



Gestational diabetes mellitus and quality of life during the third trimester of pregnancy

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Abstract

Purpose The primary aim of this study was to investigate the effect of gestational diabetes mellitus (GDM) on the quality of life (QoL) of pregnant women during the third trimester of pregnancy. The secondary aim was to compare the QoL of pregnant women with GDM according to their therapeutic approach. This is the first study of this kind conducted in Greece.

Methods A case-control study with 62 pregnant women (31 with GDM and 31 with uncomplicated pregnancy), during the third trimester of pregnancy. QoL and Health Related QoL were studied with the use of three questionnaires (EQ-5D-5L, WHOQOL-BREF and ADDQoL).

Results A decrease in the QoL was found in pregnant women with GDM compared with pregnant women with uncomplicated pregnancy ($p < 0.05$) regarding both social life and health scales. On the contrary, there was no difference in the QoL between pregnant women with GDM who followed different treatment approaches (diet or insulin).

Conclusions The diagnosis of GDM is associated with a reduction in the QoL of pregnant women during the third trimester of pregnancy, while the type of treatment does not seem to further affect it. More studies should be conducted so that the modifiers of this association can be clarified.

Keywords Pregnancy · Gestational diabetes · Quality of life · Third trimester

Introduction

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance, which appears during pregnancy [1, 2]. GDM affects 7% of pregnancies with an annual incidence of 200,000 cases [1]. The highest prevalence is observed in the Southeast Asia region (25% of pregnancies) and in low and medium-income countries [3]. Furthermore, the prevalence increases with age, reaching 39% of pregnant women aged 40–44 years [3]. Many risk factors have been implicated in the development of GDM. The major ones include a familial history of type 2 diabetes mellitus (T2DM), birth of previous child with macrosomia, previous stillbirth of unknown cause, increased circumference of the humerus, anaemia and age above 30 years [4]. GDM is associated with adverse outcomes regarding the pregnancy (preterm labour, miscarriage, pre-eclampsia) and the foetus (macrosomia, obstetrical injuries, increased mortality [5]). Pregnant women with GDM are at high risk of reappearance of GDM in a subsequent pregnancy [6] and of developing type 2 diabetes in later life [7]. Children, whose mothers

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suffered from GDM, seem to become obese more often in later life [8].

GDM, except of the complications for the mother and the offspring, affects the mental and psychological state of the pregnant women, inducing fear for their welfare and insecurity for the pregnancy [9, 10]. Despite the extensive research on GDM, there have been few studies on this aspect. Diabetes has been found to influence quality of life (QoL) negatively in many aspects. Poor glycemic control, presence of complications and treatment with insulin are factors that contribute to adverse QoL outcomes [11, 12].

World Health Organization (WHO) defines QoL as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns [13]. QoL includes many aspects, such as health, physical environment, working environment, family and social environment. Studies have revealed a decrease in QoL during pregnancy, regardless of other diseases that may have pre-existed. Factors that affect QoL during pregnancy are the gestational age, parity, assisted fertility, infertility and co-existing medical conditions [14].

The present study is a case-control study, with its primary aim being the effect of GDM on the quality of life (QoL) of pregnant women during the third trimester of pregnancy. Secondary aims are (a) to compare the QoL between pregnant women with GDM that follow different treatment approaches and (b) to study modifiers that may affect the QoL of pregnant women with GDM. This is the first study conducted in Greece on QoL in pregnant women with GDM. Knowledge of the factors that are associated with lower QoL may result in interventional programmes for their alleviation.

Patients and methods

Patients

The study took place between March and July of 2015 at the Unit of Reproductive Endocrinology, First Department of Obstetrics and Gynecology, Aristotle University of Thessaloniki, Greece. The sample was composed of 62 pregnant women, 31 with GDM and 31 with uncomplicated pregnancy, who served as controls. Inclusion criterion for both GDM and control groups was a gestational age of 26–42 weeks (third trimester). The control group was matched to the GDM group for age and gestational age. For the women of the GDM group, the diagnosis must have preceded at least 2 weeks before inclusion in the study. Exclusion criterion for both GDM and control groups was the presence of any additional health problem (co-morbidity).

All eligible women were asked to participate in a consecutive way. The response rate was 90%.

