The Relationship between Health Belief Model and Compliance with Therapeutic Regimen Among Diabetic Pregnant Women

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Abstract

Introduction: Pregnant women compliance to gestational diabetes militias (GDM) regimen plays a major role in improving their overall quality of life. However, as postulated by the Health Belief Model a greater perception of risk is associated with a greater intention to adapt lifestyle, especially in terms of diet and physical activity. ***Aim of the study***: to find out the relationship between health belief model and compliance with therapeutic regimen among diabetic pregnant women. ***Materials & Method: Research design*:** A descriptive research design was utilized in this study. ***Setting*:** This study was conducted in the outpatient clinic of antenatal unit at El-Shatby Maternity Hospital**.** ***Subjects:*** Convenience samples of 130 pregnant women attending the previously mentioned setting were recruited in the study. **Tools:** three tools were used to collect the necessary data, namely**:** Pregnant Women Basic Data Structured Interview Schedule, Summary of Diabetes Self-Care Activities (SDSCA) & Gestational Diabetes Health Belief Model Scale. ***Results****:* About two thirds (66.9%) of the study subjects were unsatisfactory compliant with diabetic regimen. Meanwhile 33.1% of the study subjects were satisfactory compliant with their regimen. A statistically significant correlation was noticed between subjects' total score of compliance and their perceived susceptibility, severity, benefits and barrier (p= 0.001, 0.020, 0.002, 0.000) respectively. ***Conclusion***: It can be concluded that level of pregnant women compliance with gestational diabetes regimen was associated with some modifying factors such as level of education, income, residence, parity, number of living children, planned pregnancy, number of antenatal visits and onset of (GDM). Furthermore, level of pregnant women compliance with GD regimen was associated with their perceived susceptibility, severity, benefits as well as barriers. ***Recommendation****(S):* To raise pregnant

women awareness toward gestational diabetes including extent of the problem, risk factors, signs, complications, diagnosis through using preventive awareness campaigns and community mobilization.

Key word: GDM, Compliance, Gestational Diabetic Regimen, Health Belief Model.

Introduction

Chronic diseases are considered as the major public health problems of today's world or within contemporary societies. Diabetes is one of the most important metabolic dysfunction which is often asymptomatic in the early stages that causes damage to body organs. One of the main forms of diabetes is gestational diabetes mellitus (GDM).GDM is defined as a glucose intolerance of variable severity occurring with onset or first recognition during pregnancy. Maternal glycemic control is the strongest predictor of perinatal morbidity in gestational diabetes[1,2]. In the year 2000, the World Health Organization (WHO) estimated that there were 171 million people in the world with diabetes. The International Diabetes Federation (IDF) estimated in 2011 the number at 366 million (of which 183 million are undiagnosed) and in 2030 at total of 552 million people are expected to have diabetes. The reported prevalence regarding GDM varies between 1 and 14% and on average; approximately 4% of all pregnancies is complicated by GDM. Risk factors known to predict the development of GDM include increased maternal age, excess weight before pregnancy, ethnicity, diabetes in a first degree relative and history of abnormal glucose tolerance [3, 4].

GDM is associated with negative consequences for both fetal & maternal outcomes. Particularly for the newborn: neonatal hypoglycaemia, shoulder dystocia, birth trauma, stillbirth, prematurity, respiratory distress syndrome, neonatal hypoglycaemia, jaundice ,brachial plexus and collar bone fractures. Unlike established diabetes with onset before pregnancy, hyperglycaemia in gestational diabetes is not established until the late second trimester, well after organogenesis. Therefore, most studies agree that gestational diabetes is not associated with increased rate of malformations. However, as in pre-gestational diabetes, increased maternal glucose and amino acid levels can result in fetal pancreatic hyperplasia with consequent hyper insulinaemia this result in fetal macrosomia [5,6].

Turning to Maternal complications are increased risk for perinatal mortality and morbidity rate , preeclampsia, recurrent vulvo-vaginal infections, increased incidence of operative deliveries, obstructed labor and development of diabetes mellitus later in life. Gestational diabetes has been recognized as the one of the strongest predictors of type 2 diabetes. Recent studies show that up to 50% of women diagnosed with GD develop type 2 diabetes within five years. Moreover pregnant women have a 41% risk of developing new GDM during a subsequent pregnancy [7-9].

