class variables (<35 years [reference group], 35-39 years, and 40 years and older). Maternal parity was best expressed as women with 1 child before the index pregnancy vs. >1 child. In the models in which induction of labour and infant birth weight were included, induction was included as a binary variable (yes/no), and infant birth weight was included in the model using one linear and one quadratic variable. For each model, the number of investigated factors never exceeded 1/10 of the number of cases.

The Kruskal-Wallis test was used to test for differences between group medians. Chi-squared tests and Fisher's exact tests were used for comparison of group frequencies.

Health care utilisation after GDM (Paper V)

The population included 579 women with GDM, (the cases) delivered during 1995-2001 in Lund and Malmö, either participating in earlier studies or identified though diagnostic registers from the University Hospitals of Lund and Malmö. Two controls were identified with the same year of birth and the same year and municipality when giving birth as the cases. For 17 only 1 control was possible to identify (n=1131). Information was collected from the Medical Birth Register at the Swedish National Board of Health and Welfare. Care was taken to ensure that the controls did not have diabetes. An explorative register study, with a descriptive, longitudinal case-control design, was used to investigate annual data on the number of outpatient contacts, inpatient days and the cost of care for 'cases' and 'controls'. The difference in utilisation and cost between cases and controls after childbirth was considered to be a measure of the excess utilisation and cost that could be attributed to GDM.

Comparisons between cases and controls were made as regards total health care utilisation and health care utilisation excluding subsequent pregnancies and childbirths, defined by having the main or second diagnosis with ICD code from group O or a DRG code 370-77 or 382-84. Data regarding health care utilisation was provided by the Patients´ Administrative System in Skåne County (PASIS), Sweden, covering the period from the years of delivery up to year 2008.

The reports from PASIS included contacts (visits and telephone calls) with public and private primary care (acute or planned contacts with doctors, midwives, nurses or physiotherapists) and in- and outpatient care at hospitals (length of stay, main diagnoses, co diagnoses, code for diagnosis-related-group). Personal identification numbers were removed before the data were delivered to the research team.

Costs are given in Swedish crowns, SEK 100 = EUR 9.6055 (www.riksbanken.se; average exchange rate in 2008).

Overall differences in health care utilisation were analysed using the Kruskal-Wallis test. Non-parametric Pearson's χ^2 test of median values was used for comparison of outpatient contacts, inpatient days and health care cost (99). The longitudinal individual data for the years 1998-2008 were analysed using panel data regression methods. The OR and 95% CI of having required at least some health care were obtained by random-effects logistic regression controlling for the woman's age, time since birth and the interaction of case and time since birth. The excess cost of healthcare utilisation for cases was computed using population-averaged generalized linear estimation (100).

RESULTS

General oral glucose tolerance test (Paper I)

The routine with a general OGTT has been practised since 1995. Of all delivered during the month of May 2003, 938 out of a potential 1010 had performed an OGTT during pregnancy Three percent of the pregnant women refused to take the test, and in 4% of cases no reason was found in the patient's records. Participation was 93% during pregnancy and 73% at follow-up visit one year after partus.

Identified prevalence of GDM

The frequency of GDM in Skåne increased from 0.8% in 1995-1999 to 1.9% in 2000-2003 ($p<0.001$). The corresponding figures for the towns of Halmstad, Ljungby and Växjö were 0.7% and 1.0%. When the material was stratified by year of birth, maternal age and parity, the OR for GDM in Skåne versus that in Halmstad, Ljungby and Växjö, was 1.5 (95% CI 1.3-1.7) for the total study period, 1.1 (95% CI 0.9-1.3) for 1995-1999 and 1.8 (95 % CI 1.5-2.2) for 2000-2003.

Table 5. Perinatal outcome and GDM

			Total births	<37 weeks			LGA		
Region	Period		n	n	(%)	OR (95%CI)	n	(%)	OR (95%CI)
Skåne	1995-1999	GDM	442	61	(13.8)	1.9 (1.5-2.5)	77	(17.4)	3.8 (3.0-4.8)
		No GDM	53490	4007	(7.5)	Reference	2598	(4.9)	Reference
	2000-2003	GDM	900	107	(11.9)	1.7 (1.4-2.1)	129	(14.3)	2.9 (2.4-3.4)
		No GDM	46423	3350	(7.2)	Reference	2312	(5.0)	Reference
Halmstad-Ljungby-Växjö	1995-1999	GDM	115	24	(20.9)	2.9 (1.9 - 4.5)	14	(12.2)	2.3 (1.3 - 3.9)
		No GDM	14872	1157	(7.8)	Reference	705	(4.7)	Reference
	2000-2003	GDM	134	25	(18.7)	2.5 (1.6-3.8)	18	(13.4)	2.9 (1.8 - 4.7)
		No GDM	12767	1014	(7.9)	Reference	619	(4.8)	Reference

Numbers (and Incidence) of infants borne before 37 completed weeks of pregnancy or LGA, by presence or GDM, Year of birth and area of delivery unit. Data stratified for year of birth, maternal age (5-Year classes) and parity (1, 2, 3, 4 +). Data from PRS

Large for gestational age and prematurity.

The OR for LGA infants in GDM pregnancies versus unaffected pregnancies showed no significant differences between compared years in neither of the areas.The OR for prematurity was higher in Halmstad, Ljungby and Växjö and for the whole period studied statistical significance (p=0.024) was shown. The frequency of brachial plexus damage was the same in the two areas when comparing GDM pregnancies and non-affected pregnancies (0.1% vs. 0.4%) (Table 5).

Opinions on care during the child bearing year (Paper II)

Answers from 267 questionnaires were analysed, corresponding to a total reply frequency of 94% (diabetes group 93%, GDM group 96%). Ninety-five percent of all the answers fell in the neutral–satisfied range (Lickert scores 2-5). Ninety-six percent of the separate questions 96% were answered.

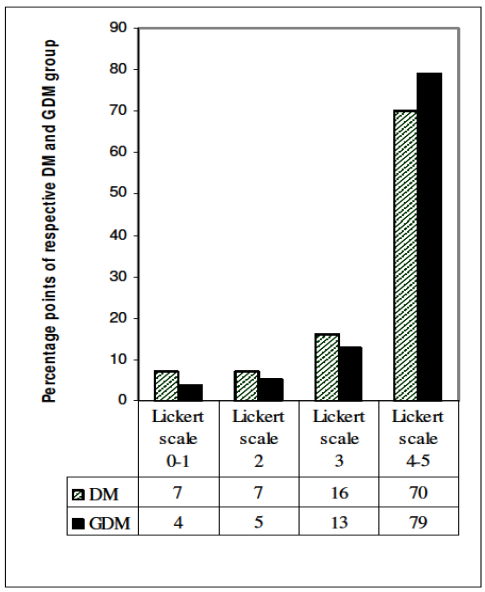


Figure 3. Distribution of Lickert scale answers.

Positively deviating answers

Accessibility to health care

There were 19 questions concerning accessibility to health care, and 97% of the answers were scored above 3 on the Lickert scale in both groups (mean 4.2-4.8). The highest scores for care during pregnancy were given to the specialist antenatal clinics for giving patients enough time, and for treating the women especially well (mean >4.5).

Participation, responsibility and respect for the participants' opinions

The scores were >3 in 91% of the diabetes group and in 96% of the GDM group. The two groups showed equal levels of dissatisfaction (2%). Positive marks (4.0-4.7) were given in particular regarding the possibility of participating in decisions and professionals' respect for the participants' opinions. In the diabetes group, the possibility of meetings with a diabetologist before becoming pregnant were especially appreciated (mean >4.3).

Care at the specialist antenatal clinic

Satisfaction with care at the specialist antenatal clinic was indicated by 96% of the diabetes group and 89% of the GDM group). Only 2% of the GDM group gave scores of 2. The treatment and the high level of knowledge were especially appreciated, but some expressed a wish for better continuity and shorter waiting times at booked doctor's visits.

Questions with negatively deviating answers

Information flow

Four questions, one for each period of care, asking whether the decisions and desires of the woman had been communicated, showed a mean Lickert scale value of 2.5. The score given was 2 in 12% of the GDM group vs. 11% in the diabetes group. Lack of communication between the various parts of care, between different teams of midwives and between doctors was mentioned. Both groups commented on an inadequate flow of information at the delivery department, and lack of knowledge amongst the staff, both on the perinatal ward and at the delivery department.

Preparation for next step in the care chain

Preparation was dealt with in 27 questions. In the diabetes group, 9 out of 12 said they were poorly prepared for what care during pregnancy involved, 48% were satisfied (scores 4 and 5), but 7% gave a score of 0. These questions were given the lowest scores in the diabetes group. Of the 13 questions regarding information on what was actually going to happen on different occasions, only 2 questions had a mean value above 4.00 on the Lickert scale.

The women diagnosed as having GDM were not prepared for the possibility of testing positive; neither did they understand the information given after the OGTT

nor the implication of the results. In comments it appeared that the participants believed that the midwives at the general antenatal clinics should have had more knowledge to be able to give better information before the OGTT and on the results.

The mean score for preparation before delivery was 3.5 for both groups. From the comments made, it was clear that both groups wished for better preparation in general care.

The information given on the perinatal ward was perceived overall as poor, with a lack of knowledge and divergent opinions amongst the staff. The perinatal ward was described as a stressful place, with a lack of midwives, a lack of knowledge, and no continuity of information. Dissatisfaction with treatment was expressed.

Post-partum check-up

Many of the participants stated that they did not know the reason for the post-partum check-up (mean score 2.4). Opinions regarding discussions of the recently completed pregnancy, information on contraceptives and the woman's future health and a possible new pregnancy were neutral (3.5). The median was however 5, indicating that although some were dissatisfied, the majority was satisfied. A need for written information was expressed.

Increased supervision

The increased number of check-ups at the specialist antenatal clinic led to problems in 20% of the diabetes group and 25% of the GDM group due to longer journeys and long waiting periods at the clinic. In addition, self-testing took time and interfered with both family life and work.

Healthy aspects of pregnancy

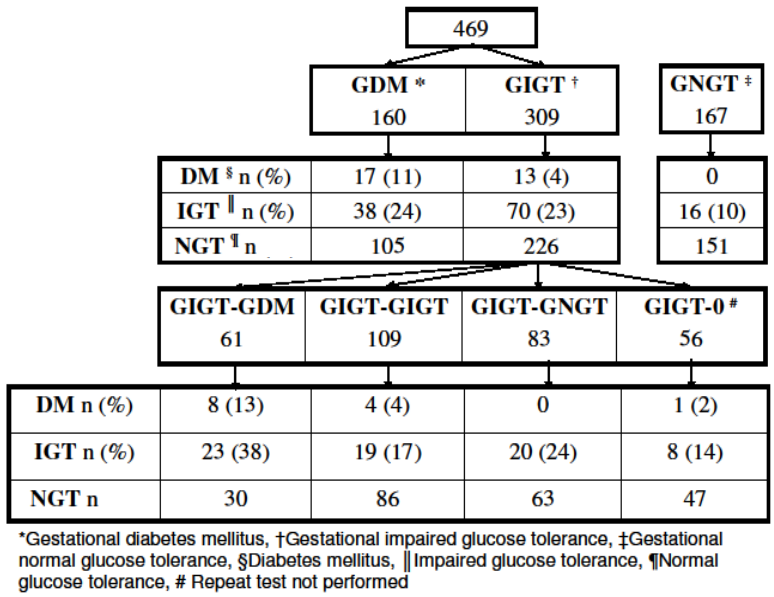
Twenty-eight comments were made in the open-ended questions expressing wishes for more focus on normal pregnancy, and for ordinary preparation for parenthood, although there was no question concerning this in the questionnaire. The participants stated that there had been too much focus on diabetes, except at the delivery department, where the situation was reversed, and the women felt that the responsibility for their diabetes rested heavily on them.

Birth plan

Five questions concerning birth plans were not analysed as the term "birth plan" had been incorrectly changed to "care plan" and the question appeared to have been misunderstood.

Results at follow-up 1-2 years postpartum (Paper III)

Diagnoses based on the results of the 1-2 year follow-up are given in Figure 4. In total, 30 women were diagnosed as having diabetes; 17/160 (11%) of the women with GDM, and 13/309 (4%) of the women with GIGT. The diagnosis of 10 women was based on the fasting value alone, that of 16 women on the 2-h values alone, and that of 4 women on both the fasting and the 2-h values. Of the 13 women with GIGT diagnosed with diabetes the majority were from the GIGT-GDM group, and revealed diabetes in 25/221 (11%).



*Gestational diabetes mellitus, †Gestational impaired glucose tolerance, ‡Gestational normal glucose tolerance, §Diabetes mellitus, ‖Impaired glucose tolerance, ¶Normal glucose tolerance, # Repeat test not performed

Figure 4. Diagnoses at 1-2 year follow-up

Women with postpartum diabetes were more often of non-European origin than those with IGT and NGT postpartum (57%, 28% and 14%), and more often had first-degree relatives with a history of diabetes (46%, 40% and 28%). They had also required insulin treatment more often during pregnancy, and were older and more overweight than women with IGT and NGT postpartum. No significant differences were found in levels of physical activity during work or leisure time.

In total, 4.7% of the women reported smoking during pregnancy (median 5 cigarettes per day, interquartile range 5-10), compared with 11.1% at follow-up (median 7

cigarettes per day, interquartile range 4-11). Snuff was used during pregnancy by 0.6% compared with 1.1% at follow-up.

Loss to follow-up

During the study period information was sent out at different times. If a woman did not reply or failed to come to an agreed appointment, reminders were used to try to reduce the number of drop-outs.

