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Effect of Lifestyle Counseling for Women with Gestational Diabetes on Fetal and Maternal Outcomes at Assiut University

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Abstract

Gestational diabetes mellitus is a serious and often ignored risk to the health of mothers and children. ***Aim of the Study:*** *To assess the effect of lifestyle counseling among women with gestational diabetes on fetal and maternal outcomes at Assiut University.* ***Materials and Method:*** *Antenatal care clinics hosted a pre-test and post-test for a quasi-experimental study.* ***Sample:*** *A total of 365 women in total attended antenatal care clinics.* ***Setting of Study:*** *The study was carried out at the Woman's Health Hospital at Assiut University and the antenatal care clinics in Assiut City, which serve the western area.* ***Tools:*** *Two instruments: a follow-up sheet and a structured interviewing questionnaire.* ***Results:*** *Blood sugar measurement and workout practice differed statistically significantly (P value = 0.000).* ***Conclusion:*** *The outcomes for mother and fetus with gestational diabetes were improved by lifestyle counseling.* ***Recommendations:*** *Women who are at risk of gestational diabetes mellitus should receive public education through the media to help prevent or lessen the difficulties that come with it for both mothers and newborns.*

Keywords: gestational diabetes mellitus (GDM), lifestyle, pregnancy outcomes, fetus

INTRODUCTION

A significant public health concern, gestational diabetes mellitus (GDM) is linked to an elevated risk of perinatal mortality and morbidity. In recent decades, the prevalence of GDM has grown in tandem with increasing conception ages. Globally, it is estimated that 13.9% of pregnancies result in GDM. Additionally, type 2 diabetes and ischemic heart disease are linked to it. During their later years, children born to mothers who had GDM during pregnancy have a higher susceptibility to metabolic disorders and pediatric cardiovascular conditions [1, 2]. Excluding instances of diabetes diagnosed early in pregnancy, GDM is characterized as diabetes that is identified during the second or third trimester of pregnancy [3]. GDM affects approximately 13.9% of pregnant women in Africa, with prevalence ranging from 1% to 28% in more affluent countries [4, 5].

Worldwide, maternal diabetes impacts over 21 million childbirths annually. In the United States, the prevalence of GDM and pre-existing conditions (including type 1 or 2) among women who gave birth to live children was 6.0% and 0.9%, respectively, in 2016 [6].

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GDM prevalence was found to be 6% among pregnant females attending Fanara Family Practice Center in Egypt [7]. Total number of pregnant women at Assiut Governorate in 2019 was 331955, while the positive case for sugar analysis were 1752 cases, so the prevalence was 0.5% [8].

Previous history of GDM, family history of diabetes, obesity, recurrent uterine tract infections, infertility treatment, history of GDM macrosomia and stillbirths in the prior pregnancy, prematurity, polycystic ovarian syndrome (PCOS), preeclampsia, advanced maternal age, polyhydramnios, and metabolic syndrome have all been found to influence the risk of GDM among mothers [9]. Gestational diabetes affects 3% to 20% of pregnant women, depending on their risk factors [10].

A pregnant woman's lifestyle changes after conception. Lack of exercise and excessive gestational weight gain are two major factors contributing to obesity after pregnancy; therefore, all women of reproductive age should begin regular exercise to support them during their pregnancies and deliveries. Preeclampsia, gestational diabetes, macrocosmic infant delivery, and other fetal-maternal difficulties are linked to excessive gestational weight gain, which is one of the biggest issues that pregnant women are facing today [11].

Gestational diabetes is linked to additional issues, such as social determinants of health. There are strong links, according to research, between the development of diabetes and risk factors related to lifestyle, including drinking, smoking, eating poorly, being obese, and not getting enough exercise. These days, over 70% of diseases are thought to have some connection to a person's lifestyle, and many illnesses seem to be either directly or indirectly brought on by lifestyle choices, or to be at least made worse or prolonged by them [12].

For roughly 70% to 85% of women with diagnosed GDM, lifestyle adjustment alone is sufficient to meet glycemic objectives. While most guidelines suggest a one- to two-week trial of lifestyle change, medication should not be postponed since euglycemia plays a crucial role in minimizing unfavorable consequences [13].