Pregnant women with GDM must be able to maintain a correct balance between different elements of a comprehensive treatment in order to achieve adequate glycemic control. GDM therapeutic regimen is essential for pregnant women to establish and maintain on a daily basis in order to improve their health. It is made up of five components: *following a meal plan, regular exercise, self-monitoring blood glucose (SMBG), insulin use as well as foot care.* Pregnant women compliance to GDM therapeutic regimen plays a major role in improving their overall quality of life. It often represents a great challenge for patients as well as for health care professionals. Many studies have documented that compliance to diabetes is not a unitary construct and in fact varies across different components of the regimen. Compliance to GDM regimen is influenced by several factors such as lack of information, complexity of regimen, perceptions of benefit, side effects, medication cost, and emotional wellbeing. [10,11]

It also appears that women who have had GDM do not perceive themselves to be at risk of developing type 2 diabetes, even though at the same time they recognize that GDM is a risk factor for type 2 diabetes. Regardless, a few studies have shown inconsistency in risk perception and patients' response to it. However, as postulated by the Health Belief Model a greater perception of risk is associated with a greater intention to adapt lifestyle, especially in terms of diet and physical activity. Thus, the concept of risk perception and, more generally, beliefs about health and health behaviors may be significant predictors of behavioral intentions firstly, then effective health behaviors. Health beliefs are refereed as the patient's perception of the severity of the disease process, perception of the benefits of adherence to treatment, and perceptions of barriers to control of the disease. This was measured using the Health Beliefs of Diabetic Patients' Scales [12,13].

The Health Belief Model (HBM) is a framework for understanding patient compliance to healthy behaviors. It focuses on two aspects of a person's conceptualization of health and health behavior. It is determined by five factors: The first factor, susceptibility, refers to the perception of vulnerability to diabetes and its complications as well as influences the adoption of health behaviors. The second factor, severity, is the perception of diabetes as a serious illness, ranging from perceiving few complications to viewing diabetes as a life-threatening disease. The third variable, benefits, concerns the perception that the regimen is effective, as the individual physically feels better from taking action as well as the person beliefs that the proposed strategy will reduce the illness threat. In GD the health benefits will prevent complications in future pregnancies and harmful effects to the fetus and DM in her offspring. The fourth factor, barriers, refers to the perceived costs of adhering to the regimen. The person weighs the benefits against the barriers and may determine the barriers are outweighed the benefits. Lastly, modifying factors such as age, level of education, number of pregnancies [14-17].

Nurses can use Health Belief model to clarify pregnant women's perceptions of risk; this enables nurses to apply strategies that influence them to make healthy lifestyle changes that plays a positive role in compliance with therapeutic regimen and prevent further complications and consequences of gestational diabetes. It is possible that each of the five dimensions operates independently and a deficit in one may lead to failure to perform the health behaviors or that interactions among components contribute to an diabetic pregnant women's perception of risk [13].

Therefore woman with GD should adopt health behavior strategies to prevent or delay DM. Finally, it should be noted that knowledge about what may influence mothers' perceptions of their HBM plays a significant role in understanding what kind of care and support they need. Hence, numerous morbidities could be prevented and mothers' experience during this vulnerable period could be improved.

Aim of the study

This study aims to find out the relationship between health belief model and compliance with therapeutic regimen among diabetic pregnant women

Operational definition

Diabetic therapeutic regimen

It included: diet, exercise, blood-glucose testing, insulin administration & foot care.

Research questions

Is there relationship between health belief model and compliance with therapeutic regimen among diabetic pregnant women?

Materials & Method

Research design: A descriptive research design was adopted.

Setting: The study was conducted at outpatient clinic of antenatal unit at EL-Shatby Maternity University Hospital. It receives clients from Alexandria as well as adjacent governorates namely: Elbehera, et al.

Subjects: according to Epi info 7 sample size estimation program a convenience sample of 130 pregnant women out of 180 (representing the average number of women attending the previously mentioned setting during the last three months prior to the study) were recruited in the study. ***Inclusion criteria:*** women who being diagnosed with diabetes during current pregnancy, had neither serious ongoing illnesses nor cognitive disorder and willing to participate was included in the study.

Tools: Three tools were used to collect the necessary data:

Tool (1): Pregnant women basic data structured interview schedule:

This tool was developed by the researchers. It entailed the following three parts; **first part**: women socio-demographic characteristics (age, level of education, occupation, marital status, residence & family type), **second part**: women's reproductive history (gravidity, parity, number of abortions, stillbirths, in addition to number, sex of living children), **third part**: women's profile of current pregnancy (whether it was planned or not, weeks of gestation, number of antenatal visit & duration of GDM).