Demographics and questionnaires

The demographic characteristics (age, week of pregnancy, family situation and education level) of all pregnant women were recorded, as well as the type of therapeutic approach for the women of the GDM group. All pregnant women completed three questionnaires. The WHOQOL-BREF [15] is a questionnaire for quantifying QoL; the EQ-5D-5L [16] is a generic measure of Health Related QoL (HRQoL) and the third questionnaire (Audit of Diabetes Dependent Quality of Life: ADDQoL) [17] is a disease-specific HRQoL measure for patients with diabetes mellitus. All three questionnaires have been translated into the Greek language and have been standardized. They contain questions that encompass different areas of QoL, specifically “health as a whole” (EQ-5D-5L), “physical health”, “psychological health”, “social relationships”, “social environment” (the four subscales of the WHOQOL-BREF) and “disease-specific questions” (ADDQoL). EQ-5D-5L consists of five questions and a visual analogue scale (VAS) asking respondents to rate their overall health on a scale from 0 (worst health) to 100 (best health). Only the EQ VAS was used in our study. WHOQOL-BREF has 28 questions which are also qualitative. It is separated in four sections, mentioned above. The score for its section is calculated with an equation determined by the provider of the questionnaire. ADDQoL has 19 questions. Each question is separated in two parts. The first part asks from the participants how specific activities would be without diabetes and the second part has questions about the importance of these activities. All three questionnaires were completed by all groups, regardless of the presence of GDM.

Ethics

The three questionnaires that were used in the study have been provided with special permission from their official bodies. All pregnant women that participated in the study signed informed consent. Approval was obtained by the Ethics Committee of the Alexandrion Technological Educational Institute of Thessaloniki.

Statistical analysis

The distribution of the parameters was tested by the Kolmogorov–Smirnov test. The data were described as mean and standard deviation (SD). The independent sample *t*-test or the non-parametric Mann–Whitney *U* test were used to check for differences between the quantitative variables, depending on their distribution (parametric or not, respectively). The only variable that followed the normal

distribution was “physical health”. To compare the qualitative variables, the Chi square test was applied. The Spearman test was used to test for correlations between the variables. Linear multiple regression models were used to study the effect of a series of independent variables (pregnancy, gestational week, educational level, health status, therapeutic approach) in the QoL scales. The significance level was set at 5% ($p=0.05$). The statistical analysis was conducted with the use of SPSS software (IBM SPSS Statistics 21).

Results

The demographic characteristics of the women studied are presented in Table 1. No differences were observed regarding the demographic parameters between the two groups.

Primary aim—EQ-5D-5L and WHOQOL-BREF questionnaires

Pregnant women with GDM showed a significantly lower QoL in the areas of total health ($p=0.002$) and social environment ($p=0.007$). There was a strong trend for lower HRQoL in the areas of physical health ($p=0.090$) and social relationships ($p=0.145$), but no difference was observed in the area of psychological health ($p=0.485$) (Table 2). Borderline p values were recorded in the answers of “anxiety-sadness”, “ordinary activities” and “degree of satisfaction from your health”.

Table 1 Demographic characteristics of the studied women

Parameter	GDM	Controls	Total
<i>n</i>	31	31	62
Age (years)	32.9 ± 5.2	32.5 ± 4.8	32.6 ± 6.3
Duration of pregnancy (weeks)	33.4 ± 2.4	35.0 ± 3.1	34.2 ± 3.7
Education level			
Primary	0 (0.0%)	0 (0.0%)	0 (0.0%)
Secondary	18 (58.1%)	12 (38.7%)	30 (48.4%)
University	13 (41.9%)	19 (61.3%)	32 (51.6%)
Relationship status			
Single	0 (0.0%)	0 (0.0%)	0 (0.0%)
Married	29 (93.5%)	29 (93.5%)	58 (93.5%)
In a relationship	2 (6.5%)	2 (6.5%)	4 (6.5%)
GDM treatment			
Diet	17 (%)	–	17 (54.8%)
Diet and insulin	14 (%)	–	14 (45.2%)

The results are shown as mean value ± standard deviation or as frequency (percentage)

GDM gestational diabetes mellitus

Table 2 Comparison of QoL scales of pregnant women with GDM and uncomplicated pregnancies (controls)