Managing gestational diabetes in women leads to reduced perinatal complications and has the potential to enhance the quality of life. The initial treatment for gestational diabetes primarily consists of non-pharmacological methods, including dietary guidance, weight control, physical exercise, and glucose monitoring. In cases where lifestyle adjustments are insufficient to achieve and maintain glycemic targets, pharmaceutical therapy becomes necessary to attain positive results for both mothers and infants [3].

Preconception counseling can help lower the risk for women who want to get pregnant but have risk factors for GDM, according to healthcare practitioners who treat them. Health care providers should advise overweight (body mass index [BMI] ≥25) or obese (BMI ≥30) women to start losing weight before getting pregnant and to exercise on a regular basis. Health care professionals should also treat underlying medical issues linked to insulin resistance. To lower their chance of developing GDM, at-risk women can follow the Institute of Medicine's (IOM) recommendations for recommended weight gain during pregnancy depending on their pre-pregnant BMI [14].

Nurses are meant to provide women with authentic, adequate, and up-to-date information in a culturally applicable manner. Education of the women is the key to attaining the interventions in the management of GDM in prenatal care. Women with gestational diabetes can effectively practice self-care management, which includes diet, exercise, and self-monitoring, by utilizing the educational resources provided at prenatal care centers. These resources may include pamphlets, written materials, and counseling sessions, among others. There are some obstacles that prevent pregnant women with GDM from practicing these lifestyle interventions [15].

Women who have experienced gestational diabetes should receive guidance on lifestyle adjustments that promote post-delivery weight loss and decrease the likelihood of developing metabolic syndrome and type 2 diabetes in the future. Additionally, these women should be made aware of the significance of getting screened for glucose intolerance again, especially before thinking about getting pregnant again. It is important to highlight the importance of contraception in order to lower the number of unintended pregnancies. A patient's prior experience with gestational diabetes should not influence the choice of contraception. Instead, healthcare providers should consider the patient's other medical conditions or factors that may contraindicate certain contraceptive options. Additionally, it is advisable to promote breastfeeding among women who have a history of GDM, as it can aid in postpartum weight reduction and potentially lower the risk of developing type 2 diabetes in the future [16].

Aim of the Study

The aim of this study was to assess the effect of lifestyle counseling for women with gestational diabetes on fetal and maternal outcomes at Assiut University.

Significance of the Study

The International Diabetes Federation provides a global estimate of GDM prevalence, which spans from 2% to more than 30% [17].

GDM has been more commonplace worldwide in recent times, with incidences ranging from 1.4% to 18.5% in various nations. In Egypt, the rate of gestational diabetes among expectant mothers affects between 2% and 14% of all pregnancies [18].

The primary treatment strategy is generally lifestyle advice combining diet and exercise. Self-monitoring of blood glucose levels helps to achieve normal glycemia. Physical activity increases the expression of several elements in the insulin signalling pathway, and it has other general effects facilitating glucose management [19].

Research Hypothesis

The educational program will raise women's awareness of GDM and its effects on the mother and fetus.

Subjects and Method

Research Design

A quasi-experimental research (pre-posttest) was utilized in this study .

Setting of Study

The study was carried out in Assiut City's Antenatal Care (ANC) clinics, which provide care for the western sector. Among the Maternal and Child Health facilities (MCHs) in this sector were Kolta, Hay Gharb, and Elarbaeen. The Antenatal Care (ANC) services at Woman's Health Hospital, Assiut University, serve as a teaching hospital catering to the needs of both public and private healthcare facilities in Assiut and the surrounding regions of Upper Egypt.

Sample

Pilot Study

Prior to beginning data collection, a pilot research was carried out on 10% (n = 40) of the women during the first 2 weeks of data collection to assess the interview time required, the relevance of the questions, and their clarity. It is part of the sample size.