The following routines have been practiced within the Mamma-study:

- Information on the study was given at all general antenatal clinics in Skåne to all women who were due to give birth during 2003-2005 (Appendix 2 in Swedish).
- At all delivery departments in Skåne, participation in the study was offered by the midwife and consent forms to sign were given out (Appendix 2 in Swedish).
- From the author, a reminder with specific information directed to the respective group, was sent out after ~4 months. It was supplemented with a confirmation form and a return envelope (Appendix 2 in Swedish).
- If no reply, 2 reminders were sent out, also together with return envelope.
- From each department of endocrinology, a notice on reserved appointment time for OGTT at follow-up was sent out.
- If the woman failed to turn up 2 new appointments were arranged, after telephone contacts.

Most of the follow-up examinations were performed after more than one year (Figure 5). Women who had become pregnant again before the planned follow-up were offered a new appointment at 6 months after the second delivery.

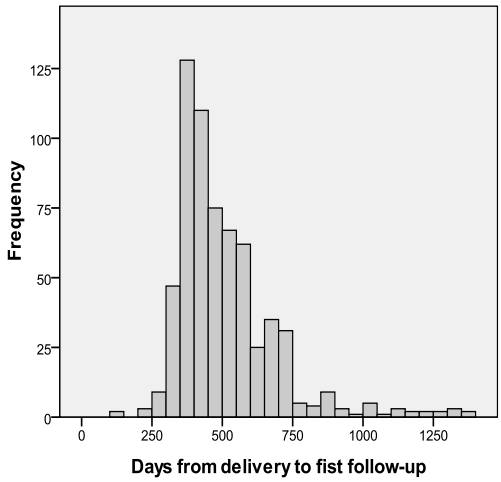


Figure 5. Days from delivery to first follow-up. (n=634, Median 465, interquartile range 388-572)

Perinatal outcome for mothers and children (Paper IV)

Outcome in mothers

Both GDM and GIGT were associated with an increased risk of hypertensive disorders during pregnancy, and the induction of labour was also more common in these groups. There was no increase in the number of planed caesarean sections in any of the groups, but for women with GDM the rate of emergency caesarean section was significantly increased. These results remained after adjustment for induction of labour and birth weight (OR 2.5, 95% CI 1.4-4.3).

Outcome in infants

The frequencies of Apgar score <7 at 5 min and premature delivery were increased in infants born to mothers with GDM. The frequency of LGA infants was higher for both women with GDM and GIGT compared with controls, while the rate of SGA infants was similar in all groups. Neonatal intensive care was needed more often in infants born to mothers with GDM or GIGT.

There was a trend towards higher rates of perinatal mortality, malformations, hypoglycaemia and hyperbilirubinaemia in the infants with increasing glucose level in the mother. However, the number of pregnancies was too small to reach statistical significance.

Table 6. Perinatal outcome, Study IV.

	GDM (n=306)			GIGT (n=744)			Controls (n=329)
	n (%)	Crude OR	Adjusted OR (95% CI)	n (%)	Crude OR	Adjusted OR (95% CI)	n (%)
Mothers							
Preeclampsia, essential or gestational hypertension	26 (8.5)	3.0	2.7 (1.3-5.8)	46 (6.2)	2.1	2.0 (1.0-4.1)	10 (3.0)
Induction	57 (18.6)	3.4	3.1 (1.8-5.2)	86 (11.6)	1.9	1.8 (1.1-3.0)	21 (6.4)
Instrumental delivery	92 (30.1)	2.1	1.9 (1.3-2.7)	155 (20.9)	1.3	1.2 (0.9-1.7)	57 (17.3)
Forceps or vacuum extraction	20 (6.5)	1.2	1.1 (0.6-2.1)	41 (5.5)	1.0	1.0 (0.6-1.8)	18 (5.5)
Caesarean section,	72 (23.5)	2.3	2.1 (1.4-3.2)	114 (15.4)	1.4	1.3 (0.9-1.9)	39 (11.9)
Elective	27 (8.8)	1.6	1.4 (0.7-2.6)	45 (6.1)	1.1	1.0 (0.5-1.7)	19 (5.8)
Emergency	45 (14.7)	2.7	2.5 (1.5-4.4)	69 (9.3)	1.6	1.5 (0.9-2.6)	20 (6.1)
Infants							
Born <37 gestational weeks	27 (8.9)	3.6	3.6 (1.6-7.7)	39 (5.2)	2.0	2.0 (1.0-4.2)	9 (2.7)
Apgar score <7 at 5 min	8 (2.6)	8.8	9.6 (1.2-78.0)	6 (0.8)	2.7	2.8 (0.3-23.2)	1 (0.3)
Large for gestational age infant	26 (8.5)	2.3	2.5 (1.3-5.1)	57 (7.7)	2.0	2.1 (1.1-3.9)	13 (3.9)
Small for gestational age infant	6 (2.0)	1.3	1.2 (0.4-4.0)	11 (1.5)	1.0	1.0 (0.3-2.8)	5 (1.5)
Neonatal intensive care > 1 day	57 (18.5)	5.2	5.2 (2.8-9.6)	62 (8.2)	2.1	2.1 (1.1-3.8)	14 (4.2)

The percentage is calculated on all non-missing data for each variable within each group.
Odds ratios (OR) with 95% confidence intervals (95% CI) for the GDM and GIGT groups compared to controls.
Adjustment was made for maternal age and parity

Use of health care postpartum (Paper V)

Data for public health care were available for 1998-2008 and for private health care for 1999-2008. The number of contacts and the cost per year for cases and controls were compared, from delivery and continuing up to 13 years after.

Table 7 shows the differences between cases and controls in health care utilisation during the 13 years studied. Inpatient care accounted for a significant proportion of the mean annual costs for cases and controls during the first years of the period investigated, but the trend shifted towards more outpatient care over time. About eight out of ten women required some health care each year. The difference between cases and controls was initially above five percentage points and towards the latter years in the period of investigation the difference was between one and two percentage points.

Regression analysis of cases and controls 1-13 years after delivery showed that cases were overall more than three times as likely to have required some health care in a year (OR 3.5, 95% CI 2.5-5.0) when controlling for age and time since delivery and

excluding health care utilisation related to pregnancy and required health care associated with an average 50% higher cost. For cases, increasing time since delivery was associated with a reduced risk of requiring health care. Annual excess cost was apparent up to 7 years after childbirth (p<0.01).

Table 7. Comparison of annual total number of contacts in public and private care, annual number of inpatient days and annual total cost by calendar year for the period 1998-2008. All figures are mean per person.

	Annual number of contacts Per person			Inpatient days Per person			Annual total cost (in SEK) Per person			Number of observations	
Year	Case	Control		Case	Control		Case	Control		Case	Control
	Mean (SEM)	Mean (SEM)	p-value[1]	Mean (SEM)	Mean (SEM)	p-value[1]	Mean (SEM)	Mean (SEM)	p-value[1]		
1998	7,38 (0,57)	5,01 (0,32)	0.0001	1,5 (0,7)	0,6 (0,1)	0.0966	11 123 (2408)	6843 (629)	0.0274	274	532
1999	9,27 (0,58)	6,31 (0,35)	<0.0001	0,7 (0,1)	0,7 (0,2)	0.9539	10 206 (780)	7669 (731)	0.0294	371	723
2000	10,19 (0,6)	6,61 (0,3)	<0.0001	1,6 (0,4)	0,3 (0)	<0.0001	15 431 (2106)	6615 (378)	<0.0001	488	950
2001	10,56 (0,53)	6,97 (0,32)	<0.0001	0,7 (0,1)	0,4 (0,1)	0.1760	11 607 (806)	7571 (505)	<0.0001	540	1054
2002	11,57 (0,61)	7,59 (0,32)	<0.0001	0,8 (0,1)	0,4 (0,1)	0.0016	13 334 (1041)	7658 (499)	<0.0001	579	1131
2003	11,95 (0,64)	8,17 (0,36)	<0.0001	0,9 (0,2)	0,5 (0,1)	0.0297	14 428 (1314)	9042 (753)	0.0001	579	1131
2004	12,07 (0,61)	8,55 (0,41)	<0.0001	0,7 (0,2)	0,6 (0,2)	0.5943	13 711 (1245)	9657 (745)	0.0031	579	1131
2005	11,46 (0,6)	8,02 (0,35)	<0.0001	0,5 (0,1)	0,5 (0,2)	0.9609	12 487 (1155)	8672 (747)	0.0042	579	1131
2006	11,12 (0,63)	8,33 (0,4)	0.0001	0,7 (0,2)	0,3 (0)	0.0096	13 370 (1400)	9396 (667)	0.0037	579	1131
2007	10,86 (0,57)	8,55 (0,39)	0.0008	0,5 (0,1)	0,7 (0,2)	0.5704	11 952 (1120)	12 321 (1531)	0.8717	579	1131
2008	12,32 (0,69)	8,5 (0,4)	<0.0001	0,8 (0,3)	0,5 (0,2)	0.4233	14 653 (1653)	11 379 (1138)	0.0988	579	1131

[1] P-values of two-sided t-tests of equal means. SEM=standard error of mean. SEK=Swedish crowns

The year of the child's birth is clearly associated with an increase in number of contacts and also in the cost of care for cases as well as controls. Women diagnosed as having GDM had a higher mean number of contacts and total cost in the year of the birth, and also in subsequent years (p=0.0014; p=0.0462). The latter was true also when cost related to pregnancy was excluded (p<0.001) as shown in figure 6, panel (a) and (b).

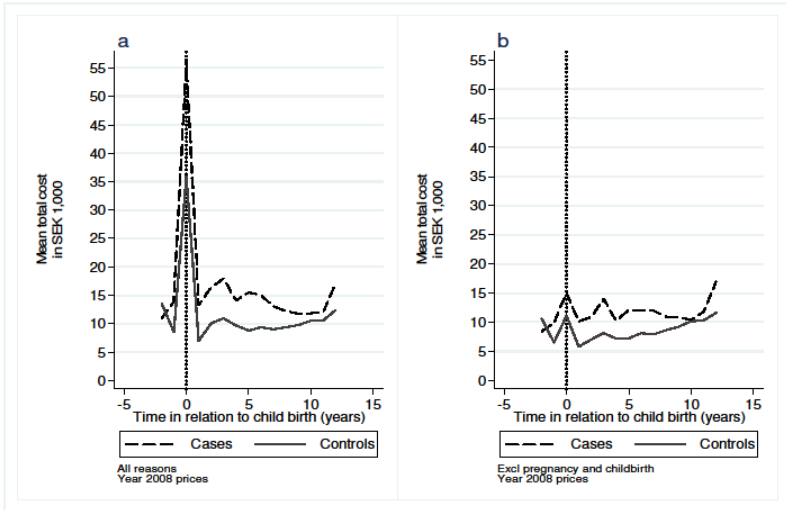


Figure 6. Mean annual total cost of health care per person for cases (dashed line) and controls (solid line) in relation to year of childbirth marked by dotted line.

DISCUSSION

The rapidly increasing number of people with diabetes is not only a problem for the individual, but will also pose a problem to society due to the considerable costs involved. Our goal must therefore be to meet this challenge with all the knowledge available to stop the progress of this disease. Early diagnosis and treatment offer the best approach, but at present there is not yet consensus on how to accomplish this.

GDM can be seen as an opportunity provided by nature to learn more about type 2 diabetes. Pregnancy is a relatively short period in a woman's life, and is a form of stress test, making it possible to observe predisposition to diabetes years before symptoms occur (12, 14, 17). GDM is one of the most important factors predisposing to subsequent diabetes, so taking advantage of this is one way of tackling the increase in the incidence of diabetes and reducing future suffering and health care cost. It also provides the possibility of reducing the risk of complications, increased morbidity and adverse pregnancy outcome.

Methods of diagnosis

There is no consensus regarding the method of diagnosing GDM. Different risk factors are used throughout the world to indicate the need for glucose measurements, but the compliance of staff is known to be low (65-67). Random tests are used in spite of the fact that it is difficult to make any test truly at random. A test could be at random in more ways. Tests could be carried out at random times during the week but are often carried out at specific weeks during pregnancy and usually planned. It is also known that women prefer certain week-days or times of day for their midwife check-ups in order to fit in with commitments to family and work. There is a higher risk of testing positive just after lunch, than before, without the risk of having GDM being higher. There is widespread knowledge that fasting before a glucose test lowers the concentration, but the degree of randomness is reduced, and the sensitivity and specificity of the test are influenced. RGMs are still employed despite the fact that it is known that over 50% of those with GDM are not identified (29, 101). It can be questioned whether it is economically or ethically justified to deny women the possibility of testing for GDM when the identification of GDM patients allows for better pregnancy outcome and provides the opportunity for the individual to improve her future health by changing lifestyle and eating habits.

When OGTTs are performed, after overnight fasting, twice as many cases of GDM are identified. Worries have been expressed that OGTT results in false-positive diagnoses, wrongly stigmatising pregnancies as abnormal. When OGTT was compared with RGM (Paper I), it was found that there is no dilution with healthy pregnant women, but underdiagnosis when using RGM (29, 101).

The material required for an OGTT is inexpensive and the method is not labour intensive. The 2 hours of waiting spent by the patient can be regarded as the most expensive part of the test due to loss of production, but the test can also be seen as an investment in the health for the individual and the society (6). This time can also be used to give information, for midwife check-ups or parent groups; or simply to provide a time for rest and contemplation for mothers to be.

The results of the HAPO-study appeared promising, indicating the future possibility of using 1-hour blood glucose levels for diagnosis (87). Unfortunately, in the most recent reports (91) it is not clear how many cases of GDM were identified by the 1-hour and 2-hour levels as the results are reported as cumulative values.