Tool II: Summary of Diabetes Self-Care Activities (SDSCA)

This tool was originally proposed and revised by Glasgow et al (1987, 2000). [18] The researchers adapted it and translated into Arabic language to measure subject's level of compliance with gestational diabetes regimen. It included 12 items divided into 5 sections. Specifically: diet (5 items), exercise (2 items), monitoring of sugar levels (2 items), insulin intake (1 item) and foot-care (2 items). Each item varied among 8 points likert scale. Namely: no compliance (0), one day compliance (1) , two days compliance (2), three days compliance (3), four days compliance (4), five days compliance (5), six days compliance(6) , seven days compliance(7).Negative statements were reversed in scoring. The total score ranged from zero to 84. Subject's compliance level ranked as follows: unsatisfactory compliant < 42 & satisfactory compliant ≥ 42

Tool III: Gestational Diabetic Health Belief Model Scale

This tool was adapted from two scale (Given et al,1983) and (Bradly et al 2013)[19,20] and translated into Arabic language by the researchers to measure health belief model constructs. It entailed 16 items divided into 4 sections. Specifically: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. Subjects' response to each item varied among a 5 point likert scale. Namely: strongly agree (5), Agree (4), undecided (3), disagree (2), strongly disagree (1). It was divided into 4 subscales. Possible total score for each subscale was ranked as follow: low perceived level < 12 & high perceived level ≥ 12.

METHOD

The study was conducted according to the following steps:

1. An official letter from the Faculty of Nursing- Alexandria University was directed to the responsible authorities of El Shatby Maternity Hospital to obtain permission to conduct the study and collect the necessary data.

2. Tool (I) was developed by the researchers based on extensive review of recent relevant literature. Tool (II), (III) were adapted and translated into Arabic language.

3. Tools were tested for content validity by a jury of five experts in the field of obstetric and gynecologic nursing and community health nursing. The recommended modifications were done and the final form was finalized after proving valid.

4. Tool reliability was tested by cronbach's alpha test. Tool II was 0.82, Tool III, was 0.80. The results were statistically acceptable.

5. A pilot study was carried out on 13 pregnant women (excluded from the study subjects) from the previously mentioned setting to assure feasibility of the study, clarity and applicability of the tools and to identify obstacles that might interfere with the process of data collection. Tools were modified accordingly prior to data collection.

6. For each recruited subject an informed oral consent was obtained after explaining the purpose of the study. In addition, her anonymity, privacy, freedom to withdraw from the study at any time and confidentiality of her data were all emphasized prior starting the interview.

7. Each woman was individually interviewed. The duration of each interview ranged between 30-45 minutes. Three days per week were specified for data collection over a period of four months, started from the beginning of June till the end of September 2016. An average of 6 to 10 interviews was performed per day

8. Statistical analysis was done after collection of data by using Statistical Package for Social Sciences (SPSS) version 16. Descriptive and analytical statistics were used such as percentages, means and standard deviations. Chi-square-test& Fisher Exact-test with a P value was set at 0.05 to identify statistical significance difference between the results.

RESULTS

Table (I): Number & Percent Distribution of the Study Subjects according to their Socio-Demographic Characteristics

Socio-demographic characteristics	No (=130)	%
➢ **Age (years)**		
• 20-	68	52.3
• 30-	50	38.5
• 40-	12	9.2
Mean ± SD	**29.68 ± 5.822**	
➢ **Educational level**		
• Illiterate / read &write	32	24.6
• Primary school	28	21.5
• Secondary school	52	40.0
• University or higher	18	13.8
➢ **Job**		
• Housewife	111	85.4
• Worker	15	11.5
• Employer	4	3.1
➢ **Type of the family**		
• Nuclear	76	58.5
• Extended	54	41.5
➢ **Residence**		
• Rural	40	30.8
• Urban	90	69.2
➢ **Income**		
• adequate	76	58.5
• inadequate	54	41.5

According to Table (I) slightly more than one-half (52.3%) of the study subjects were in their twenties. About less one - fourth (24.6%, 21.5%) of them were either illiterate or holding primary certificate, respectively. Almost all of them (85.4%) were housewives. Considerable percent (69.3% & 58.5%) of them were dwelling urban areas within nuclear families, respectively. More than one -half (58.5%) of them perceived their families' income as adequate.

