

Diabetes & its Complications

Adherence to Anti-Diabetic Therapy in Women with Diabetes in Pregnancy

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ABSTRACT

Background: Hyperglycemia in pregnancy is associated with adverse pregnancy outcomes. Strict glycaemic control is necessary to promote favourable pregnancy outcomes.

Objectives: To assess adherence to anti-diabetic therapy (diet, physical activity and medications) in women with diabetes in pregnancy.

Methods: This study utilized a cohort of 157 pregnant women at three Central hospitals in Zimbabwe. Adherence to anti-diabetic therapy was the exposure and the outcomes of interest were maternal and perinatal outcomes. This paper focuses on adherence levels. Consecutive sampling was used to recruit women with diagnoses of gestational diabetes, type I and type II diabetes. Ethical approval was granted by respective ethical review boards. Participants gave informed consent. Data was collected through an interviewer administered questionnaire which had sections on demographics, adherence to diet, physical activity and medications and perinatal outcomes. An adherence level of at least 80%, measured by self-report, was high while an adherence of less than 80% was low. Data were analyzed using the statistical package for Social Sciences (SPSS) version 20. Descriptive statistics were used to analyze demographic data and adherence levels.

Results: Majority participants (31.8%) were aged from 30-34 years. Regarding type of diabetes, 25.5% had type I, 43.9% type II while 30.6% had gestational diabetes mellitus. Mean adherence to anti-diabetic therapy was 79.6%.

Conclusions: Adherence to anti-diabetic therapy namely diet, physical activity and medications was suboptimal. Adherence counselling and monitoring is essential in pregnancy considering the strict glycaemic control that is required in diabetes in pregnancy.

Keywords

Diabetes in pregnancy, Adherence, Diet, Physical activity, Medications, Anti-diabetic therapy.

Introduction

Diabetes in pregnancy refers to gestational diabetes mellitus (GDM), type I and type II diabetes. GDM is glucose intolerance first recognised during pregnancy. Adherence is the extent to which a person's behaviour closely follows agreed recommendations

from a health care provider [1]. Adherence in pregnant women with diabetes is compromised by overload of advice from different health care professionals, self-monitoring of blood glucose (SMBG) and strict dietary manipulation.

Women with diabetes in pregnancy can give birth to healthy neonates provided their blood glucose levels are well controlled with a diabetic diet, exercise and an appropriate body weight [2]. It is crucial to promote a high level of adherence to anti-

diabetic therapy to prevent adverse birth outcomes. The level of adherence to anti-diabetic therapy in pregnancy is not well known in Zimbabwe. The purpose of the study was to assess levels of adherence to anti-diabetic therapy in women with diabetes in pregnancy. Anti-diabetic therapy in the study referred to diet, physical activity and medications.

Materials and Methods

This study was a cohort of 157 pregnant women with diabetes in pregnancy at three central hospitals in Zimbabwe. The purpose was to assess level of adherence to anti-diabetic therapy. Consecutive sampling was used to recruit women with diagnoses of gestational diabetes, type 1 and type II diabetes. Ethical approval was granted by the respective ethical review boards. All participants gave informed consent. Included into the study were pregnant women aged 18-45 years with diabetes in pregnancy and who were on insulin. Excluded from the study were women who had not undergone adherence counseling, who were on diet therapy alone, the very ill, the institutionalized and those who had previously participated in either the pilot or the main study. Data collection was done from September 2015 to January 2017 through an interviewer administered questionnaire. Adherence level of 80%, by self-reports, and above was classified as good adherence while levels below 80% were classified as poor. Participants were followed up from 20-24 weeks of gestation up to 6 weeks post-delivery. Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 20 and STATA. Descriptive statistics were used to analyze data on demographics and adherence levels.

Results

Demographic Variables

Table 1 presents demographic variables. Forty (25.5%) participants had Type I diabetes mellitus, 69 (43.9%) had Type II while 48 (30.6%) had GDM. Fifty (31.8%) participants were aged 30-34, 130 (82.8%) were married 113 (72.0%) had attained the ordinary level of education while 91 (58%) were unemployed.

Variable		Frequency	Percentage	Cumulative Percentage
Type of Diabetes	Type I	40	25.5	25.5
	Type II	69	43.9	69.4
	GDM	48	30.6	100
Age in Years	18-24	21	13.4	13.4
	25-29	37	23.6	36.9
	30-34	50	31.8	68.8
	35-39	38	24.2	93
	40-44	11	7	100
Marital Status	Single	21	13.4	13.4
	Married	130	82.8	96.2
	Cohabiting	6	3.8	100
Level of Education	None	1	0.6	0.6
	Primary	18	11.5	12.1
	Ordinary	113	72	84.1

Level of Education	Advanced	10	6.4	90.4
	Tertiary	15	9.6	100
Employment Status	Unemployed	91	58	58
	Self employed	39	24.8	82.8
	Employed	27	17.2	100

Table 1: Demographic Variables (1) (N=157).