Different ways to express glucose concentrations

Glucose concentration can be expressed in different ways, such as, as mg/dl or mmol/L. Furthermore, several factors influence the value measured, and are not always accounted for such as, whether venous or capillary blood is sampled, and whether plasma or blood glucose concentration is measured. There are also different factors for converting blood glucose to plasma glucose. Carpenter et al. (75) used a factor of 1.14% based on results from the laboratory of Yale-New Haven Hospital, CT, USA, (101), while the US National Diabetes Data Group (NDDG) uses 1.11%, based on recommendations from the Scientific Division of the International Federation of Clinical Chemistry and Laboratory Medicine (86). This implies different but fully comparable values but unfortunately the underlying causes are not generally known. This is not an insurmountable problem but may lead to clinical misinterpretation and difficulties when comparing results.

The HemoCue device used in these studies has a built-in conversion factor of 1.11% (86) giving a *imaginary* somewhat lower cut-off level of 8.6 mmol/L for abnormal glucose tolerance than that presented by the WHO, of 8.9 mmol/L (8).

Retesting when the result is GIGT

Using the lower value of capillary plasma glucose concentration (8.6 mmol/L) as the diagnostic limit for GDM instead of previously used value of 10.0 mmol/L, will mean a considerable increase in the amount of health care services required, during both pregnancy and at follow-up. Study III shows that the identified group women having GDM primary or after retesting, corresponds well with the group predicted to diabetes 1-2 years after delivery. Therefore re-testing could provide a means of reducing the amount of work while maintaining good sensitivity.

Estimated reduction when excluding the low-risk-group

Using the ADA low-risk group classification, to determine who is not in need if undergoing an OGTT, may be one way of decreasing the increased work load if lowering the limits for GDM in pregnant women (83, 84). Of all the women who agreed to participate, and who had valid OGTT results in the Mamma-study, age was

the only characteristic known for all participants. Excluding women younger than 25 years of age would have reduced the number of OGTTs by 8.5%, a maximum that will be reduced when also regarding the remaining risk factors.

Other studies have reported lower compliance with routines that do not involve all patients (65-67), which could jeopardize the total results.

Program for health care having diabetes during pregnancy

During the 1970s, groups of specialists with interest in pregnancy and diabetes started to work together to improve the outcome of pregnancy, especially for the children (4, 5). This groups have considerable knowledge on the relation between episodes during pregnancy and their consequences for glucose values and for the outcome. Therefore current health care programmes for pregnant women are extensive compared to ordinary basic pregnancy programmes, but they differ. In Skåne, the basic programme for women with GDM is more extensive than in other areas (as demonstrated for Lund in Paper II, Table 2). The opinions of critics regarding this programme was, that pregnancies when having GDM were stigmatised as not normal, that the women were deprived of having a normal pregnancy and positive experience of being pregnant. However, the results presented in Paper II showed that the women experienced great satisfaction, especially with the superior knowledge of staff at the S-ANC, which they shared with the women by encouraging them to participate in making decisions and by showing respect for their opinions. Negative opinions were instead voiced regarding the inadequacy of information given by the staff at the general antenatal clinics before the OGTT leading to anxiety and fear.

The questionnaire

Why making an anonymous questionnaire? As the aim was to describe opinions from the group of women, it was important to reach a sufficient number, which would not have been possible using interviews. In addition questionnaires based on interviews are known to systematically reflect more desirable responses (102).

New tests have not been validated or used before, which is negative. However tailored questionnaires have the advantage of being adjusted to the specific activity. In the present study the personnel were involved in the construction phase making it easier to support the respondents and the answering rate was very high, over 90 %. A negative association has been described between willingness to participate in questionnaires and reported problems during the caring period (103). Anonymity as well as involving the regular staff has been pointed out as important factors when pregnant women consider participating in studies (104-106). The fact that the personnel participated in the construction and distribution of the questionnaires, but otherwise were blinded to the answers, may have contributed to the high answering rate.

Informed choice

Working with informed choices should always be the model, providing possibilities for questions, knowing limitations, to be aware of risks and implications of tests. To participate in an OGTT during pregnancy is an offer and the decision whether to participate should be made as an informed choice (93). Decisions must not be contrary to the patients' interests on purpose, alternative results, risks and implications (94) and information must be given before any examination or screening.

It is not always clear whether the OGTT is presented by the midwife, or regarded by the women as being voluntary. "Isn't this what everyone is supposed to do?" Women take the test in order to confirm that all is well, while the medical health services use screening methods to identify otherwise healthy people with unusual diseases. Unfortunately, the information given is not always sufficient, and the risk of testing positive is not enough reflected upon or realized by neither the midwives in general antenatal clinics nor the women as shown in Study II and the women experience that as lack of knowledge by the midwife.

If the result of OGTT shows that the woman has GDM, this will have implications on the rest of the woman's life, leading to a crisis that could have been avoided by informing before the test. Initially, the diagnosis of GDM is a shock. However, upon reflection, the diagnosis means that these women have been given the chance of a safer pregnancy and to prevent ill health in the future. Adequate information before the test will help women to be prepared for its consequences.

Ultrasound screening during pregnancy and OGTT are comparable regarding needs of preparation before the test. Routines for ultrasound screening have however been studied more. Experience has shown that accurate information must be provided on the problem detected, and that opportunity should be given for the woman to express her feelings especially those of shock or unfairness (107, 108).

It is thus necessary to give good, impartial information before the test so that the woman is prepared for the result, or is sufficiently well-informed if she decides not to take the test.

Treatment during pregnancy

The results presented in Paper I and IV ought to be reflected upon. GDM and IGT during pregnancy imply adverse pregnancy outcome compared to women with normal glucose levels. As in the case of the HAPO study (87, 88) these studies also indicated a risk continuum rather than a threshold value. This should be taken into consideration in the discussion on whether the limit of 8.6 mmol/L should be used to diagnose GDM.

Secondly, there is a risk that the diagnosis of GDM may lead to an increased risk of interventions afflicting the figures. However, induction of labour and acute caesarean sections were 2.5-3 times increased. The risk for infants being large for gestational age

were 2.5 times increased, for Apgar score <7 at 5 minutes more than 9 times, and the need for neonatal intensive care over 5 times. This was the results in spite of our treatment. In addition increases in odds ratios for the GIGT group were seen as well, less pronounced but still significant, with doubled risk for induction of labour, large for gestational age infant and use of neonatal intensive care >1 day.

Taken together, in spite of the extended health care programme offered to the women with GDM, the Studies I and IV still show adverse pregnancy outcome for the GDM group. Thus, our extended treatment program is not sufficient enough and there has to be discussions on how it can be improved to reduce the negative outcome.

Predisposition for diabetes and health care cost

Complications and hospitalisation, arising from diabetes, account for the highest cost of health care (45, 47, 52, 55-57, 109). However, a doubling or the medical cost already during the first 8 years after the diagnosis of diabetes has been described (110, 111). The observed differences between cases and controls during the childbearing year was expected due to the increased care programmes but was maintained also when cost related to pregnancy and childbirth was excluded. The differences between cases and controls was mainly due to an increase in outpatient contacts, although cases where more likely to have an inpatient period when diagnosis related to pregnancy and childbirth were excluded.

It was expected that that a continuous growth in the use of medical resource would be observed during the years after delivery, but in fact, increasing time since delivery was associated with a reduced consuming of health care. Provided that most women who develop diabetes after GDM are diagnosed within 5 to 10 years after delivery (37) one possible explanation could be that once diabetes is diagnosed and the patients are gradually transferred to more structured health care the need of health care will slowly be reduced.

Loss to follow-up

The aim of any study is to include as many as possible of the participants in follow-up investigations. In Study III follow-up was planned for one year later, and many participants dropped out, despite repeated reminders. Performing the tests during the first year after delivery, within the period of parental leave, it is possible the number of participants would have been higher. It is also possible that if the test could be offered at the welfare centre they normally belong to, more women had participated.

When comparing results in different studies, it would have been desirable and appropriate to compare both the characteristics of the participants and of the drop-outs at the same time. It is, however, not possible to describe those who did not want to participate as thoroughly as those who did. Therefore, it is neither possible to ensure the subset of drop-outs is not skewed in any way. This may of course be the reason why similar accounts are not often found in studies (18). In Paper III the loss to follow-up was 44%, influenced by a somewhat higher loss in the control group, all

though more reminders were sent, possible in a study but perhaps not in clinical everyday work. When making calculations for cost of follow-up programmes it is necessary to take in account the losses and to include cost for this extra time needed.

Preventing diabetes after GDM

Through studies involving OGTTs of pregnant women, it is already known that about 50% of women who have GDM will develop diabetes within 5-10 years (33, 37). It is possible to postpone or prevent the debut of diabetes but this requires early diagnosis and, when necessary, early treatment. The identification of diabetes during pregnancy provides 5-10 years for preventive measures. Studies show that close monitoring over a significant period is required to ensure lifestyle changes (59, 61, 62), and that beliefs and behaviour concerning health must also be changed (64).

Physical activity decreases insulin resistance as it stimulates increased glucose uptake in skeletal muscles, thereby lowering blood glucose levels (58). The woman's partner is often involved in the pregnancy, and his support represents the factor with strongest positive influence regarding a possible increase in exercise, both during pregnancy and after delivery. Most often the partner provides the assistance with child care to set time free for it as well (64). Children of women with type 2 diabetes run a risk of becoming obese. It has been shown that the family is very important when helping these children. Small efforts involving the whole family have a greater influence on the results than, for example, organised sports activities (113, 114).

Since this concerns young, and during pregnancy, extremely well motivated family representatives, over time positive spin-off effects on the next generation can be expected with economic benefits for society. Considering the EU recommendations on preventive health care as an economic measure (6), it could be profitable to invest in regular annual follow-ups starting during pregnancy and continuing. The gain will be seen later when the money invested in preventive health reduces the cost of qualified hospital care.

Reflections

Buchanan and Kjos (115) once said, "It was once fashionable for theological scholars to debate the number of angels that could dance on the head of a pin. The debate was quite heated, narrowly focused, and unencumbered by facts. They made for great controversy, but solved no real problems". This remark was made bearing in mind the discussions of today on GDM with focus on, what they call nuances (115). The results of the HAPO study (87, 88), long-awaited by many, and the IADPSG recommendations (84) may have the potential to unify opinion. Once standards have been accepted throughout the world international collaborations can be instigated to identify, predict and prevent adverse outcomes of pregnancy and future illness in these women. In Sweden, work is guided by the EU recommendations (6) the Swedish Government policy document (7), the SBU report (44), and the new national guidelines for diabetes care from 2010, which recommend changes in lifestyle, counselling and systematic follow-up (116). The enormity of the problem we could be faced with in

the future may stimulate bodies and organisations with the required knowledge and power to formulate standard recommendations.

CONCLUSIONS

The main conclusions drawn from these studies are summarised below.

- Women with GDM can be identified using a general 75 g OGTT.
- Such OGTTs can be routinely performed at antenatal clinics, with high compliance and reliability.
- Women with gestational diabetes mellitus were satisfied with the health care programme during pregnancy.
- Performing a 75g OGTT at annual follow-ups in women with GDM and GIGT-GDM would make it possible to identify most of the women with diabetes.
- Treating women with GDM during pregnancy lowers the risk of adverse perinatal outcome. However, with present routines many pregnancies still show adverse outcome. This might be a starting-point for discussions on changes in the regime.
- Women with GDM, so hence predisposition for diabetes, show increased consumption of health care resources, during the following 13 years after pregnancy.
- Identifying GDM allows us to improve the future health of these women and their children. Therefore, it is not ethically or economically acceptable to withhold the possibility to gain information on diabetes predisposition, or to omit to follow up knowledge that is important for a person's future life.

SUMMARY IN SWEDISH

Svensk sammanfattning

Graviditetsdiabetes (GDM) definieras som förhöjt blodglukos (blodsocker) som uppstår eller upptäcks under graviditet och som oftast försvinner efter förlossningen. Orsaken anses vara en otillräcklig förmåga att öka insulinproduktionen i takt med det ökade behov som normalt uppträder under en graviditet till följd av hormonella förändringar. Livsstilsfaktorer såsom stillasittande, felaktig kost och övervikt innebär en ökad risk att drabbas.

GDM kan betraktas som en manifestation av typ 2 diabetes under graviditet och är en stark riskfaktor för framtida diabetesinsjuknande. GDM ger oftast inga symtom och är därför svårt att upptäcka utan aktivt sökande. Diagnosen ställs med en oral glukostoleranstest (OGTT). Cirka 300 nya kvinnor med potentiellt anlag för diabetes identifieras varje år i Skåne med hjälp av OGTT under graviditet.

Högt blodglukos hos modern innebär i sin tur högt blodglukos hos fostret. Detta medför en ökad insulinproduktion hos fostret med risk för alltför kraftig fostertillväxt och förlossningskomplikationer. Därför är det viktigt att behandla förhöjda glukosvärden hos modern.

Målet med avhandlingsarbetet var dels att beskriva ett tillförlitligt sätt att diagnostisera GDM och att beskriva kvinnornas uppfattning om den vård som erbjuds, dels att beskriva graviditetsutfallet och att kartlägga förekomsten av diabetes efter förlossningen utifrån olika gränsvärden vid OGTT under graviditet, samt att utvärdera behovet av sjukvård efter GDM.

Rutiner för allmän, decentraliserad OGTT under graviditet med hög kvalitet och högt deltagande har beskrivits. Resultat jämfördes för åren 1995-1999 och 2000-2003 och för två lika områden men med olika screeningmetoder, OGTT till alla eller slumpmässiga glukosmätningar (RGM) med värden över en viss gräns som urval för OGTT. Med OGTT till alla identifierade 100% fler kvinnor med GDM än med RGM-metoden och de som inte identifierades med RGM-metoden var lika sjuka som de som identifierades.