Table (II): Distribution of the Study Subjects according to their Compliance with Gestational Diabetic Regimen on average 7 days per week

Items of gestational diabetes activities	**Mean ± SD**
1. Follow eating plan.	2.79± **2.67**
2. Consumption of five or more serving of fruits and vegetables.	3.46± **2.23**
3. Consumption of high fat foods	3.90± **2.72**
4. Space carbohydrates evenly through the day	3.44± **2.67**
5. Follow healthful eating plan	2.89± **2.18**
6. Participate in at least 30 minutes of physical activity	0.32± **0.890**
7. Participate in a specific exercise session	2.45± **2.84**
8. Check blood glucose level	2.01± **1.79**
9. Check blood glucose level regularly as doctor order	1.62± **1.41**
10. Take insulin as doctor order	6.23± **1.50**
11. Inspection of foot	1.84± **2.27**
12. Check inside shoes for safety	1.59± **2.31**

Table (II) exhibits distribution of the study subjects according to their compliance with gestational diabetic regimen on average 7 days per week over the past month**.** The study subjects reported that they followed their eating plan for an average 2.79 times per week. Consumption of five or more servings of fruits and vegetables was reported for an average 3.46 times per week. Unfortunately eating high fat foods such as red meat or full-fat dairy products was exhibited for an average 3.9 times per week. Study subjects also were reported that they space carbohydrates evenly through the day for an average 3.44 times per week, while as they followed a healthful eating plan for an average 2.89 times per week. The study subjects had participated in at least 30 minutes of physical activity for 0.32± 0.890 times per week. Testing blood sugar was demonstrated for an average 2.01 times per week. The study subjects reported taking insulin for average 6.23 times per week. Inspection inside the shoes for safety had exhibited for an average 1.59 times per week.

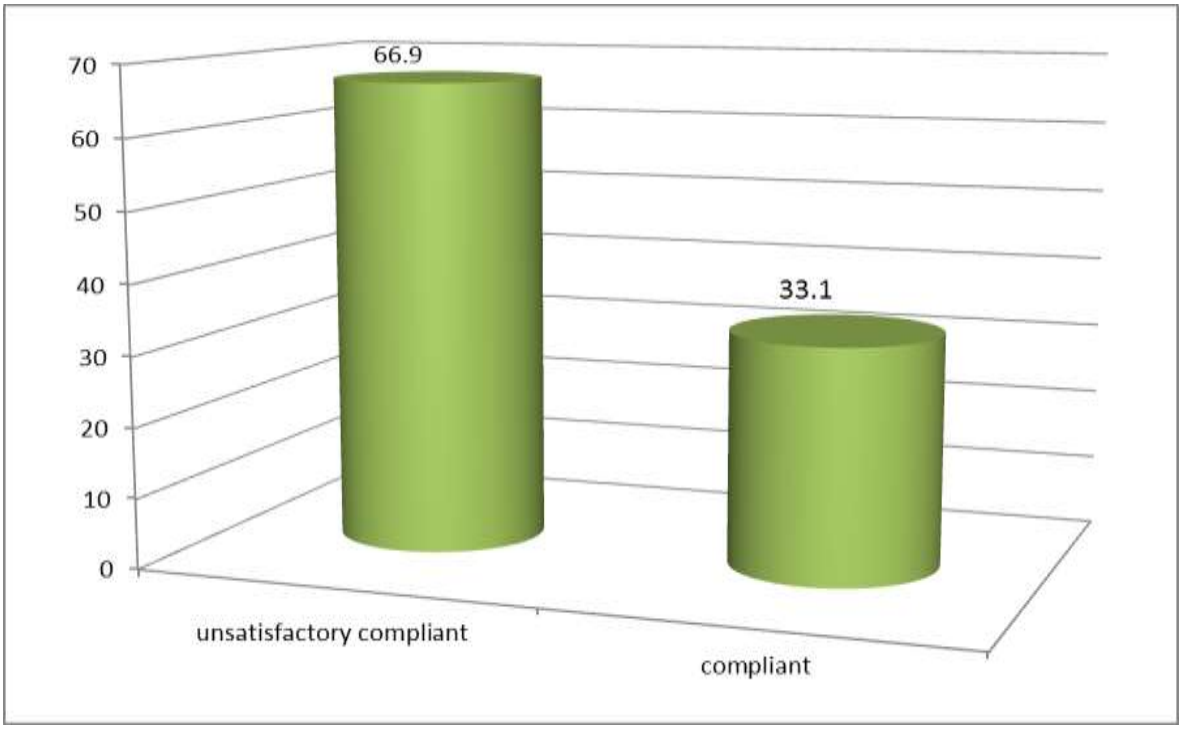

Figure (1): Number & Percent Distribution of the Study Subjects According to their Total Score of Compliance with GD Regimen

Figure (1) about two thirds (66.9%) of pregnant women were unsatisfactory compliant with their GD regimen. Meanwhile 33.1% of study subjects were satisfactory compliant with their regimen.