QoL scale (questionnaire)	GDM	Controls	<i>p</i> value
<i>N</i>	31	31	
Total health ^{EQ-5D-5L}	75.5 ± 19.3	88.1 ± 8.0	0.002
Physical QoL ^{WHOQOL-BREF}	25.5 ± 5.1	27.5 ± 4.0	0.090
Psychological QoL ^{WHOQOL-BREF}	22.3 ± 3.2	22.9 ± 2.4	0.485
Social relationships ^{WHOQOL-BREF}	12.0 ± 2.7	12.8 ± 2.6	0.145
Social environment ^{WHOQOL-BREF}	28.5 ± 3.9	30.8 ± 3.4	0.007

The results are shown as mean value ± standard deviation

Bold represents statistically significant values

GDM gestational diabetes mellitus, QoL quality of life

Primary aim—ADDQoL questionnaire

No differences were observed in the answers of the ADDQoL questionnaire between the GDM and the control group and between the two therapeutic approaches. Borderline p value was recorded in the answers of the “current quality of life” question (Table 3).

Secondary aims

There was no difference in the mean values of the QoL scales that were examined between the different types of therapeutic approaches (diet only compared to diet and insulin) (Table 4). In women without GDM (controls), there was a correlation between age and the total HRQoL scale ($p=0.009$) (Table 5). No other association was found between the age of the participants and the parameters of HRQoL.

Table 3 Current HRQoL between pregnant women with GDM and uncomplicated pregnancies (controls) (ADDQoL)

Current QoL	Frequencies		%		<i>p</i> value
	GDM	Controls	GDM	Controls	
<i>n</i>	31	31			0.098
Excellent	1	4	3.2	12.9	
Very good	11	18	35.5	58.1	
Good	10	7	32.3	22.6	
Neither good nor bad	5	2	16.1	6.5	
Bad	2	0	6.5	0.0	
Very bad	2	0	6.5	0.0	
Total	31	31	100	100	

GDM gestational diabetes mellitus, QoL quality of life

Table 4 Comparison of QoL scales of pregnant women with GDM depending on their therapeutic approach

QoL scale	Diet	Diet and insulin	<i>p</i> value
<i>n</i>	17	14	
Total health ^{EQ-5D-5L}	76.2 ± 19.7	74.6 ± 19.7	0.532
Physical health ^{WHOQOL-BREF}	25.5 ± 5.8	25.4 ± 4.2	0.830
Psychological health ^{WHOQOL-BREF}	22.4 ± 2.8	22.1 ± 3.7	0.659
Social relationships ^{WHOQOL-BREF}	12.3 ± 2.4	11.7 ± 3.0	0.718
Social environment ^{WHOQOL-BREF}	28.6 ± 3.3	28.4 ± 4.6	0.873

The results are shown as mean value ± standard deviation
GDM gestational diabetes mellitus, *QoL* quality of life

Discussion

The present study investigated a group of pregnant women during the third trimester of pregnancy, aiming to evaluate the QoL with the use of standardized questionnaires. The application of the EQ-5D-5L and WHOQOL-BREF questionnaires demonstrated a reduction in the “total health” and “social environment” QoL scales, a borderline reduction in the “physical health” scale and no difference in the “psychological health” and “social relationships” scales, when women with GDM were compared with those with uncomplicated pregnancies (controls).

A secondary aim was to compare the HRQoL between the different therapeutic approaches for the GDM (insulin therapy or diet). Contrary to the common belief, the addition of insulin did not affect the QoL of the pregnant women with GDM. Finally, none of the studied parameters, such as age, week of pregnancy, therapy or education, modified the QoL in pregnant women with GDM.

Many studies have attempted to study the effect of GDM on the QoL of pregnant women. In a Canadian study [18], pregnant women with GDM (*n* = 29) described their experience of being diagnosed with GDM. It was associated

with emotions of fear, anxiety and disappointment. The women stated that they felt socially isolated, with low self-esteem and feelings of disappointment, especially if the therapeutic approach could not treat GDM efficiently. The adoption of a strict diet resulted in anxiety, disappointment and fluctuations in the daily intake of food. Nevertheless, the women that did not use insulin considered themselves as “lucky”. Finally, the women had anxiety in the prospect that they or their offspring might acquire T2DM in the future.