Kvinnornas uppfattning om det utökade vårdprogram som erbjöds alla med diabetes under graviditets har efterfrågats. En enkät gavs till alla kvinnor med diabetes före graviditeten såväl som till alla kvinnor med GDM, som besökte Specialistmödravården i Lund under tiden från 2002-10-01 till och med 2003-10-31. Resultatet visade att kvinnorna var mycket nöjda med vården, speciellt med den möjlighet som gavs att delta i beslut och den respekt som visades för deras

uppfattning, men de önskade bättre förberedelse inför glukosbelastningen och bättre informationsflöde mellan enheter.

Kvinnor förlösta 2003-2005 deltog i en uppföljningsstudie. Alla hade genomfört en OGTT under graviditeten. Olika gränsvärden för 2-tim kapillärt plasmaglukos användes, ≥10.0 mmol/L (GDM), 8.6-9.9 mmol/L (sänkt glukostolerans under graviditet, GIGT) och <8.6 mmol/L (normal glukostolerans under graviditet, kontroller). Vid uppföljningen 1-2 år efter förlossningen hade 11% (n=160) i GDM-gruppen, 4% (n=309) i GIGT-gruppen och ingen (n=167) i kontroll-gruppen diabetes. Vid diagnosen GIGT erbjöds en förnyad OGTT. Gruppen som vid förnyad test fick diagnosen GDM hade samma diabetesförekomst vid uppföljningen som den ursprungliga GDM-gruppen.

Förlossningsresultatet var försämrat för kvinnor med GDM och GIGT jämfört med kontroller, vilket sammanföll med ökat glukosvärde vid OGTT. Resultaten visade ökad förekomst av högt blodtryck under graviditet, fler igångsättningar av förlossning, fler akuta kejsarsnitt, fler stora barn för tiden, fler barn med Apgar score <7 vid 5 min efter förlossning, liksom ett större behov av neonatal intensivvård.

Kvinnor med GDM riskerade att behöva söka sjukvård mer än 3 gånger så ofta som kontrollerna, till en genomsnittligt 50% högre kostnad, vilket var tydligt upp till 7 år efter förlossningen.

Slutsats: Allmän decentraliserad OGTT i samband med graviditet identifierar alla med GDM, ger en chans att förbättra graviditetsutfallet och en möjlighet att tidigt informera kring livsstilsförändringar för att förbättra framtida hälsa.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to all those who have helped me and contributed in different ways to this work.

All you women, who participated in our studies and allowed me to use your test results and answered my questionnaires, thank you. There would have been no results without you.

Docent Kerstin Berntorp, my supervisor, for making it possible for me to fulfil the dream I have had for so long, and for helping, urging and supporting me all the way.

Docent Anders Åberg, my assistant supervisor and good friend in whose footsteps I have followed. Thank you for convincing me this was possible and for encouraging and believing in me from the first idea.

Docent Elizabeth Crang-Svalenius, my assistant supervisor who from the very start encouraged me.

Professor Karel Maršaĺ , who gave me the opportunity to return, and to take my first course on the road of science. Thank you, for your always very kind support. This is your "fault".

Docent Göran Lingman, head of our Department of Obstetrics and Gynaecology who made it possible for me to complete this work within my employment.

Docent Karin Källén for giving experienced and skilled help to me with all the statistical evaluations in Papers I, and IV and with the writing, especially when finishing Paper I.

PhD Katarina Steen-Carlsson, my inspiring teacher at the course in health economics and my assisting supervisor during Paper V. Your knowledge and help have been invaluable for this paper.

My co-author Anders Frid for contributions to Paper I and the Mamma-study, and Mona Landin-Olsson, Johan Kalén and Dag Ursing for contributions to the Mamma-study.

Margareta Larsson, Eva Cronsioe and all my friends at the Specialist Antenatal Clinic throughout the years, for interesting discussions, advice, help and support. Thank you!

All my midwife colleagues around Skåne who helped me by performing the tests and filling in all those lists. Thank you also for the support and encouragement I have experienced over the years.

Margit Bergström and Bertil Nilsson in Lund, Vera Gunnarsson in Malmö and Anneli Svensson in Helsingborg, who organised the follow-up tests; you have been such great help.

Finally, My Family, for always being there through the difficult years, having patience with me, for supporting and encouraging me and for listening. I love you all!

Thanks to the Foundations of the County of Skåne and the Research Funds of Lund and Malmö University Hospitals.

REFERENCES

1. Svensk förening för obstetrik och gynekologi (SFOG) och Svenska barnmorskeförbundet (SBF). Mödrahälsovård, sexuell och Reproduktiv hälsa (Maternal health care, sexuell and reproductive health): Stockholm: Svensk förening för obstetrik och gynekologi; 2008. Report nr.8 (in Swedish).
2. Åberg A. Gestational diabetes, screening, diagnosis and prognosis. Doctoral thesis, Lund University, Sweden.
3. Meyer, L. Svangerskabets patologi for læger og studerende. Gyldendalske Boghandeln Nordisk förlag. 1906;120-121.
4. Gabbe SG. Medical complications of pregnancy. Management of diabetes in pregnancy: Six decades of experience. In: Pittkon RM. Zlatnik FJ eds. The Yearbook or obstetrics and gynecology Chicago, London: Yearbook medical publishers. 1980;180:37-49.
5. Gellis S, Hsia D. The infant of the diabetic mother. A.M.A Diseases of children. 1959;97:1-41.Definition, diagnoses and classification of diabetes mellitus and its complications. WHO Geneva 1995.2.
6. Decisions adopted jointly by the European parliament and the council. Decision no 1350/2007/EC of the European parliament and of the council of 23 Oct. 2007 establishing a second programme of community action in the field of health (2008-13).
7. Regeringens proposition 2007/08:110. en förnyad folkhälsopolitik (in Swedish).
8. World Health Organization (1999). Definition, diagnosis, and classification of diabetes mellitus and its complications. Report of a WHO consultation. Part 1: Diagnosis and classification of diabetes mellitus. Geneva: World Health Organization.
9. Buchanan TA, Metzger BE, Freinkel N, Bergman RN. Insulin sensitivity and B-cell responsiveness to glucose during late pregnancy in lean and moderately obese women with normal glucose tolerance or mild gestational diabetes. Am J Obstet Gynecol. 1990;162:1008-1014.
10. Metzger B, Buchanan T, Coustan D, Leiva A, Dunger D, Hadden D, et al.. Summary and recommendations of the fifth international workshop-conference of gestational diabetes mellitus. Diabetes Care. 2007;30(suppl. 2):S251-S260).
11. Catalano PM. Carbohydrate metabolism and gestational diabetes. Clin Obstet Gynecol. 1994;37(1):25-28.

12. Sorensen RL, Brelje TC. Adaptation of islets of Langerhans to pregnancy: beta-cell growth, enhanced insulin secretion and the role of lactogenic hormones. Horm Metab Res. 1997;29(6):301-7.

13. Catalano PM Tyzbir ED, Wolfe RR, Roman NM, Amini SB, Sims EA. Longitudinell changes in basal hepatic glucose production and suppression during insulin infusion in normal pregnant women. Am J Obstet Gynecol. 1992;167(4 Pt 1):913-9.

14. Beck P, Daughaday WH. Human placental lactogen: Studies of is acute metabolic effects and disposition in normal man. J Clin Invest. 1967;1:103-110.

15. Catalano PM, Tyzbir ED, Roman NM, Amini SB, Sims EA. Longitudinal changes in insulin release and insulin resistance in nonobese pregnant women. Am J Obstet Gynecol. 1991;165 (6 PT 1):1667-72.

16. Handwerger S, Freemark M. The roles of placental growth hormone and placental lactogen in the regulation of human fetal growth and development. J Pediatr Endocrinol Metab. 2000;13(4):343-56.

17. Buchanan T, Xiang A, Kjos SL, Watanabe R. What is gestational diabetes? Diabetes Care. 2007;30(suppl 2):S105-S111.

18. Damm P. Gestational diabetes mellitus and subsequent development of overt diabetes mellitus. Dan Med Bull 1998;45:495-509.

19. Hadden DR. Geographic, ethnic and racial variations in the incidence of gestational diabetes mellitus. Diabetes. 1985; 34 (Suppl2):8-12.

20. Engelgau MM, Herman WH, Smith PJ, German RR, Aubert RE. The Epdemiology of diabetes and pregnancy in the U.S. 1988. Diabetes Care. 1995; 18:1029-33.

21. Clausen T D, Mathiesen E,. Ekbom P, Hellmut E, Mandrup-Poulsen T, Damm P. Poor pregnancy outcome in women with type 2 diabetes. Diabetes Care. 2005;28(2):323-328.

22. Åberg A, Westbom L, Källén B. Congenital malformations among infants whose mothers had gestational diabetes or pre-existing diabetes. Early Hum Dev. 2001;61(2):85-95.

23. Rice PA, Rourke JE, Nesbitt RE Jr. In vitro perfusion studies of the human placenta. VI. Evidence against active glucose transport. Am J Obstet Gynecol. 1979;133:649-55.

24. Stenger V, Henry J, Cestaric E, Eitzman D, Prystowsky H. Movements of glucose in the human pregnant uterus. Am J Obstet Gynecol. 1966;94:261-267.

25. Felig P, Coustan D. Diabetes mellitus. In Medical complications during pregnancy. Eds. G N Burrows & T. F. Ferris. 2nd ed. W. B. Saunders. Philadelphia. 1982.

26. Gillmer MD, Beard RW, Brook FM, Ojakey NW. Carbohydrate metabolism in pregnancy. Part II. Relation between Maternal glucose metabolism in the newborn. 1975;3:402-404.

27. Macintosh M, Fleming K, Bailey J, Doyle P, Modder J, Acolet D, Golightly S, Miller A. Perinatal mortality and congenital anomalies in babies of women with type 1 or type 2 diabetes in England, Wales and Northern Ireland: population based study. BMJ. 2006;333:177-80.

28. Blank A, Grave GD, Metzer BE: International NIH consensus conference: Adverse perinatal outcome of gestational diabetes mellitus. Diabetes Care. 1995;18:1227-1229.

29. Östlund I, Hansson U. Repeated random blood glucose measurements as universal screening test for Gestational Diabetes Mellitus. Acta Obst Gyn Scand. 2004; 83:46-51.

30. Åberg A, Rydström H, Frid A. Impaired glucose tolerance associated with adverse pregnancy outcome: A population-based study in southern Sweden. Am J Obstet Gynecol. 2001;184:77-83.

31. Langer O, Yogev Y, Most O. Gestational diabetes: the consequences of not treating. Am J Obstet et Gyn. 2005;192:989-97.

32. Åberg A, Westbom L. Association between maternal pre-existing or gestational diabetes and health problems of their children. Acta Paediatr. 2001;90(70):746-50.

33. Landon MB, Spong CY, Thom E, Carpenter MW, Ramin SM, Casey B et al. A multicenter, randomized trial of treatment for mild gestational diabetes. N Engl J Med. 2009; 361:1339-48.

34. Crowther C, Hiller J, Moss J, McPhee A, Jeffries W, Robinson J. Effect of Treatment of Gestational Diabetes Mellitus on Pregnancy Outcomes. N Engl J Med. 2005;352 (24):2477-86.

35. Brody S, Harris R, Lohr K. Screening for gestational diabetes: A summary of the evidence for the U.S. preventive service task force. 2003;101(2):380-392.

36. Aberg A, Jonsson E, Eskilsson I, Landin-Olsson M, Frid A. Predictive factors of developing diabetes mellitus in women with gestational diabetes. Acta Obstet Gynecol Scand. 2002;81:11-6.

37. Kim C, Newton KM, Knopp RH. Gestational diabetes and the incidence of type 2 diabetes: a systematic review. Diabetes care. 2002;25:1862-1868.

38. Lobner K, Knopff A, Baumgarten A, Mollenhauer U, Marienfeld S, Garrido-Franco M et al. Predictors of postpartum diabetes in women with gestational diabetes mellitus. Diabetes. 2006;55:792-7.

39. Schaefer-Graf UM, Buchanan TA, Xiang AH, Peters RK, Kjos SL. Clinical predictors for a high risk for the development of diabetes mellitus in the early puerperium in women with recent gestational diabetes mellitus. Am J Obstet Gynecol. 2002;186:751-6.

40. Golden S H, Bennet WL Baptita-Roberts K, Wilson LM, Barone B, Tiffany L et al. Gender Medicine. 2009;6:109-22.

41. Bellamy L, Casas J-P,Hingorani AD, Williams D. Lancet. 2009;373:1773-79.

42. Carr DB, Utzschneider KM, Hull RL, Tong J, Wallace TM, Kodama K et al. Gestational diabetes mellitus increases the risk of cardiovascular disease in women with a family history of type 2 diabetes. Diabetes Care. 2006;29(9):2078-83.

43. Lauenburg J, Mathiesen E, Hansen T, Glümer, Jørgensen T, Borch-Johnson K et al. The prevalence of Metabolic syndrome in a Danish population of women with previous gestational diabetes mellitus is three-fold higher than in the general population. J clin Endocrinol Metab. 2005;90(7):4004-4010.

44. Intensiv glukossänkande behandling vid diabetes. SBU-Statens beredning för medicinsk utvärdering. 2009. (Intensive glucose lowering treatment during diabetes. Swedish council on Technology assessment in health care). Available from www.sbu.se. (in Swedish).