Table (III): Number & Percent Distribution of the Study Subjects According To their Health Belief Constructs

Health belief constructs	No (=130)	%
➢ **Perceived susceptibility**		
• Low	16	12.3
• High	114	87.7
➢ **Perceived severity**		
• Low	22	16.9
• High	108	83.1
➢ **Perceived benefits**		

• Low	29	22.3
• High	101	77.7
➢ **Perceived barriers**		
• Low	35	26.9
• High	95	73.1

Table (III) reveals distribution of the study subjects according to their health belief regarding gestational diabetes. Almost all (87.7%) of study subjects perceived themselves as being highly susceptible for gestational diabetes & its complications. Regarding perceived severity, the majority (83.1%) of them were highly perceived the severity of gestational diabetes. The same profile was observed in perceived benefit, that is to say; 77.7% of study subjects were highly perceived benefits of the various actions in reducing the gestational diabetes threat. Slightly less than three quarters (73.1%) of study subjects had highly perceiving for barriers associated with positive control of GDM.

Table (IV): Relationship between the Study Subjects' Socio-Demographic Characteristics and their total score of compliance with GD regimen

Socio-Demographic Characteristics	Level of compliance				Test
	Unsatisfactory compliant		Satisfactory Compliant		
	No	%	**NO**	%	
➢ **Age (years)**					
• 20-	42	61.8	26	38.2	^{FE}p =0.357
• 30-	37	74	13	26	
• 40-	8	66.7	4	33.4	
➢ **Educational level**					
• Illiterate	26	81.2	6	18.8	
• Primary school	23	82.1	5	17.9	^{FE}p =0.007*
• Secondary school	30	57.7	22	42.3	Rho =0.289
• University or higher	8	44.4	10	55.6	
➢ **Occupation**					
• Housewife	80	72.1	31	27.9	^{FE}p =0.007*
• Worker	5	33.3	10	66.7	Rho =0.260
• Employer	2	50	2	50	
➢ **Family type**					

• Nuclear	47	61.8	29	38.2	X^2= 2.134
• Extended	40	74.1	14	25.9	P = 0.114
➢ **Residence**					
• Rural	36	90	4	10	X^2=24.702
• Urban	51	56.7	39	43.3	P= 0.000*
					Rho = 0.327
➢ **Income**					
• Adequate	64	84.2	12	15.8	X^2=24.702
• Inadequate	23	42.6	31	57.4	P= 0.000*

X^2: chi square
FEp: p value based on Fisher's exact probability was calculated using Mont Carlo method
* P < 0.05 (significant)

According to table (IV) a statistically significant correlation is observed between total score of study subjects' compliance with GD regimen and their socio-demographic characteristics except in relation to age & family type. Namely: level of education (P = 0.003), occupation (P = 0.007), residence (P = 0.008) and income (P= 0.000). Level of education was statistically significantly positively correlated with study subjects' total score of their compliance with diabetic regimen (Rho = 0.289). That is to say, with increased level of education, level of compliance increased. Specifically, As much as 55.6% of the university participants were compliant with their GD regimen, compared to only 18.8% of those who were illiterate. A statistically significant positive correlation was observed in relation to occupation (Rho= 0.260). Where as much as 50% of employee were compliant with diabetic regimen compared to only 27.9% of housewives. Income was statistically significantly correlated with study subjects' total score of compliance with GD regimen. Less than one-fifth (15.5%) of the study subjects who perceived their income as adequate were satisfactory compliant compared to 57.4% of those who perceived it as inadequate.

Table (V): Relationship between study subjects' reproductive history and their total score of compliance with GD regimen

Reproductive history	Level of compliance				Test
	Unsatisfactory compliant		Satisfactory Compliant		
	NO	%	No	%	
➢ **Gravidity**:					
• Primigravida	12	52.2	11	47.8	X^2=3.879
• Multigravida	56	67.5	27	32.5	
• Grand multigravida (≥5)	19	79.2	5	20.8	P= 0.143
➢ **Parity**					
• Nullipara	20	58.8	14	42.2	X^2=7.858
• Primipara	15	51.7	14	48.3	P= 0.049*
• Multipara (Twice)	26	74.3	9	25.7	Rho = - 0.211
• Grand multipara (≥ 3)	26	81.2	6	18.8	
➢ **Number of abortions:**					
• No	61	70.9	25	29.1	X^2=5.39
• Once	21	67.7	10	32.3	P= 0.068
• Two time or more	5	38.5	8	61.5	
➢ **Number of still births**					X^2=0.463
• None	73	68.2	34	31.8	P= 0.496
• Once or more	14	60.9	9	39.1	
➢ **Number of living children**:					
• None	27	58.7	19	41.3	X^2=12.079
• One child	13	50	13	50	P= 0.007*
• Two children	25	73.5	9	26.5	Rho= - 0.274
• Three children or more	22	91.7	2	8.3	