Sample Size

Purposive sampling revealed that, during the data collection period, 365 women visited ANC clinics in Assiut City, with a population total of 7398 and a confidence interval of 95%.

$$ss = \frac{Z^{2*}(p)^{*}(1-p)}{c^2}$$

where Z = Z value, 1.96 for 95% confidence level, p = percentage picking a choice, expressed as decimal 5.) used for sample size (ss) needed (c = confidence interval, expressed as decimal) e.g., .04 = ±4.

(Correction for finite population)

$$\text{new ss} = \frac{\text{ss}}{1 + \frac{\text{ss} - 1}{\text{pop}}}$$

where pop = population.

Inclusion Criteria

1. Pregnant women between 28 and 36 weeks of gestation with GDM
2. Pregnant women who are eligible and willing to take part in the study

Exclusion Criteria

1. Pregnant women who refused to participate in the study
2. Women with any contraindication for exercise
3. Probable serious fetal defect

Statistical Analysis

Data entry and analysis were conducted using the statistical software SPSS version 22. The data were presented using numbers, percentages, means, and standard deviations. For comparing various qualitative variables, the chi-square test was utilized. When comparing quantitative variables between two groups, an independent sample t-test was employed, and for comparisons involving more than two groups, an analysis of variance (ANOVA) test was used. The paired samples t-test was applied to compare quantitative data before and after the intervention. When $P < 0.05$, the P-value is deemed statistically significant.

Data Collection Tools

Two instruments were utilized to collect the data: a follow-up sheet and a structured interviewing questionnaire.

Tool 1: A Structured Interviewing Questionnaire

The researchers used textbooks, online papers, scientific periodicals, and other sources to review relevant literature, both domestic and international. After that, the tools were ready. The researchers created this questionnaire after studying several previous studies, relevant literature, and feedback from three professors of nursing and medical science at Assiut University who specialize in obstetrics and gynecology. Expert input led to the appropriate adjustments being implemented.

This tool consisted of the following four parts:

Part 1

Sociodemographic data: name, age, occupation, address, telephone number, education level, residence.

Part 2

A. *Obstetric history:* number of gravidities, parity living children, normal vaginal deliveries, cesarean section, abortion and stillbirth.
B. *Family history:* GDM, obesity, hypertension, diabetes and cardiovascular disease.
C. *Risk factor:* age ≥35 years, obesity or overweight, excessive weight gain during pregnancy, excessive central body fat deposition, previous pregnancies with macrosomia and GDM, short stature, polyhydramnios, hypertension, or preeclampsia, and a family history of diabetes are all risk factors. Lifestyle factors, such as diet and exercise, as well as medical history, which includes chronic conditions, may also be risk factors for GDM.

Part 3: Exercise and Dietary Interventions by Women

This part included questions to evaluate the kind of exercise, length, frequency, and intensity; contraindications to exercise during pregnancy; advantages of exercise during pregnancy; and diet (type and effective dietary components).

Part 4: Educational Program

The educational program was written in Arabic, and each mother received a copy in the form of a booklet to refresh their memory on the topics covered (intervention phase). An explanation of GDM symptoms and signs, how GDM affects the mother and the fetus, GDM screening, risk factors, and lifestyle adjustments (diet, exercise, and glucose control).

Tool 2: Follow-up Sheet

The follow-up sheet consisted of the following two parts posttest (the same data of pretest after completion of the educational intervention).

Part 1: Maternal Outcomes

Complications after delivery on mother, type of delivery, maternal blood glucose, intraoperative complications, and postoperative complications.

Part 2: Fetal Outcomes

Complication after delivery of baby, effect of gestational diabetes on the fetus, time of birth, weight of the newborn, blood sugar, and Apgar score.

Procedure

Procedure was conducted in three phases.

Phase I: (Preparation Phase)

The director of health and the director of Women's Health Hospital gave their written consent for this study to be carried out. Oral consent was obtained from the study participants who were women. The investigator presented herself to the participants and elucidated the purpose of the investigation. There was no risk or invasive technique included in this investigation. The program's sessions and time were settled upon during this step of program administration arrangement. The pre-test was conducted between January 2018 and December 2018. Each questionnaire typically required an average of 30 to 40 minutes to complete. Data collection occurred twice a week, specifically on Mondays and Wednesdays. The researcher and the women coordinated to choose the best time to educate.