45. Henriksson F, Agardh C-D, Berne C et al. Direct medical costs for patients with type 2 diabetes in Sweden. J Intern Med. 2000;248:387-96.

46. Ettaro L, Songer T, Zhang P & Engelgau M. Cost of illness studies in diabetes mellitus. Pharmacoeconomics. 2004;22:149-64.

47. Jonsson B. Revealing the cost of Type II diabetes in Europe. Diabetologia. 2002;45:S5-12.

48. Gerdtham U G, Clarke P, Hayes A & Gudbjornsdottir S. Estimating the cost of diabetes mellitus-related events from inpatient admissions in Sweden using administrative hospitalization data. Pharmacoeconomics. 2009;27:81-90

49. Bolin K, Gip C, Mörk AC, Lindgren B. Diabetes, healthcare cost and loss of productivity in Sweden 1987 and 2005-a register-based approach. Diabet Med. 2009;26:928-34

50. Lindholm C, Burström B, Diderichsen F. Does chronic illness cause adverse social and economic cosequences among Swedes? Scand J Public Health. 2001;29:63-70.

51. Rayce SL, Christensen U, Hougaard CO & Diderichsen F. Economic consequences of incident discease: the effect on loss of annual income. Scand J Public health. 2008;26:258-64.

52. Norlund A, Appelqvist J, Bitzén P-O et al. Cost of illness of adult diabetes mellitus underestimated if comorbidity is considered. Journal of Internal Medicine. 2001;250:57-65.

53. Hämäläinen H, Maki J, Virta L et al. Return to work after first myocardial infarction in 1991-1996 in Finland. Eur J Public Health. 2004;14:350-53.

54. Ringborg A, Yin D, Martinell M et al. The impact of acute myocardial infarction and stroke on health care costs in patients with type 2 diabetes in Sweden. European Journal of Cardiovascular prevention and Rehabilitation. 2009;16:576-82.

55. Ringborg A, Lindgren P, Martinell M et al. Prevalence and incidences of type 2 diabetes and its complications 1996-2003-estimated from a Swedish population-based study. Diabetic Medicine. 2008;25:1178-1186.

56. Clarke P, Gray A, Legood R, Briggs A, Holman R. The impact of diabetes-related complications on healthcare costs: results from the United Kingdom Prospective Diabetes Study (UKPDS Study No.65). Diabet Med. 2003;20:442-50

57. Brandle M, Zhou H, Smith B et al. The direct medical cost of type 2 diabetes. Diabetes care. 2003:26:2300-04.

58. Sigal R, Kennedy G, Boulé N, Wells G, Prud´homme D, Frontier M et al. Effects of aerobic training, resistance training or both on glycemic control in type 2 diabetes. Ann Intern Med. 2007;147:357-69.

59. Tuomilehto J, Lindström J, Eriksson J, Valle T, Hämäläinen H, Ilanne-Parikka P et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med. 2001;344(18):1343-50.

60. Ben-Haroush A, Yogev Y, Hod M. Epidemiology of gestational diabetes mellitus and its association with Type 2 diabetes. Diabet Med. 2004;21:103-13.

61. Pan X-R, Li G-W, Hu Y-H, Wang J-X, Yang W-Y, An Z-X et al. Effects of diet and exercises in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and diabetes study. Diabetes Care. 1997;20(4):537-544.

62. Stage E, Ronneby H, Damm P. Lifestyle changes after gestational diabetes. Diab Res Clin Pract. 2004;63:67-72.

63. Andersson DM, Keith J, Nova PD (Eds.) Mosby´s medical nursing & allied dictionary (6th ed.). St Louis, MO: Elsevier. 2002.

64. Jones EJ, Roche CC, Appel SJ. A review of health beliefs and lifestyle behaviors of women with previous gestational diabetes. J Obstet Gynecol Neonatal Nurs. 2009;38(5):516-26.

65. Person M, Winkvist A, Mogren I. Surprisingly low compliance to local guidelines for risk factor based screening for gestational diabetes mellitus-A population-based study. BMC Pregnancy and Childbirth. 2009;16:53.

66. Stephenson MJ. Screening for gestational diabetes mellitus: a critical review. J Fam Pract. 1993;37:277-283.

67. Marquette GP, Klein VR, Niebyl JR. Efficacy of screening for gestational diabetes. Am J Perinatol. 1985;2:7-9.

68. Weiner CP, Fraser MM, Burns JM, Cost efficacy of routine screening for diabetes in pregnancy: 1-h versus 2-h specimen. Diabetes Care. 1986;9:255-9.

69. Cousins L, Dattel BJ, Hollingworth DR, et.al. Glycosylated hemoglobine as a screening test for carbohydrate intolerance in pregnancy. Am J Obstet Gynecol 1984;150:455-60.

70. American diabetes association. Diagnoses and classifications of diabetes mellitus. Diabetes Care. 2010;33 (suppl.1):S62-S47.69).

71. Ekelund M, Shaat N, Almgren P, Groop L, Berntorp K. Prediction of postpartum diabetes in women with gestational diabetes mellitus. Dabetologia. 2010;53:45257.

72. Grandjean H, Sarramon MF, De Mouzon J, Reme JE, Pontonnier G. Detection of gestational diabetes by means of ultrasonic diagnosis of excessive fetal growth. Am J Obstet Gynecol. 1980;138:790-92.

73. Kakad R, Anwar A, Dyer P, Webber J, Dale J. Fasting Plasma Glucose is not Sufficient to Detect Ongoing Glucose Intolerance after Pregnancy Complicated by Gestational Diabetes. Exp Clin Endocrinol Diabetes. 2010;118(4):234-6.

74. Kwong S, Mitchell R, Senior P, Chik C. Postpartum Diabetes Screening. Adherence rate and the performance of fasting plasma glucose versus oral glucose tolerance test. Diabetes Care. 2009;32:2242-2244.

75. Carpenter MW and Coustan DR. Criteria for screening tests for gestational diabetes. Am J Obstet Gynecol. 1982;144:768-73.

76. O'Sullivan JB and Mahan CM. Criteria for the oral glucose tolerance test in pregnancy. Diabetes. 1964;13:278-85.

77. World Health Organization. Diabetes Mellitus: Report of a WHO Study Group. Tech. Rep. 1985. Ser No. 727:9-17.

78. Klimt CR, Prout TE, Bradley RF, Fisher G, Gastineau CF, Marks H et al. Standardization of the oral glucose tolerance test. Repost from the committee on statistics of the American Diabetes Association. Diabetes. 1969;18:299-310.

79. Agardh C-D, Berne C. Diabetes. Bolinder J. (Eds.) Hormonella och metabola undersökningar (pp. 249-59). 2009. Stockholm: Liber AB. (in Swedish).

80. Harlass FE, Brady K, Read JA. Reproducibility of the oral glucose tolerance test in pregnancy. J. Am. Obstet. Gynecol. 1991;164:564-568.

81. Schousboe K, Henriksen JE, Kyvik KO, Sorensen TIA, Petersen PH. Reproducibility of S-insulin and B-Glucose responses in two identical oral glucose tolerance tests. Scand. J. Clin. Lab. Invest. 2002;62:623-630.

82. Balion C, Raina P, Gerstein H, Santaguida L, Morrison K, Booker L et al. Reproducibility of impaired glucose tolerance (IGT) and impaired fasting

glucose (IFG) classification: a systematic review. Clin. Chem. Lab. Med. 2007;45:1180-1185.

83. Diagnoses and classification of diabetes mellitus. American diabetes association. Diabetes Care 2007;30(suppl 1)S42-S47.

84. Diagnoses and classification of diabetes mellitus. American diabetes association. Diabetes Care. 2010;33(suppl 1):S62-S69.

85. Lind T, Phillips PR. Influence of pregnancy on the 75-g OGTT. A prospective multicenter study. The Diabetic Pregnancy Study Group of the European Association for the Study of Diabetes. Diabetes 1991;40(Suppl 2):8-13.

86. Burnett RW, D'Orazio P, Fogh-Andersen N, Kuwa K, Kulpmann WR, Larsson L et al. IFCC recommendation on reporting results for blood glucose. Clin. Chim. Acta. 2001;307:205-209.

87. The hyperglycemia and adverse pregnancy outcome (HAPO) study. HAPO study cooperative research group.Intern J Gyneco Obstetr. 2002;78:69-77.

88. The HAPO study cooperative research group. Hyperglycemia and adverse pregnancy outcome. N engl J Med. 2008;358(19):1991-2002.

89. Sermer M, Naylor D, Gare D, Kenshole A, Ritchie J, Farine D et al.Impact of increasing carbohydrate intolerance on maternal-fetal outcomes in 3637 women without gestational diabetes. Am J Obstet Gynecol. 1995;173(1):146-56.

90. Sacks DA, Greenspoon JS, ABU-Fadil S, Henry HM, Wolde-Tsadic G, Yao JFF. Toward universal criteria for gestational diabetes: The 75-gram glucose tolerance test in pregnancy. Am J Obstet Gynecol. 1995;172:607-14.

91. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes care. 2010;33(3):676-682.

92. SOSFS 1998 Hälso- och sjukvårdslagen (National Board of Health and Welfare; The Law concerning Health and Medical care). 1982: 763. Socialstyrelsen, Stockholm, Sweden. (in Swedish).

93. Mitchell LM. Women's experiences of unexpected ultrasound findings. J Midwifery & Women's health. 2004:49(3):228-234.

94. Marteau M, Dormandy E, Michie S. A measure of informed choice. Health Expectations 2001;4:99-108.

95. Carr S. Screening for Gestational Diabetes. Diabetes Care. 1998;21:14-8.

96. Agardh C-D, Åberg A, Nordén N. Glucose levels and insulin secretion during a 75 g glucose challenge test in normal pregnancy. J Intern Med. 1996;240:303-9.

97. Lickert R. A technique for measurements of attitudes. Archives of Psychology. 1932;140:1-55.

98. Polit D, Hungler B. Nursing Research. Principles and Methods. Philadelphia: Lippincott Williams & Wilkins; 2004.

99. Altman D. Practical statistics for medical research. London: Chapman & Hill. 1991.

100. StataCorp. Stata: Release 11. Statistical software. College Station, TX: Stata Corp LP. 2009.

101. Anderberg E, Källén K, Berntorp K, Frid A Åberg A. A simplified oral glucose tolerance test in pregnancy: compliance and results. Acta Obstet Gynecol Scand. 2007;86:1432-1436.

102. Mager M, Farese G. What is "true" about blood glucose? A comparison of three procedures. Am J Clin Pathol. 1965;44:104.

103. Okamoto K, Ohsuka K, Shiraishi T, Hukazawa E, Wakasugi S, Furuta K. Comparability of epidemiological information between self- and interviewer-administrated questionnaires. J Clin Epidemiol. 2002;55:505-11.

104. Perneger TV, Chamot E, Bovier PA. Nonresponse bias in a survey of patient perceptions of hospital care. Med Care. 2005;43:374-80.

105. Whiddett R, Hunter I, Engelbrecht J, Handy J. Patients' attitudes towards sharing their health information. Int J Med Inform. 2006;75(7):530-41.

106. Mohanna K, Tunna K. Withholding consent to participate in clinical trials. Br J Obstet Gynaecol. 1999;106:892-7.

107. Baker L, Lavender T, Tincello D. Factors that influence Women's Decisions about whether to participate in research: An exploratory study. BIRTH. 2005;32:60-6.

108. Ekelin M. Parents' expectations, experiences and reactions to a routine ultrasound examination during pregnancy. 2008. Doctoral thesis, University of Lund, Sweden.

109. Larsson A-K. Parent's experiences and reactions when an unexpected finding in their foetus is revealed at a routine ultrasound examination – a multi method study. 2009. Doctoral thesis, University of Lund, Sweden.

110. Henricsson F, Jonsson B. Diabetes: the cost of illness in Sweden. J Intern Med. 1998;244:461-8.

111. Brown JB, Nichols GA, Glauber HS, Bakst AW. Type 2 diabetes: incremental medical care cost during the first 8 years after diagnosis. Diabetes Care. 1999;22:1116-24.

112. Jonsson PM, Markė L-Å, Nyström L, Wall S, Östman J. Excess costs of medical care 1 and 8 years after diagnosis of diabetes: estimate from young and middle-aged incidence cohorts in Sweden. Diabetes Res Clin Pract. 2000;50:35-47.

113. Damm P, Kühl C, Bertelsen A, Mølsted-Pedersen L. Predictive factors for the development of diabetes in women with previous gestational diabetes mellitus. Am J Obstet Gynecol. 1992;167:607-616.

114. Nowicka p, Lanke J, Pietrobelli A, Aptzsch E, Flodmark C-E. Sports camp with six months of support from a local sports club as a treatment for childhood obesity. Scand J Public Health. 2009;37:793-800.

115. Nowicka P, Pietrobelli A, Flodmark C-E. Low-intensity family therapy intervention is useful in a clinical setting to treat obese and extremely obese children. Int J Pediatr Obes. 2007;2:211-217.

116. Buchanan TA, Kjos SL. Counterpoint: Glucose monitoring in gestational diabetes. Diabetes Care, 2003;226(3):94.

117. Nationella riktlinjer för diabetesvården 2010. - Stöd för styrning och ledning. Socialstyrelsen 2010. (National guidelines for diabetes care 2010. – Support for guiding and leading. National board of Health and Welfare 2010.) (in Swedish).