X2: chi square
* P < 0.05 (significant)

According to table (V), no statistically significant correlation was noticed between subjects' total score of compliance and their gravidity (P=0.143), number of abortion (P=0.068) and the number of still birth (P=0.496). On the contrary, a statistically significant negative correlation was observed between subjects' total score of compliance and their parity (P=0.049) (Rho = - 0.211), and number of living children (P=0.007) (Rho = - 0.274). Only 18.8% of the grand multiparas were compliant with gestational diabetes regimen compared to as much as 48.3% of primipara.

Unsatisfactory compliance was evident among almost three quarters and more (73.5% and 90.7%) of those who had two children and three or more children, respectively, compared to 58.7 % and 50 % of the subjects who had not or just one child, respectively.

Table (VI): Relationship between the study subjects' profile of current pregnancy and their total score of compliance with GD regimen

Profile of Current pregnancy	Level of compliance				Test
	Unsatisfactory compliant		Satisfactory Compliant		
	NO	%	NO	%	
➢ **Wanted / Planned pregnancy**					
• Planned	22	91.7	2	8.3	X^2=8.141
• Unplanned	65	61.3	41	38.7	P= 0.004*
					Rho = - 0.250
➢ **Duration of current pregnancy:**					
▪ First trimester	7	46.7	8	53.3	X^2=4.196
▪ Second trimester	24	63.2	14	36.8	P= 0.123
▪ Third trimester	56	72.7	21	27.3	
➢ **Number of antenatal visits:**					X^2=16.150
▪ Less than 4 visits	26	89.7	3	10.3	P= 0.000*
▪ 4 -7 visits	57	65.5	30	34.3	Rho = 0.347
▪ ≥ 8 visits	4	28.6	10	71.4	
➢ **Onset of GDM:**					
▪ First trimester	17	41.5	24	58.5	F^{ET}=0.000*
▪ Second trimester	64	77.1	19	22.9	Rho = - 0.378
▪ Third trimester	6	100	0	0	

^{FE}p: p value based on Fisher's exact probability was calculated using Mont Carlo method
X2: chi square * P < 0.05 (significant)

According to table (VI) a statistically significant correlation was observed between subjects' level of compliance and their pregnancy planning ((P=0.004), number of attended antenatal visits ((P=0.000) & onset of GDM (P=0.000). Surprisingly more than one-third (38.7%) of the study subjects with unplanned pregnancy were compliant with GD regimen compared to only 8.7% of those with planned pregnancy. Almost three quarters (71.4%) of the subjects who attended satisfactory antenatal visits (≥8 visits) were compliant with GD regimen compared to only 10.3% of those with unsatisfactory number of visits (<4 visits).

Table (VII): Relationship between the study subjects' Health Belief Constructs and their total score of compliance with GD regimen

Health Belief Construct	Level of compliance				Test of Sig,
	Unsatisfactory compliant		Satisfactory Compliant		
➢ **Perceived susceptibility**	**NO**	**%**	**NO**	**%**	
• Low	16	100	0	0	X^2=9.018
• High	71	62.3	43	37.7	p= 0.001*
➢ **Perceived severity**					
• Low	19	86.4	3	40	X^2=4.521
• High	68	63	16.3	37	p= 0.020*
➢ **Perceived benefits**					
• Low	26	89.7	3	10.3	X^2=8.714
• High	61	60.4	40	39.6	p= 0.002*
➢ **Perceived barriers**					
• Low	8	22.9	27	77.1	X^2=42.014
• High	79	83.2	16	16.8	p= 0.000*

X2: chi square * P < 0.05 (significant)

Table (VII) reveals a statistically significant correlation was noticed between subjects' total score of compliance and their perceived susceptibility, perceived severity, perceived benefits and perceived barriers. Satisfactory compliance were evident among more one-third (37.7%) of pregnant women who perceived themselves highly susceptible to GDM complications compared to none of who had low perceived susceptibility (p=0.000). Slightly less than two-fifths (37% & 39.6%) of study subjects who highly perceived severity of GD & benefits were satisfactory compliant with GD regimen (p=0.020, 0.002), respectively. A statistically significant correlation was noticed between subjects' total compliance level and their perceived barriers (p=0.000)). Unfortunately unsatisfactory compliance were evident among as much as 83.2% of study subjects who had high perceived barriers compared to only 22.9% of those who had low perceived barriers.