Table 2 presents scores for adherence to diet. The minimum score was 23.1%, maximum 92.3%, mean 66.7%, mode 61.5%, range 69.2% and the standard deviation was 13.8.

Total adherence to diet (out of 39)	Total adherence to diet (%)	Frequency	Percentage	Cumulative Frequency
9	23.0	2	1.3	1.3
13	33.3	3	1.9	3.2
14	35.9	3	1.9	5.1
17	43.6	5	3.2	8.3
18	46.2	3	1.9	10.2
19	48.7	1	.6	10.8
20	51.3	1	.6	11.5
21	53.9	13	8.3	19.7
22	56.4	9	5.7	25.5
23	59.0	7	4.5	29.9
24	61.5	19	12.1	42.0
25	64.1	4	2.5	44.6
26	66.7	10	6.4	51.0
27	69.2	12	7.6	58.6
28	71.8	10	6.4	65.0
29	74.4	9	5.7	70.7
30	76.9	9	5.7	76.4
31	79.5	4	2.5	79.0
32	82.1	10	6.4	85.6
33	84.6	12	7.6	93.0
34	87.2	5	3.2	96.2
35	89.7	5	3.2	99.4
36	92.3	1	0.6	100

Table 2: Total scores on adherence to diet (N=157).

Table 3 presents total adherence to diet range scores. Majority 45 (28.7%) scored from 60%-69%.

Adherence to diet category (%)	Frequency	Percentage	Cumulative Percentage
<50	17	10.8	10.8
50-59	30	19.1	29.9
60-69	45	28.7	58.6
70-79	32	20.4	79.0
80-89	32	20.4	99.4
90-100	1	.6	100.0

Table 3: Total adherence to diet ranges (N=157).

Adherence to Physical Activity

Table 4 presents total scores for adherence to physical activity.

Adherence to physical activity (out of 13)	Variable: Adherence to physical activity (%)	Frequency	Percentage	Cumulative percentage
4	30.8	2	1.3	1.3
5	38.5	3	1.9	3.2
7	53.9	20	12.7	15.9
8	61.5	10	6.4	22.3
9	69.2	13	8.3	30.6
10	76.9	71	45.2	77.8
11	84.6	30	19.1	94.9
12	92.3	8	5.1	100

Table 4: Total scores of adherence to physical activity (N=157).

Table 5 presents categories of scores on adherence to physical activity. Majority 71 (45.2%) scored from 70%-79%.

Adherence to physical activity category (%)	Frequency	Percentage	Cumulative Percentage
<50	5	3.2	3.2
50-59 (Poor)	20	12.7	15.9
60-69 (Poor)	23	14.6	30.5
70-79 (Poor)	71	45.2	75.7
80-89 (Good)	30	19.1	95
90-100 (Very good)	8	5	100

Table 5: Adherence to physical activity categories (N=157).

Adherence to medications

Table 6 presents total scores on adherence to medications. The absolute score was out of 8 and then converted to percentage. The minimum score was 12.5% (1 out of 8), maximum 100% (8 out of 8), mean 79.6% (6.4 out of 8), mode 100% (8 out of 8) and standard deviation was 26.4% (2.1).

Total score on adherence to medications (out of 8)	Total score on adherence to medications (%)	Frequency	Percentage	Cumulative Percentage
1	12.5	3	1.9	1.9
2	25.0	2	1.3	3.2
3	37.5	5	3.1	6.4
4	50.0	7	4.5	10.8
5	67.5	24	15.3	26.1
6	75.0	17	10.8	36.9
7	87.5	19	12.1	49.0
8	100	80	51.0	100.0

Table 6: Total scores on adherence to medications (N=157).

Table 7 presents categories of score of adherence to medications. Majority 80 (51%) scored from 90% and above.

Adherence to medication category (%)	Frequency	Percentage	Cumulative Percentage
<50 (Poor)	17	10.8	10.8
60-69 (Poor)	24	15.3	26.1
70-79 (Poor)	17	10.8	36.9
80-89 (Good)	19	12.1	49.0
90-100 (Very good)	80	51	100.0

Table 7: Adherence to medications categories (N=157).