APPENDIX 1

Information and questionnaires used in Study II

- Written information about the study handed out when inviting the women to participate in the study (in Swedish).
- Different questionnaire parts (all in Swedish)

  Pilot study

  Type 1 diabetes. Questionnaire part I (covering the time before the S-ANC)

  Type 1 diabetes. Questionnaire part II (covering pregnancy care at the S-ANC)

  Type 1 diabetes. Questionnaire part III (covering care at the delivery department and post-natal care at the hospital)

  Type 1 diabetes. Questionnaire part VI (covering the post-partum check-up after 6-8 weeks)

  GDM. Questionnaire part I (covering the time before the S-ANC)

  GDM. Questionnaire part II (covering pregnancy care at the S-ANC)

  GDM. Questionnaire part III (covering care in the delivery department and post-natal care at the hospital)

  GDM. Questionnaire part VI (covering care at the check-up after 6-8 weeks)

Patientinformation

Utvärdering av våden av gravida kvinnor som har eller får diabetes i samband med graviditet.

Alla kvinnor som har eller får diabetes i samband med graviditeten kommer i kontakt med specialist mödravårdsmottagningen i Lund. De mycket goda medicinska resultaten som vi får genom vården har visat s i flera undersökningar.

Däremot har vi inte frågat kvinnorna själv om deras tankar kring vården. Det grundschema för graviditetskontroller som gäller vid flertalet graviditeter kompletteras en hel del när man har diabetes, huvudsakligen genom tätare kontroller.

Vi undrar om du skulle vilja hjälpa oss genom att, i samband med ordinarie kontroller, vid tre tillfällen besvara våra enkäter. Deltagandet är helt frivilligt och dina svar är anonyma.

Med vänlig hälsning

Eva Jönsson	Anders Åberg	Margareta Larsson
Barnmorska	MD, ÖL,	Barnmorska
KK Lund	Spec. MVC	Spec. MVC
	KK Lund	KK Lund

0 = dåligt
5 = utmärkt

ENKÄT

PILOTPROJEKT – Del I-IV

1. Var presentationen, strukturen klar? Ja □ Nej □
2. Var någon fråga svår att förstå? Ja □ Nej □
3. Vilken/vilka och varför?

_____

_____

_____

_____

_____

4. Kändes någon fråga onödig? Ja □ Nej □
5. Vilken/vilka och varför?

_____

_____

_____

_____

_____

6. Fattades någon fråga? Ja □ Nej □
7. Vilken/vilka?

_____

_____

_____

0 = dåligt
5 = utmärkt

ENKÄT Diabetes mellitus

Del I **Lämnad under spec-tiden**

A.

1. Har du varit i kontakt med din diabetesläkare för att diskutera inför denna graviditet? Ja □ Nej □

2. Om ja, fick du information om vikten av bra blodsocker-kontroll? Ja □ Nej □

3. Fick du information om vart du skulle vända dig när du blev gravid? Ja □ Nej □

4. Är du nöjd med informationen inför graviditet? 0 1 2 3 4 5

5. Upplevde du respekt för dina åsikter? 0 1 2 3 4 5

6. Kände du eget ansvar och delaktighet i de beslut som togs? 0 1 2 3 4 5

Vi är tacksamma om du har förslag på hur informationen och förberedelsen inför graviditet kan förbättras?

Förslag.

_____

_____

B. PERINATALAVDELNING 44 (under graviditeten)

1. Fick du tillräcklig information vid ankomsten om vad som skulle ske vid vistelsen på Perinatalavdelning 44? Ja □ Nej □

2. Fick du veta vem du kunde kontakta, medan du var på avdelningen, om du undrade något? Ja □ Nej □

3. Var informationen kring blodsockerprovtagningen tillräcklig? 0 1 2 3 4 5

4. Var informationen kring hur glukometern skall användas och skötas tillräcklig? 0 1 2 3 4 5

5. Är du nöjd med information vid mötet med barnmorskorna? 0 1 2 3 4 5

6. Är du nöjd med information vid mötet med läkarna? 0 1 2 3 4 5

7. Har du fått tillräcklig information om speciella risker och hänsyn som måste tas i samband med graviditeten utifrån din diabetessjukdom? 0 1 2 3 4 5

0 = dåligt
5 = utmärkt

8. Fick du veta vart du skulle vända dig om problem uppstod med graviditeten när du kommit hem? Ja □ Nej □

9. Är du nöjd med information vid mötet med dietisten? 0 1 2 3 4 5

10. Fick du veta vart du skulle vända dig om problem uppstod med kosten? Ja □ Nej □

11. Fick du tillräckligt med tid, uppmärksamhet, på avdelningen? 0 1 2 3 4 5

12. Kände du dig väl omhändertagen på avdelningen? 0 1 2 3 4 5

13. Upplevde du respekt för dina åsikter? 0 1 2 3 4 5

14. Kände du eget ansvar och delaktighet i vården och i de beslut som togs? 0 1 2 3 4 5

15. Blev du informerad om den fortsatta vården och vad den skulle innebära? Ja □ Nej □

16. Fick du reda på var fortsatta kontroller skulle ske? Ja □ Nej □

17. Fick du tid till nästa besök? Ja □ Nej □

18. Är du nöjd med informationen du fick i samband med vården på Perinatalavdelning 44? 0 1 2 3 4 5

19. Är du nöjd med bemötandet i samband med vården på Perinatal avdelning 44? 0 1 2 3 4 5

Vi är tacksamma för dina förslag på hur vården för gravida kvinnor med diabetes skulle kunna förbättras på Perinatalavdelning 44?

Förslag.

_____

_____

0 = dåligt
5 = utmärkt

ENKÄT Diabetes mellitus
Del II **Lämnas under BB-tiden**

C. SPECIALISTMÖDRAVÅRDEN (Graviditets kontroller)

1. Har tillgängligheten till specialistmottagningen motsvarat dina behov (t.ex. telefonkontakt, besökstider)? 0 1 2 3 4 5

2. Har du fått tillräckligt med tid, uppmärksamhet? 0 1 2 3 4 5

3. Kände du eget ansvar och delaktig i de beslut som tagits? 0 1 2 3 4 5

4. Upplevde du respekt för dina åsikter? 0 1 2 3 4 5

5. Innebar de utökade kontrollerna problem för dig? Ja □ Nej □

På vad sätt? _____

6. Kände du dig väl omhändertagen? 0 1 2 3 4 5

7. Är du nöjd med den information du fått på specialistmödravårds-mottagningen kring diabetessjukdomen, graviditeten och förlossningen? 0 1 2 3 4 5

8. Är du nöjd med bemötandet du fått på specialistmödravårds-mottagningen? 0 1 2 3 4 5

Vi är tacksamma för dina förslag på hur vården för gravida kvinnor med diabetes skulle kunna förbättras på Specialistmödravårdsmottagningen?

Förslag:

_____

_____

D. FÖRLOSSNINGEN

1. Kände du dig väl förberedd inför förlossningen? 0 1 2 3 4 5

2. Hade du fått tillräcklig information om vad som skulle ske med hänsyn till din diabetessjukdom? 0 1 2 3 4 5

3. Fick du tillräcklig information under förlossningen med hänsyn till din diabetes? 0 1 2 3 4 5

4. Kände du dig väl omhändertagen? 0 1 2 3 4 5

5. Har du fått tillräckligt med tid, uppmärksamhet, med tanke på din sjukdom? 0 1 2 3 4 5

0 = dåligt
5 = utmärkt

6. Upplevde du eget ansvar och delaktig i de beslut som togs? 0 1 2 3 4 5

7. Upplevde du respekt för dina åsikter? 0 1 2 3 4 5

8. Är du nöjd med bemötandet i samband med vården på förlossningsavdelningen? 0 1 2 3 4 5

Vi är tacksamma för dina förslag på hur vården för kvinnor med diabetes skulle kunna förbättras på Förlossningsavdelningen?

Förslag:

_____

_____

0 = dåligt
5 = utmärkt

ENKÄT Diabetes mellitus
Del III Lämnas och besvaras vid efterkontrollen

F. PERINATALAVDELNING 44 (Efter förlossningen)

1. Kände du dig väl förberedd inför tiden efter förlossningen?	0 1 2 3 4 5
2. Hade du fått tillräcklig information om vad som skulle ske med hänsyn till din diabetessjukdom?	0 1 2 3 4 5
3. Hade du fått information om speciell vård av barnet efter förlossningen?	0 1 2 3 4 5
4. Kände du dig väl omhändertagen?	0 1 2 3 4 5
5. Har du fått tillräckligt med tid, uppmärksamhet, med tanke på din sjukdom?	0 1 2 3 4 5
6. Upplevde du eget ansvar och delaktig i de beslut som togs?	0 1 2 3 4 5
7. Upplevde du respekt för dina åsikter?	0 1 2 3 4 5
8. Är du nöjd med bemötandet i samband med vården på Perinatalavdelning 44?	0 1 2 3 4 5

Vi är tacksamma för dina förslag på hur vården för kvinnor med diabetes skulle kunna förbättras på Perinatalavdelning 44 vid vårdtiden efter förlossningen .

Förslag:

_____

_____

G. SPECIALISTMÖDRAVÅRDEN (Efterkontroll)

1. Var du informerad om vad som skulle ske vid detta besöket?	0 1 2 3 4 5
2. Fick du en bra genomgång av graviditeten och förlossningsförloppet?	0 1 2 3 4 5
3. Fick du tillräcklig information om preventivmetod även utifrån din sjukdom?	0 1 2 3 4 5
4. Fick du tillräcklig information om fortsatta kontroller av din diabetes sjukdom?	0 1 2 3 4 5

0 = dåligt
5 = utmärkt

5. Fick du tillräcklig information och råd inför en eventuell kommande graviditet? 0 1 2 3 4 5

6. Fick du fått tillräckligt med tid? 0 1 2 3 4 5

7. Upplevde du eget ansvar och delaktig i de beslut som togs? 0 1 2 3 4 5

8. Kände du respekt för dina åsikter? 0 1 2 3 4 5

9. Hur har din kontakt varit med diabetesläkaren under graviditeten, förlossningen och BB-tiden.

tillgänglighet 0 1 2 3 4 5
kontinuitet 0 1 2 3 4 5

Vi är tacksamma för dina förslag på hur vården skulle kunna förbättras för kvinnor med diabetes vid efterkontrollen.

Förslag:

_____

_____

0 = dåligt
5 = utmärkt

ENKÄT Diabetes mellitus

Del IV **Lämnas och besvaras vid efterkontrollen**

1. Hade du skrivit vårdplan? Ja □ Nej □

Varför/varför inte? _____

_____

2. På vilka enheter frågade personalen efter den? _____

_____

3. Innefattade den vården under graviditeten? Ja □ Nej □

Varför/varför inte? _____

_____

4. Innefattade den vården under förlossningen

Varför/varför inte? _____

_____

5. Innefattade den vården under BB-tiden? Ja □ Nej □

Varför/varför inte? _____

_____

6. Har information om beslut och önskemål rörande dig vidare befordrats mellan de olika enheterna? 0 1 2 3 4 5

Kommentar _____

7. Har du upplevt kontinuitet i besluten kring din vård genom de olika enheterna? 0 1 2 3 4 5

Kommentar _____

8. Har olika personer du mött varit insatta i rutinerna? 0 1 2 3 4 5

Kommentar _____

9. Har din ankomst varit känd och planerad? 0 1 2 3 4 5

Kommentar _____

10. Har personalen varit beredd att svara på dina frågor? 0 1 2 3 4 5

Kommentar _____

0 = dåligt
5 = utmärkt

11. Har rutiner kring provtagningar fungerat? 0 1 2 3 4 5

Kommentar _____

12. Har den information du fått på olika enheter varit

a. adekvat Ja □ Nej □

b. tillräcklig för att kunna ta ställning inför beslut om din vård Ja □ Nej □

c. lätt att förstå Ja □ Nej □

d. kommit vid rätt tidpunkt Ja □ Nej □

Om nej på någon av frågorna, på vad sätt? När? _____

_____

_____

0 = dåligt
5 = utmärkt

ENKÄT Gestationsdiabetes
Del I **Lämnad under spec-tiden**

A. MHV

1. Fick du i förväg veta hur glukosbelastningen skulle gå till? 0 1 2 3 4 5
2. Visste du vad resultatet kunde innebära? 0 1 2 3 4 5
3.Förstod du informationen efter belastningen? 0 1 2 3 4 5
4. Fick du bra information om fortsatta vården? 0 1 2 3 4 5
5. Fick du veta vart du skulle vända dig framöver? Ja □ Nej □
6. Fick du tillräckligt med tid? 0 1 2 3 4 5
7. Kände du dig väl omhändertagen? 0 1 2 3 4 5
8. Upplevde du eget ansvar och delaktighet i beslut som togs? 0 1 2 3 4 5
9. Upplevde du respekt för dina åsikter? 0 1 2 3 4 5
10. Kände du dig väl omhändertagen? 0 1 2 3 4 5
11. Är du nöjd med den information du fått på barnmorske-mottagningen i samband med belastningen? 0 1 2 3 4 5
12. Är du nöjd med bemötandet du fått på barnmorske-mottagningen i samband med belastningen? 0 1 2 3 4 5

Vi är tacksamma för dina förslag på hur omhändertagandet i samband med glukosbelastningen skulle kunna förbättras.
Förslag:

_____

_____

B. SPECIALISTMÖDRAVÅRDEN **(Tisdagen)**

1. Hade du fått tillräcklig information om vad som skulle ske vid besöket? 0 1 2 3 4 5
2. Var informationen kring blodsockerprovtagningen tillräcklig? 0 1 2 3 4 5
3. Var informationen om hur glukometern skall användas och skötas tillräcklig? 0 1 2 3 4 5