Discussion

Gestational DM (GDM) is one of the major DM classifications that associated with pregnancy. Effective management of GDM during pregnancy and proper follow-up care can prevent risk of developing life-threatening complications. One of the most important factors affecting GDM management is patients' compliance with the prescribed treatment regimen. Accordingly, the original health belief model, health behaviors of individual is determined by personal belief [21, 22]. Better understanding of women's belief toward compliance with diabetic regimen can be enforced by analyzing the factors which hinder or improve such adherence [16]. As these factors affecting treatment compliance could help nurses and other healthcare professionals to provide better medical care and more appropriate patient education, thereby considerably improving the lives of the affected women and their children. **Hence** this study aims to find out the relationship between health belief model and compliance with therapeutic regimen among diabetic pregnant women. The discussion of the present study results will be present under two main headings: modifying factors (demographic, reproductive & profile of current pregnancy) as well as health belief regarding GDM.

Modifying factors

The present study revealed no statistically significant correlation between level of compliance and mothers' *age*. This result was unexpected since the age factor is obvious i.e. with increasing age, the degree of compliance decreases for several reasons. For example, increase the potential of mistakes in taking medications as well as increase responsibilities. This result is incongruent with **Sunsaneevithayakul P et.al (2006)[23]** who had studied non-compliance to clinical practice guideline for screening of gestational diabetes mellitus in Siriraj hospital. They found that the poorest compliance was reported in women more than 30 years of age. **Kio JO et al. (2015) [24]** who had assessed assessment of dietary and drug compliance among diabetic pregnant women attending antenatal clinic in **Nigeria.** They found that compliance was positively and significantly associated with age of women.

Regarding to mothers' level of education in the current study there is a statistically significantly positively correlation between mother's level of education and their level of

compliance GD regimen. That is to say, with increased level of education level of compliance increased. This result is in line with other four studies. *First* , **Serap T& Bayram S. (2015)** [25] who had carried out study about factors influencing adherence to diabetes medication in **Turkey**. They found that patient's level of education was statistically significant with compliance. *Second*, **Murphy A et.al (2004)** [26] who did assessed nutrition education for women with newly diagnosed gestational diabetes mellitus**.** They observed that women with high school education showed a significant improvement of their compliance. *Third*, **Kapur K et .al** (2008) [27] who had carried out study about Barriers to changing dietary behavior. They found respondents' drug compliance increased with increasing level of education. *Fourth*, the previously mentioned study done by **Kio JO et al. (2015).**[24]They found that compliance to gestational diabetes regimen was positively and significantly associated with level of education. Such agreement is kind of expected, since more educated mothers tend to appreciate and understand the consequences of non-compliance unlike illiterate pregnant who cannot read or distinguish their medications which increase the risk of errors and noncompliance. Moreover education usually paves the way to more health information seeking and utilization.

Income, in the current study was statistically significantly correlated with studied women total score of compliance with diabetic regimen. This could be explained by the fact that financial inadequacies may cause the woman to be so preoccupied with her depleted circumstances. Moreover, high cost of hypoglycemic agents hindered the optimal adherence to the treatment. This result is in line with **Pourghaznein T et al (2013)** [28] who had studied the relationship between health beliefs and medication adherence in patients with type2 diabetes: A correlation-cross sectional study. They found that higher income patients exhibit higher medication adherence. In addition to the aforementioned study had done by **Kio J O et al (2015)** [24]. This study revealed that drug compliance was positively and significantly influenced by income level

The current study revealed a statistically significant negative correlation between studied women's level of compliance and their parity. This result may be explained by the fact that higher parity women often work long hours in food markets or family related duties these factors may together contribute to an increased burden of care and decrease their level of

compliance. This result also goes in line with previously mentioned study done by **Pourghaznein T et al(2013)** [28] who found a significant relation between adherence and number of children.

Inadequate care during pregnancy breaks a critical link in the continuum of care, and affecting both women and babies. Essential interventions in ANC include identification and management of obstetric complications such as gestational diabetes. Modifying risky behavior is highly important especially among those with high risk pregnancy [11].The current study revealed that there is a statistically significant correlation was observed between subjects' level of compliance and their pregnancy planning and number of attended antenatal visits. In fact, planned pregnancy as well as adequate antenatal care and follow-up especially among women with gestational diabetes are highly recommended hence it fraught with challenges. One of these challenges is the adherence to therapeutic regimen. Hence unwanted or mistimed pregnancy affects generally on women antenatal care seeking behaviors either by delaying or by rejecting such care which indirectly may affecting on their adherence to therapeutic regimen. This finding was supported by **Exavery A. et al (2013)** [29] who assessed how mistimed and unwanted pregnancies affect timing of antenatal care initiation in three districts in **Tanzania**. They found that the initiation of antenatal care was delayed among mother who have unwanted or mistimed pregnancy.