In an Australian study (*n* = 15) [19], five parameters were identified as obstacles for the management of GDM: (1) time restrictions due to the need for immediate change in lifestyle; (2) physical restrictions that prevented exercise and better regulation of GDM; (3) social restrictions, such as changes in family life and participation in social events; (4) limited understanding of the disease itself and (5) reluctance to use insulin. The women reported that the thought of the welfare of their child and the family support motivated them to achieve a better glycemic regulation.

An Italian study (*n* = 298) [9] demonstrated that 66% of the pregnant women with GDM were afraid for their child, while 28.9% were afraid of possible congenital disease. The difficulties they faced were related to diet, monitoring of glucose levels at home and physical exercise. The initiation of insulin therapy resulted in additional anxiety. The vast majority of women considered their family as a major help in managing GDM.

The studies mentioned above are qualitative studies, in which pregnant women are interviewed over the course of their experience with GDM during pregnancy. Quantitative studies are rare. In an Italian study, pregnant women with GDM or type 1 diabetes were compared with healthy individuals using the SF-36 questionnaire [20]. It is remarkable that pregnant women with GDM or type 1 diabetes report a better QoL in their physical activity compared with the control group. As the authors mention, this is probable due to the fact that the patients are giving more attention to their physical activity compared with controls. On the other hand, healthy pregnant women report a better general health

Table 5 Correlation between QoL scales and the age of the studied women (EQ-5D-5L, WHOQOL-BREF)

	Total health ^a		Physical health ^b		Psychological health ^b		Social relationships ^b		Social environment ^b	
	<i>rho</i>	<i>p</i>	<i>rho</i>	<i>p</i>	<i>Rho</i>	<i>P</i>	<i>Rho</i>	<i>p</i>	<i>rho</i>	<i>p</i>
GDM	-0.181	0.329	0.006	0.972	0.129	0.488	0.162	0.384	0.004	0.984
Controls	<0.001	0.009	-0.217	0.240	0.078	0.675	-0.150	0.422	0.082	0.063
All women	-0.084	0.516	-0.112	0.386	0.106	0.414	0.007	0.958	-0.002	0.986

Bold represents statistically significant values

GDM gestational diabetes mellitus, *QoL* quality of life

^aEQ-5D-5L

^bWHOQOL-BREF

compared with patients. Women with GDM were divided in two subgroups according to their therapeutic approach (insulin or diet). The two subgroups did not differ in their general health condition, which agrees with our findings.

A recent systematic review concluded that QoL is worse in pregnant women with GDM compared with healthy individuals [21] and suggested that interventional programmes are associated with better outcomes. A cohort study demonstrated that GDM or pre-existing diabetes mellitus does not correlate with depression, whether the latter is post-partum or diagnosed during pregnancy [22]. Even though there is no consensus on a correlation between GDM and perinatal depression, Bowers et al. [23] in a cohort study ($n=121,260$, from whom 5606 with GDM) demonstrated that pre-existing depression is a risk factor for the appearance of GDM. There is, therefore, evidence of a two-way association between depression and GDM. A case-control study (GDM group, $n=206$; controls, $n=95$) [24] focused on the effect of intensified therapy on the emotional state and general well-being. Consistent with our results, there was no difference in the emotional status between women with GDM and controls, as well as between insulin- and diet-treated women. Women with optimal GDM control had less anxiety compared with those with moderate control.

An important strength of our study is the use of three standardized questionnaires to assess QoL, which covered all HRQoL areas. The questionnaires were filled out by the participants themselves, after the provision of clear instructions, reducing the issues that could have occurred in an interview-type approach. The most important limitation is that there was no information regarding the pre-pregnancy QoL. An additional limitation is the relatively small sample size. However, an *a posteriori* power analysis showed that the inclusion of larger samples would not change the main results of the study. Finally, the patients' group was further divided into two subgroups, a sample reduction which may have affected the results.

In conclusion, the diagnosis of GDM is associated with a reduction in the QoL of pregnant women during the third trimester of pregnancy, while the type of treatment does not seem to further affect it. GDM is a clinical entity that can result in adverse outcomes for the mother and the neonate. QoL is of equal importance, as some of its components (total health, social environment) can be affected by GDM. As the association between GDM and QoL appears to be bidirectional, further research is needed to identify factors that deteriorate QoL in pregnant women with GDM.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in this study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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