0 = dåligt
5 = utmärkt

4. Fick du veta vart du skulle vända dig om problem uppstod när du kommit hem? Ja □ Nej □

5. Fick du reda på var fortsatta kontroller skulle ske? Ja □ Nej □

6. Fick du tid till nästa besök? Ja □ Nej □

C. SPECIALISTMÖDRAVÅRDEN (Onsdagen)

1. Är du nöjd med information vid mötet med dietisten? 0 1 2 3 4 5

2. Fick du veta vart du skulle vända dig om problem uppstod med kosten när du kommit hem? 0 1 2 3 4 5

3. Är du nöjd med informationen vid mötet med KK-läkaren? 0 1 2 3 4 5

4. Är du nöjd med informationen vid mötet med diabetes läk? 0 1 2 3 4 5

5. Har du fått tillräcklig information om speciella risker och hänsyn som måste tas utifrån diabetessjukdomen i samband med graviditet? 0 1 2 3 4 5

6. Blev du informerad om den fortsatta vården och vad den skulle innebära? 0 1 2 3 4 5

7. Fick du veta vart du skulle vända dig om problem uppstod med graviditeten när du kommit hem? Ja □ Nej □

8. Är du nöjd med information vid mötet med barnmorskan? 0 1 2 3 4 5

9. Fick du reda på var fortsatta kontroller skulle ske? Ja □ Nej □

10. Fick du tid till nästa besök? Ja □ Nej □

11. Fick du tillräckligt med tid vid besöken dessa två dagar? 0 1 2 3 4 5

12. Kände du dig väl omhändertagen? 0 1 2 3 4 5

13. Upplevde du respekt för dina åsikter? 0 1 2 3 4 5

14. Kände du eget ansvar och delaktighet i vården och i de beslut som togs? 0 1 2 3 4 5

15. Är du nöjd med bemötandet i samband med besöken? 0 1 2 3 4 5

Vi är tacksamma för dina förslag på hur vården skulle kunna förbättras vid dessa besöken.
Förslag. _____

_____

0 = dåligt
5 = utmärkt

ENKÄT Gestationsdiabetes
Del II **Lämnad under BB-tiden**

D. SPECIALISTMÖDRAVÅRDEN (övriga graviditets kontroller)

1. Har tillgängligheten till specialistmottagningen motsvarat dina behov (t.ex. telefonkontakt, besökstider)? 0 1 2 3 4 5

2. Har du fått tillräckligt med tid, uppmärksamhet? 0 1 2 3 4 5

3. Kände du eget ansvar och delaktighet i de beslut som togs? 0 1 2 3 4 5

4. Upplevde du respekt för dina åsikter? 0 1 2 3 4 5

5. Innebar de utökade kontrollerna problem för dig? Ja □ Nej □

På vad sätt _____

6. Kände du dig väl omhändertagen? 0 1 2 3 4 5

7. Är du nöjd med den information du fått på specialist-mödravårdsmottagningen kring diabetessjukdomen, graviditeten och förlossningen? 0 1 2 3 4 5

8. Är du nöjd med bemötandet du fått på specialist mödravårdsmottagningen? 0 1 2 3 4 5

Vi är tacksamma för dina förslag på hur vården på specialistmödravårdsmottagningen skulle kunna förbättras.
Förslag:

_____

_____

E. FÖRLOSSNINGEN

1. Kände du dig väl förberedd inför förlossningen? 0 1 2 3 4 5

2. Hade du fått tillräcklig information om vad som skulle ske med hänsyn till din diabetessjukdom? 0 1 2 3 4 5

3. Fick du tillräcklig information under förlossningen med hänsyn till din diabetes? 0 1 2 3 4 5

4. Kände du dig väl omhändertagen? 0 1 2 3 4 5

5. Fick du tillräckligt med tid, uppmärksamhet, med tanke på din sjukdom? 0 1 2 3 4 5

0 = dåligt
5 = utmärkt

6. Upplevde du eget ansvar och delaktig i de beslut som togs? 0 1 2 3 4 5

7. Upplevde du respekt för dina åsikter? 0 1 2 3 4 5

8. Är du nöjd med bemötandet i samband med vården på förlossningsavdelningen? 0 1 2 3 4 5

Vi är tacksamma för dina förslag på hur vården för kvinnor med diabetes skulle kunna förbättras på Förlossningsavdelningen.
Förslag:

_____

_____

0 = dåligt
5 = utmärkt

ENKÄT Gestationsdiabetes

Del III **Lämnas och besvaras vid efterkontrollen**

F. PERINATALAVDELNING 44 (Efter förlossningen)

1. Kände du dig väl förberedd inför tiden efter förlossningen?	0 1 2 3 4 5
2. Hade du fått tillräcklig information om vad som skulle ske med hänsyn till din diabetessjukdom?	0 1 2 3 4 5
3. Hade du fått information om speciell vård av barnet efter förlossningen?	0 1 2 3 4 5
4. Kände du dig väl omhändertagen?	0 1 2 3 4 5
5. Har du fått tillräckligt med tid, uppmärksamhet, med tanke på din sjukdom?	0 1 2 3 4 5
6. Upplevde du eget ansvar och delaktig i de beslut som togs?	0 1 2 3 4 5
7. Upplevde du respekt för dina åsikter?	0 1 2 3 4 5
8. Är du nöjd med bemötandet i samband med vården på Perinatalavdelning 44?	0 1 2 3 4 5

Vi är tacksamma för dina förslag på hur vården för kvinnor med diabetes skulle kunna förbättras på Perinatalavdelning 44 vid vårdtiden efter förlossningen.

Förslag:

_____

_____

0 = dåligt
5 = utmärkt

G. SPECIALISTMÖDRAVÅRDEN (Efterkontroll)

1. Var du informerad om vad som skulle ske vid detta besöket? 0 1 2 3 4 5

2. Fick du en bra genomgång av graviditeten och förlossningsförloppet? 0 1 2 3 4 5

3. Fick du tillräcklig information om preventivmetod även utifrån din sjukdom? 0 1 2 3 4 5

4. Fick du information, om särskild hänsyn för din framtida hälsa, med tanke på ditt anlag för diabetes? 0 1 2 3 4 5

5. Fick du tillräcklig information och råd inför en eventuell kommande graviditet? 0 1 2 3 4 5

6. Fick du tillräckligt med tid? 0 1 2 3 4 5

7. Upplevde du eget ansvar och delaktig i de beslut som togs? 0 1 2 3 4 5

8. Kände du respekt för dina åsikter? 0 1 2 3 4 5

9. Hur har din kontakt varit med diabetesläkaren under graviditeten, förlossningen och BB-tiden.

tillgänglighet 0 1 2 3 4 5
kontinuitet 0 1 2 3 4 5

Vi är tacksamma för dina förslag på hur vården skulle kunna förbättras för kvinnor med diabetes vid efterkontrollen.

Förslag:

_____

_____

0 = dåligt
5 = utmärkt

ENKÄT Gestationsdiabetes

Del IV **Lämnas och besvaras vid efterkontrollen**

1. Hade du skrivit vårdplan? Ja □ Nej □

Varför/varför inte? _____

_____

2. På vilka enheter frågade personalen efter den? _____

_____

3. Innefattade den vården under graviditeten? Ja □ Nej □

Varför/varför inte? _____

_____

4. Innefattade den vården under förlossningen

Varför/varför inte? _____

_____

5. Innefattade den vården under BB-tiden? Ja □ Nej □

Varför/varför inte? _____

_____

6. Har information om beslut och önskemål rörande dig vidare befordrats mellan de olika enheterna? 0 1 2 3 4 5

Kommentar _____

7. Har du upplevt kontinuitet i besluten kring din vård genom de olika enheterna? 0 1 2 3 4 5

Kommentar _____

8. Har olika personer du mött varit insatta i rutinerna? 0 1 2 3 4 5

Kommentar _____

9. Har din ankomst varit känd och planerad? 0 1 2 3 4 5

Kommentar _____

10. Har personalen varit beredd att svara på dina frågor? 0 1 2 3 4 5

Kommentar _____

0 = dåligt
5 = utmärkt

11. Har rutiner kring provtagningar fungerat? 0 1 2 3 4 5

Kommentar _____

12. Har den information du fått på olika enheter varit

a. adekvat Ja □ Nej □

b. tillräcklig för att kunna ta ställning inför beslut om din vård Ja □ Nej □

c. lätt att förstå Ja □ Nej □

d. kommit vid rätt tidpunkt Ja □ Nej □

Om nej på någon av frågorna, på vad sätt? När?_____

_____

_____

APPENDIX 2

Written information used during Study III

All information was available in Swedish, Serbian-Croatian and Arabic.

- First information about the Mamma study, distributed at the antenatal clinics
- Invitation to participate, including the possibility of signing a consent form
- Specific information for the three groups, gestational diabetes, gestational impaired glucose tolerance and normal glucose tolerance

Protocol used at the follow-up 1-2 years after delivery.

Förberedande information Mammastudien

Till alla blivande mammor i Skåne
Information om forskningsprojektet Graviditetsdiabetes i Skåne "Mammastudien"

Du har samtidigt med detta brev fått information om Teddy-studien vars avsikt är att utarbeta nya metoder för att bestämma faktorer som kan förutsäga vilka barn som riskerar att få insulinberoende diabetes (typ 1 diabetes). Du har också fått information om den rutinmässiga glukosbelastning som görs på alla gravida i Skåne. Diabetes som utvecklas under graviditet kallas för graviditetsdiabetes. När graviditeten är avslutad blir sockervärdena oftast normala men det föreligger en ökad risk att senare i livet få diabetes, främst då s k vuxendiabetes (typ 2 diabetes). Vi har idag otillräcklig kunskap om vilka faktorer som innebär ökad sjukdomsrisk. Med förhoppning om att i framtiden bättre kunna förutsäga vem som kommer att drabbas pågår nu en noggrann 5-års uppföljning av alla gravida kvinnor i Skåne. Vi erbjuder därvid bl a en förnyad glukosbelastning 1, 3 samt 5 år efter avslutad graviditet.

Med anledning av Teddy-studien tas i samband med förlossningen blodprov på dig och ditt barn som sedan kan analyseras för att bestämma antikroppar och ärftliga faktorer av betydelse för utveckling av typ 1 diabetes. Det blodprov som togs på dig kan också användas för senare analys av ärftliga faktorer som kan ha betydelse för utveckling av typ 2 diabetes.

Att delta i Graviditetsdiabetes-studien innebär

- att vi analyserar mammas blodprov med avseende på antikroppar samt för identifiering av olika arvsanlag (gener) som kan medföra ökad risk för diabetesinsjuknande
- att vi tar del av analysresultatet i Teddy, men enbart under förutsättning att Du godkänt ditt deltagande i Teddy
- att Du kallas till glukosbelastning 1, 3 samt 5 år efter avslutad graviditet (OBS! Bland de som uppvisat en helt normal glukosbelastning under graviditet kallas enbart var tjugonde kvinna till ombelastning.)

Du kommer att delges resultatet av den efterföljande glukosbelastningen i direkt anslutning till undersökningen och eventuella avvikelser kommer att följas upp och behandlas enligt gängse rutiner. Du kommer däremot inte att delges resultaten av de immunologiska och genetiska analyserna eftersom vi i dagsläget saknar kunskap om den riskökning som en eventuell avvikelse innebär för den enskilde individen.

Att vara med i Graviditetsdiabetes-studien är naturligtvis helt frivilligt och Du kan avbryta ditt deltagande när som helst. Alla uppgifter behandlas konfidentiellt och enskilda personer kan inte spåras i kommande forskningsrapporter. Du får gärna kontakta någon av oss om Du har kompletterande frågor. Vi återkommer med en definitiv inbjudan till deltagande i Graviditesdiabetes-studien en tid efter förlossningen.

Dr Kerstin Berntorp	Dr Anders Frid	Dr Anders Åberg	Eva Anderberg
Endokrinkliniken	Endokrinkliniken	Kvinnokliniken	Barnmorska, KK
Malmö	Malmö	Lund	Lund
Tel: 040 - 33 10 00	Tel: 040-33 10 00	Tel: 046-17 25 20	Tel: 046-17 79 75

Om Du ej förstår svenska så be någon i Din omgivning att kontakta Eva Anderberg, tel 046 - 177975.
If you don't understand Swedish, please ask someone to contact Eva Anderberg, tel 046 - 177975.

Inbjudan
Mammastudien

Till alla nyblivna mammor i Skåne
Information om forskningsprojektet Graviditetsdiabetes i Skåne – "Mammastudien"

Du har tidigare fått information om Graviditetsdiabetes-studien samt innebörden av graviditetsdiabetes. Om diabetes utvecklas under graviditet brukar blodsockervärdena bli normala igen efter förlossning. Risken är dock stor att sjukdomen återkommer senare. Vi har idag otillräcklig kunskap om vilka faktorer som innebär ökad sjukdomsrisk. Vår förhoppning med graviditetsdiabetes-studien är att i framtiden bättre kunna förutsäga vilka kvinnor som riskerar att drabbas av framtida diabetessjukdom, främst s k vuxendiabetes (typ 2 diabetes). Samtidigt pågår studien Teddy som syftar till att bestämma faktorer som kan förutsäga vilka barn som riskerar att få insulinberoende diabetes (typ 1 diabetes).

Med anledning av Teddy togs i samband med förlossningen blodprov på dig och ditt barn som sedan kan analyseras för att bestämma antikroppar och ärftliga faktorer av betydelse för utveckling av typ 1 diabetes. Det blodprov som togs på dig kan också användas för analys av ärftliga faktorer som kan ha betydelse för utveckling av typ 2 diabetes.