Adherence to anti-diabetic therapy

Table 8 presents adherence to anti-diabetic therapy (composite score for diet, physical activity and medications). The absolute total adherence score was out of 60 which was then converted to a percentage. The range was 67.3% (40 out of 60), minimum was 26.7% (16 out of 60), maximum was 94.0% (56 out of 60), mean was 66.8% (40 out of 60) and mode was 80% (48 out of 60).

Total adherence to anti-diabetic therapy (out of 60)	Total adherence to anti-diabetic therapy (%)	Frequency	Percentage	Cumulative Percentage
16	26.7	1	.6	0.6
18	30.0	2	1.3	1.9
21	35.0	1	.6	2.5
22	36.7	1	.6	3.2
23	38.3	3	1.9	5.1
24	40.0	2	1.3	6.4
25	41.7	4	2.5	8.9
26	43.3	2	1.3	10.2
27	45.0	7	4.5	14.6
28	46.7	1	.6	15.3
29	48.3	2	1.3	16.6
32	53.3	2	1.3	17.8
34	56.7	9	5.7	23.6
35	58.3	1	.6	24.2
36	60.0	7	4.5	28.7
37	61.7	9	5.7	34.4
38	63.3	2	1.3	35.7
40	66.7	1	.6	36.3
42	70.0	13	8.3	44.6
43	71.7	11	7.0	53.5
44	73.0	3	1.9	55.4
45	74.4	4	2.5	58.0
46	76.0	5	3.2	61.1
47	78.0	3	1.9	63.1
48	80.0	12	7.6	70.1
49	81.0	17	10.8	81.5
50	83.0	11	7.0	88.5
52	86.7	11	7.0	95.5
53	88.3	5	3.2	98.7
55	91.7	1	.6	99.4
56	94.0	1	.6	100.0

Table 8: Total scores of adherence to anti-diabetic therapy (N=157).

Table 9 presents adherence to anti-diabetic therapy ranges. Majority 56 (35.6%) scored from 80%-89%.

Variable (adherence to anti-diabetic therapy)	Frequency	Percentage	Cumulative Percentage
< 50 (Poor)	26	16.6	16.6
50-59 (Poor)	12	7.6	24.2
60-69 (Poor)	19	12.1	36.3
70-79 (Poor)	42	26.8	63.1
80-89 (Good)	56	35.6	98.7
90-100 (Very good)	2	1.3	100.0

Table 9: Adherence to anti-diabetic therapy ranges (N=157).

Discussion

Majority participants (31.8%) were aged between 30-34 years. In terms of type of diabetes, 30.6% participants had GDM, 43.9% had pre-gestational Type II while 25.5% had pre-gestational Type I diabetes. Majority (82.8%) participants were married highlighting the vital role of spouses in diabetes care. Spouses provide social support to affirm healthy behaviours and social control to modify health behaviours in their partner's diabetes management. Only 10.2% participants earned more than \$459 which is the poverty datum line for Zimbabwe. Financial barriers in the management of diabetes in pregnancy have been widely reported in literature [3-5].

Regarding education, 88% had attained at least ordinary level. The high literacy level can be an opportunity to utilise written educational material on adherence to therapy. Optimum glucose control is vital in pregnancy and the intensity required necessitates a patient to learn, commit and execute [6].

The mean adherence to diet in this study was 66.8% and 33 (21.0%) scored above the recommended 80% adherence. Adherence rates equal to or exceeding 80% are vital for effective control of blood glucose in diabetes mellitus [7]. Poor adherence to diet in diabetes in pregnancy has been cited in literature by a number of authors [5,8-11]. Sousa et al. reported sub-optimal adherence to diet in GDM [12]. Twenty-four (19.7%), 23 (18.9%) and 47 (38.5%) did not follow the proposed diet, did not follow recommended meal frequency and ingested sugar respectively. Though 92.4% participants in this study had a meal plan, only 22.9% reported always following it. It is important to discuss possible meal plans appropriate to personal food preferences and socio-economic status.

Poor adherence to diet, ranging from 7.56% to 37% has also been reported in non-pregnant diabetic populations [13-17], and in developed countries [8,18,19]. Some challenges of adhering to diet reported include difficulties with regular scheduling of meals, changing amount and type of food, failing to read body signals in relation to level of blood glucose [18], and having feelings of deprivation that resulted in some participants seeking out justifications for continuing with unhealthy dietary habits [19]. Low adherence to diet reported in this study could also be due to

interference of domestic responsibilities with adherence as reported in literature [11]. Majority participants performed household chores such as cleaning the house and cooking. Furthermore, the health of a pregnant woman might not be considered important enough to spend extra money on healthy foods and treatment [20]. Diabetes affects pregnant women more than non-pregnant populations due to presence of more than usual pregnancy discomforts associated with physiologic changes, including those that interfere with insulin use. This necessitates even stricter adherence to therapy in pregnancy.