In order to improve compliance it is highly important to focus on the importance of regular antenatal care especially among women with gestational diabetes, attending antenatal care clinics give extra chance for the health care team to enrich women knowledge regarding to their pregnancy, helps to early detection of any deviation from normal and help the team to tailor information for each women based on their needs; all of these factors will affecting on their compliance to therapeutic regimen.

Health belief model

Adherence also encompasses numerous health-related behaviors that extend beyond taking prescribed pharmaceuticals. A comprehensive description of how and why a desired change in behavior is expected to happen among pregnant women with gestational diabetes so that the Health Belief Model as a psychological framework that outlines predictable health related

behaviors was used in the current study. People's life experiences and exposures to past events shape their perception of susceptibility, severity, barriers, benefits and cost of adhering to prescribed interventions. The process of gestational diabetes education should allow for an effective discussion and exploration of beliefs which is needed to promote appropriate self-care [30].

The finding of current study revealed a statistically significant correlation was noticed between subjects' total compliance and their perceived susceptibility. . These results are positive findings, since understanding the susceptibility to complications will act as a motive toward seeking care which modify the risky behaviors and encourage to more complying with therapeutic regimen. So that raising awareness about susceptibility for risks of complications from uncontrolled gestational diabetes playing an important role in adherence to self-care behaviors.

The same findings were reported by **Alatawi** Y **et al, (2016) [31]**. They had investigated the association between health beliefs and medication adherence among patients with type 2 diabetes. Additionally, **Sharifirad G et al (2007)** [32] added that the patients didn't prevent the complications of their diabetic foot, because their perceived susceptibility was low [16]. Furthermore**, Jacob J (2013)** [33]. .He had evaluated the impact of protection motivation theory grounded messaging on diabetes prevention behaviors following gestational diabetes. He reported that women who attended the information session reported higher perceived susceptibility.

On the other hand this finding is inconsistent with **Morrison MK et al. (2010)** [34] who studied dietetic practice in the management of gestational diabetes mellitus: a survey of Australian dietitians. They suggested that perceived risk may be an insufficient motivator for adoption of health behaviors for prevention of disease. Risk perception may not consistently change behaviors and that other factors such as self-efficacy, sleep disturbance and family DM history may have more of an influence on adoption of healthy lifestyle behaviors.

Several studies confirmed that low-risk perception has been recognized as a barrier to the adoption of positive health behavior [35]. The current study finding reveal a statistically significant correlation was noticed between subjects' total compliance level and their

perceived barriers. This could be attributed to pregnant women with GDM balance benefits of treatment with barriers that interfere their compliance. This finding is in line with **Collier S et al. (2011)** [36] . They carried out a qualitative study of perceived barriers to management of diabetes among women with a history of diabetes during pregnancy in **Turkey**. They concluded that perceiving greater benefits of a treatment than barriers has been shown to be correlated with adherence to treatment. The barriers to achieving glycemic control during pregnancy could help assist women in achieving optimal pre-pregnancy and intra-pregnancy glycemic control.

Several studies confirmed that the proper management of diabetes is mainly related to patient's compliance. Hence understanding the four construct of HBM affecting positively on modifying the self-care behavior and decrease the subsequent complications. The results of HBM assessment will emphasize the educational program that must be applied by the nurse [37]. **Bayat F et al (2013) [38]** studied the effects of education based on extended health belief model in type 2 diabetic patients: a randomized controlled trial and found that, the results of this study showed an increase in the mean scores of perceived susceptibility, perceived severity, perceived benefits and self-efficacy.

Conclusion

From the results of current study it can be concluded that level of pregnant women compliance with gestational diabetes regimen was associated with some modifying factors such as level of education, income, residence, parity, number of living children, planned pregnancy, number of antenatal visits and onset of (GDM). Furthermore, level of pregnant women compliance with GD regimen was associated with their perceived susceptibility, severity, benefits as well as barriers.

Recommendations

Based on the finding of the present study the following recommendation are suggested

- Pre- service - & in service training are recommended for health care providers regarding gestational diabetes preventive strategies based on the Health Belief Model.

- Raising public and community awareness toward Gestational diabetes including extent of the problem, risk factors, signs, complications, diagnosis through using preventive awareness campaigns and community mobilization.
- Continuous monitoring to pregnant women's level compliance with their diabetic regimen is suggested

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