Att delta i Graviditetsdiabetes-studien innebär

- att vi analyserar mammas blodprov med avseende på antikroppar samt för identifiering av olika arvsanlag (gener) som kan medföra ökad risk för diabetesinsjuknande
- att vi tar del av analysresultatet i Teddy, men enbart under förutsättning att Du godkänt ditt deltagande i Teddy
- att Du kallas till glukosbelastning 1, 3 samt 5 år efter avslutad graviditet (OBS! Bland de som uppvisat en helt normal glukosbelastning under graviditet kallas enbart var tjugonde kvinna till ombelastning.)

Du kommer att delges resultatet av den efterföljande glukosbelastningen i direkt anslutning till undersökningen och eventuella avvikelser kommer att följas upp och behandlas enligt gängse rutiner. Du kommer däremot inte att delges resultaten av de immunologiska och genetiska analyserna eftersom vi i dagsläget saknar kunskap om den riskökning som en eventuell avvikelse innebär för den enskilde individen.

Att vara med i Graviditetsdiabetes-studien är naturligtvis helt frivilligt och Du kan avbryta ditt deltagande när som helst. Alla uppgifter behandlas konfidentiellt och enskilda personer kan inte spåras i kommande forskningsrapporter. Du får gärna kontakta någon av oss om Du har kompletterande frågor.

Vi hoppas att Du vill delta i Graviditetsdiabetes-studien. Även om Du väljer att ej delta ber vi dig skriva under detta papper och bifoga det i svarskuvertet. **OBS! Glöm inte fylla i rutan Etnisk bakgrund längs ner!**

Dr Kerstin Berntorp	Dr Anders Frid	Dr Anders Åberg	Eva Anderberg
Endokrinkliniken	Endokrinkliniken	Kvinnokliniken	Barnmorska, KK
Malmö	Malmö	Lund	Lund
Tel: 040 - 33 10 00	Tel: 040-33 10 00	Tel: 046-17 25 20	Tel: 046-17 79 75

Om Du ej förstår svenska så be någon i Din omgivning att kontakta Eva Anderberg, tel 046 - 177975.
If you don't understand Swedish, please ask someone to contact Eva Anderberg, tel 046 - 177975.

Vill delta i Graviditetsdiabetes-studien ☐ *Vill inte delta i studien* ☐ *Datum*.....

Personnummer.....*Namn*.....

Jag hade graviditetsdiabetes ☐ Jag hade gränsvärden och fick göra ny belastning ☐

Min glukosbelastning var bra ☐

Från vilket land
kommer din mamma? .....
Från vilket land
kommer din pappa? .....

Jag har gått på barnmorskemottagningen på/i

.....

Normala värden
Mammastudien

Information till nyblivna mammor med normal sockerbelastning under graviditet och som tackat ja till deltagande i studien Graviditetsdiabetes i Skåne – ”Mammastudien”

I samband med graviditeten genomgick Du en sockerbelastning på mödravårdscentralen i syfte att fastställa eventuell diabetesdiagnos (sockersjuka). Diabetes som utvecklas under graviditet kallas för graviditetsdiabetes. När graviditeten är avslutad blir sockervärdena oftast normala men det föreligger en ökad risk att senare i livet få diabetes, främst då s k vuxendiabetes (typ 2 diabetes). Vi har idag otillräcklig kunskap om vilka faktorer som innebär ökad sjukdomsrisk. Som tidigare nämnts är vår förhoppning med Graviditetsdiabetes-studien att i framtiden bättre kunna förutsäga vem som kommer att drabbas av diabetessjukdom. För att rätt kunna bedöma resultaten måste vi även följa kvinnor med normal sockeromsättning under graviditet. Därför inbjuder vi även Dig att deltaga i studien. Du kommer därvid att kallas till en förnyad glukosbelastning 1, 3 samt 5 år efter avslutad graviditet.

Sockerbelastningen utföres på likartat sätt som när Du var gravid. Du får dricka en sockerlösning och via en fin plastkateter i armvecket tas sedan blodprov vid 4 tillfällen under 2 timmar för bestämning av blodsocker och insulin. Insulinnivån användes som ett mått på hur mycket insulin bukspottskörteln kan tillverka.

Du kommer i god tid att få meddelande om exakt plats och tidpunkt för undersökningen. I förberedelserna ingår att man gärna bör försöka äta regelbundna måltider de närmaste 3 dagarna före belastning och i övrigt leva som vanligt. Efter kl 22.00 kvällen före får Du inte äta eller dricka någonting. Du bör också avstå från att röka undersökningsdagens morgon.

Deltagandet i uppföljningen är naturligtvis helt frivillig och Du kan när som helst avbryta Ditt deltagande. Alla uppgifter behandlas konfidentiellt och enskilda personer kan inte spåras i kommande forskningsrapporter. Du får gärna kontakta någon av oss om Du har fler frågor eller önskar mer information.

Dr Kerstin Berntorp	Dr Anders Frid	Dr Anders Åberg	Eva Anderberg
Endokrinkliniken	Endokrinkliniken	Kvinnokliniken	Barnmorska, KK
Malmö	Malmö	Lund	Lund
Tel: 040 - 33 10 00	Tel: 040-33 10 00	Tel: 046-17 25 20	Tel: 046-17 79 75

Om Du ej förstår svenska så be någon i Din omgivning att kontakta Eva Anderberg, tel 046 - 177975.
If you don´t understand Swedish, please ask someone to contact Anderberg, tel 046 - 177975.

Gränsvärden Mammastudien

Information till nyblivna mammor med gränsvärden vid sockerbelastning under graviditet och som tackat ja till deltagande i studien Graviditetsdiabetes i Skåne "Mammastudien"

I samband med graviditeten genomgick Du en sockerbelastning på mödravårdscentralen i syfte att fastställa eventuell diabetesdiagnos (sockersjuka). Diabetes som utvecklas under graviditet kallas för graviditetsdiabetes. När graviditeten är avslutad blir sockervärdena oftast normala men det föreligger en ökad risk att senare i livet få diabetes, främst då s k vuxendiabetes (typ 2 diabetes). Vi har idag otillräcklig kunskap om vilka faktorer som innebär ökad sjukdomsrisk. Som tidigare nämnts är vår förhoppning med Graviditetsdiabetes-studien att i framtiden bättre kunna förutsäga vem som kommer att drabbas av diabetessjukdom. I samband med graviditeten uppvisade Du gränsvärden för graviditetsdiabetes, d v s blodsocker mitt emellan normalt och graviditetsdiabetes. Mycket tyder på att även kvinnor med s k gränsdiabetes under graviditet löper en ökad risk att i framtiden drabbas av diabetes. Vi vill därför erbjuda även Dig samma uppföljning som de med graviditetsdiabetes. Du kommer därvid att kallas till en förnyad glukosbelastning 1, 3 samt 5 år efter avslutad graviditet.

Sockerbelastningen utföres på likartat sätt som när Du var gravid. Du får dricka en sockerlösning och via en fin plastkateter i armvecket tas sedan blodprov vid 4 tillfällen under 2 timmar för bestämning av blodsocker och insulin. Insulinnivån användes som ett mått på hur mycket insulin bukspottskörteln kan tillverka.

Du kommer i god tid att få meddelande om exakt plats och tidpunkt för undersökningen. I förberedelserna ingår att man gärna bör försöka äta regelbundna måltider de närmaste 3 dagarna före belastning och i övrigt leva som vanligt. Efter kl 22.00 kvällen före får Du inte äta eller dricka någonting. Du bör också avstå från att röka undersökningsdagens morgon.

Deltagandet i uppföljningen är naturligtvis helt frivillig och Du kan när som helst avbryta Ditt deltagande. Alla uppgifter behandlas konfidentiellt och enskilda personer kan inte spåras i kommande forskningsrapporter. Du får gärna kontakta någon av oss om Du har fler frågor eller önskar mer information.

Dr Kerstin Berntorp	Dr Anders Frid	Dr Anders Åberg	Eva Anderberg
Endokrinkliniken	Endokrinkliniken	Kvinnokliniken	Barnmorska, KK
Malmö	Malmö	Lund	Lund
Tel: 040 - 33 10 00	Tel: 040-33 10 00	Tel: 046-17 25 20	Tel: 046-17 79 75

Om Du ej förstår svenska så be någon i Din omgivning att kontakta Eva Anderberg, tel 046 - 177975.
If you don´t understand Swedish, please ask someone to contact Eva Anderberg, tel 046 - 177975.

Graviditetsdiabetes Mammastudien

Information till nyblivna mammor med graviditetsdiabetes som tackat ja till deltagande i studien Graviditetsdiabetes i Skåne "Mammastudien"

I samband med graviditeten genomgick Du en sockerbelastning på mödravårdscentralen i syfte att fastställa eventuell diabetesdiagnos (sockersjuka). Dina blodsockervärden var därvid förhöjda. Diabetes som utvecklas under graviditet kallas för graviditetsdiabetes. När graviditeten är avslutad blir sockervärdena oftast normala men det föreligger en ökad risk att senare i livet få diabetes, främst då s k vuxendiabetes (typ 2 diabetes). Vi har idag otillräcklig kunskap om vilka faktorer som innebär ökad sjukdomsrisk. Som tidigare nämnts är vår förhoppning med Graviditetsdiabetes-studien att i framtiden bättre kunna förutsäga vem som kommer att drabbas av diabetessjukdom. Med anledning av Graviditetsdiabetes-studien kommer Du att kallas till en förnyad glukosbelastning 1, 3 samt 5 år efter avslutad graviditet.

Sockerbelastningen utföres på likartat sätt som när Du var gravid. Du får dricka en sockerlösning och via en fin plastkateter i armvecket tas sedan blodprov vid 4 tillfällen under 2 timmar för bestämning av blodsocker och insulin. Insulinnivån användes som ett mått på hur mycket insulin bukspottskörteln kan tillverka.

Du kommer i god tid att få meddelande om exakt plats och tidpunkt för undersökningen. I förberedelserna ingår att man gärna bör försöka äta regelbundna måltider de närmaste 3 dagarna före belastning och i övrigt leva som vanligt. Efter kl 22.00 kvällen före får Du inte äta eller dricka någonting. Du bör också avstå från att röka undersökningsdagens morgon.

Deltagandet i uppföljningen är naturligtvis helt frivillig och Du kan när som helst avbryta Ditt deltagande. Alla uppgifter behandlas konfidentiellt och enskilda personer kan inte spåras i kommande forskningsrapporter. Du får gärna kontakta någon av oss om Du har fler frågor eller önskar mer information.

Dr Kerstin Berntorp	Dr Anders Frid	Dr Anders Åberg	Eva Anderberg
Endokrinkliniken	Endokrinkliniken	Kvinnokliniken	Barnmorska, KK
Malmö	Malmö	Lund	Lund
Tel: 040 - 33 10 00	Tel: 040-33 10 00	Tel: 046-17 25 20	Tel: 046-17 79 75

Om Du ej förstår svenska så be någon i Din omgivning att kontakta Eva Anderberg, tel 046 - 177975.
If you don´t understand Swedish, please ask someone to contact Eva Anderberg, tel 046 - 177975.

DNA-nummer:

MAMMASTUDIEN Namn, personnr

Ort: .....

Datum: .....

1-, 3-, 5-års uppföljning (ringa in rätt alternativ) Datum för partus: .....

Ansvarig sjuksköterska: ..... Paritet: .....
(antal födda barn)

Diagnos under graviditet

Graviditetsdiabetes (helblod ≥ 9,0 el plasma ≥ 10,0 mmol/l vid 2 tim OGTT) ☐

Nedsatt glukostolerans under graviditet (helblod 7,8-8,9 el plasma 8,6-9,9 mmol/l vid 2 tim OGTT) ☐

Normal glukostolerans under graviditet (helblod < 7,8 el plasma < 8,6 mmol/l vid 2 tim OGTT) ☐

Insulin vid OGTT taget ☐ Åter gravid ☐ DNA-prov taget ☐

Längd: ..... cm Vikt: ..... kg BMI: .....

Glukos 0 min	/	/	mmol/l
Glukos 30 min	/	/	mmol/l
Glukos 120 min	/	/	mmol/l

Plasma: venöst ☐ Kapillärt ☐

Insulin under graviditeten?
Ja ☐ Nej ☐

Resultat: NGT ☐ IGT ☐ DM ☐

***NGT** (normal glukostolerans)*
Kapillärt el venöst plasma 0-värde < 7,0 mmol/l ***och***
Kapillärt plasma 2-tim värde < 8,9 el venöst < 7,8 mmol/l

***IGT** (nedsatt glukostolerans)*
Kapillärt el venöst plasma 0-värde < 7,0 mmol/l ***och***
Kapillärt plasma 2-tim värde ≥ 8,9 och < 12,2 el venöst ≥ 7,8 och < 11,1 mmol/l

***DM** (diabetes mellitus)*
Kapillärt el venöst plasma 0-värde ≥ 7,0 mmol/l ***och/eller***
Kapillärt plasma 2-tim värde ≥ 12,2 el venöst ≥ 11,1 mmol/l

Deltar eller deltagit i annat projekt med anledning av graviditeten?
Ja ☐ Nej ☐
Om ja, vilket? .....
.....
.....

Etnisk bakgrund

Från vilket land härstammar din mamma? ..... Din pappa? .....

Från vilket land härstammar din mormor? ..... Din morfar? .....

Från vilket land härstammar din farmor? ..... Din farfar? .....

Rökvanor

Röker du? Ja ☐ Nej ☐ Om ja, hur många cigaretter dagligen? .....

Rökte du under graviditeten? Ja ☐ Nej ☐ Om ja, hur många cigaretter dagligen? .....

Snusar du? Ja ☐ Nej ☐ Om ja, hur många gånger dagligen? .....

Snusade du under graviditeten? Ja ☐ Nej ☐ Om ja, hur många gånger dagligen? .....