Adherence to Physical Activity

The mean adherence to physical activity in this study was 73.3% and only 38 (24.2%) scored at least 80%. This rate is relatively higher than the 10% level of physical activity in pregnancy reported by Anjana et al. (2015) in a study conducted in India as part of the WINGS-MOC project [21]. Most of physical activity reported in Africa is done during performance of household activities and has an intensity that falls below intensities recommended in guidelines [21,22].

In this study 82.8%, 77.1%, 91.1%, 92.4% and 90.4% reported to be involved in sweeping the yard, fetching water, washing clothes, cooking and walking respectively. This could have given the women a perception of being active in their pregnancies. Aerobic or resistance exercise, performed at a moderate intensity at least three times per week, safely helps to control postprandial blood glucose levels in women diagnosed with diabetes [23]. In this study only 33.1%, 27.4%, and 28% were involved in aerobic exercise, exercised 3 or more times per week and exercised for 30 minutes or more per session. There is need for physiotherapists' involvement in exercise education in pregnant women.

Misconceptions about physical activity in pregnancy, lack of knowledge about which activities to undertake, lack of facilities at community level and lack of time are barriers to physical activity [22]. Tiredness, lack of energy and being physically unwell in women with diabetes in pregnancy interferes with adherence to exercise [24,25].

In the National Maternal and Infant Health Survey, 42% of women reported exercising during pregnancy and half of these exercised for more than 6 months into the pregnancy [26]. Recreational walking, swimming and aerobics were the most frequent activities reported. In another study of 386 women, 61% of pregnant women participated in some form of regular physical activity [27]. In the Avon Longitudinal Study of Parents and Children, 48.8% of pregnant women engaged in strenuous physical activity in the first trimester, with the most common activities reported being brisk walking, swimming and antenatal exercises [28]. Data on diabetes and exercise in Sub-Saharan Africa is scarce and exercise is yet to be fully embraced as a major component in the management of diabetes [29]. The benefits of exercise in non-pregnant diabetic populations, including increased insulin sensitivity, are well documented [30-32].

Qualitative studies in women with diabetes in pregnancy have also revealed challenges of adherence to exercise. Low levels of physical activity in resource-limited settings are attributed to limited options, unavailability of dedicated locations, such as gyms thus restricting women to brisk walking [11]. Negative views about exercise during pregnancy, consideration of domestic role as sufficient physical exertion, unsafe environments, cultural inappropriateness and comorbidities affect physical activity negatively [33]. Benefits include reduced post prandial hyperglycemia, improved insulin sensitivity [34], increased glucose uptake, delayed initiation of insulin therapy, and improved cardio-respiratory fitness in women with diabetes.

Adherence to medications

Mean adherence to medications in this study was 83.2%. Ninety-nine (63.1%) participants scored at least 80%. Diabetic patients have been reported in literature to find it easier to adhere to medications more than lifestyle behaviours [21,35]. This rate is much higher than rates reported in literature in non-pregnant diabetic populations. Kio et al. reported 41% adherence to medications in women with GDM [36]. Suboptimal adherence rates to medication in non-pregnant diabetic populations ranging from 21.4% to 78.3% have been reported [37-41]. Self-reports used to measure adherence in this study could have over-estimated the adherence. Objective measures of adherence such as drug levels are recommended.

Adherence to anti-diabetic therapy

A composite score of overall adherence to therapy was calculated. Mean adherence to anti-diabetic therapy was 68.8%. Fifty-eight (36.9%) participants scored at least 80%. Few authors have researched on the social and behavioural effects of the diagnosis from the viewpoint of the women affected. Adherence to therapy is one such social behavioural effect of diabetes in pregnancy. Such studies have been done in non-pregnant diabetic populations and similar rates of suboptimal adherence have been reported [13-15,17].

Implications of the findings

Low adherence observed underscores the importance of routine adherence counselling during pregnancy. Health education should be customised to suit individual patient needs. More recommendations from the findings of the study have been published elsewhere [42,43]. Strict adherence to healthy lifestyle habits must be advocated in health policies particularly in developing countries where access to and quality of health care are problems.

Limitations of the study

Self-reports could have overestimated adherence. Objective measures of adherence such as measuring drug levels are costly and not feasible in a resource limited setting. This was a hospital based study and respondents could have given socially desirable responses. Visiting respondents in their homes was not feasible thus respondents were seen as they received routine antenatal care.

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