The program's teaching locations were Hay Gharb MCH, Kolta MCH, and Elarbaeen MCH. Teaching strategies and resources: It was crucial to prepare basic teaching strategies and audiovisual aids, such as brainstorming sessions, PowerPoint presentations, handouts, and discussions, before putting the educational program into action.

Phase II: (Implementation Phase)

A total of 365 expectant mothers who visited the prenatal care clinic in the second trimester were the subjects of the current study, which was conducted at the ANC. checked for GDM at the check-up clinic. The study comprised all prenatal care clinic visits by pregnant women with estimated gestational ages between 24 and 28 weeks. The investigator conducted in-person interviews with each woman to gather information for the questionnaire, which covered personal information, family history, medical history, obstetric history, and GDM risk factor. A pregnancy for follow-up schedule indicated that each week's Monday and Wednesday should be used for data collection, the investigator welcomed and sent greetings to GDM pregnant women. The women were given an orientation to the program and informed about the time and location of the first session prior to its start. Every session began with an overview

of the previous one's contents and the goals for the next ones. In order to ascertain the impact of the implemented program, the women's knowledge was finally tested using the identical pretest format repeated each session.

The educational program was held for 2 days in order to finish the program content between the end of March 2018 and the end of April 2018. There were three sessions in all.

The program sessions covered the following items:

1. *First session:* The definition of GDM, risk factors (both maternal and fetal-neonatal), causes, symptoms, and indicators of potential problems (both maternal and fetal/neonatal), GDM screening and diagnosis, and the efficacy of treatment in preventing complications were all covered.
2. *Second session:* Self-care practices for people with GDM, including self-monitoring blood sugar levels, self-injection of insulin, body weight monitoring, dietary intake monitoring, physical activity (exercise), danger signs, self-monitoring daily fetal movement, and hygienic measures, were described in detail.
3. *Third session: This session* emphasized the need of postpartum follow-up care, nutrition, exercise, and medication in addition to preventing the recurrence of GDM in subsequent pregnancies addition to delivering general and fundamental information on lifestyle, the investigator-created pamphlets to help the women grasp the instructions of health education. Each counselling session included individual consultations with the women regarding their food and exercise regimens.

A booklet with answers to the pregnant women's inquiries about their needs and issues was given to them at the conclusion of each session. offering general health education to expectant mothers via a written, prepared pamphlet and by responding to any inquiries they may have regarding the directions contained in the brochure, which is written in Arabic so that expectant mothers can readily understand it. The investigator reviewed any matters that were unclear or unaccepted, worked out a strategy for the following visit, and informed the client about referrals in the event that any concerns arose.

Phase III: (Evaluation Phase)

1. After implementation of the educational program for women, reassessment was done by the post-test, which was given two weeks after implementation program and completing course to evaluate outcome during the last ANC visit in the third trimester.
2. Evaluation was done by the investigator to evaluate the women's lifestyle (healthy nutrition, exercise and, blood monitoring) after implementation program for 4 weeks.
3. The types of food ingested between meals, the amount of each food category consumed, and the regularity with which pregnant women take their recommended vitamin intake were assessed.
4. Evaluation was done by the investigator to evaluate the women's and fetal outcome.

Administrative Design

The director of the Women's Health Hospital and the director of the undersecretary of the Ministry of Health formally approved the request for this study.

Ethical Consideration

The Ethics Committee of the Assiut University Faculty of Nursing approved the research proposal. The study adhered to standard ethical guidelines for clinical research. The research subjects are not at risk while it is being applied. Following an oral explanation of the study's purpose and nature, the women's consent was acquired. Anonymity and confidentiality were guaranteed. Study participants are free to decline to participate and/or to leave the study at any moment, for any reason. Privacy was taken into account when gathering data.

RESULTS

The socioeconomic characteristics of the women under study are presented in Table 1. The women who were recruited had an average age of 19.0 ± 42.0 years, and their educational attainment showed that less than one-third (31.5%) had completed secondary school. Additionally, three-quarters (75%) of the women were housewives. In terms of place of residence, the majority of the sample (58.1%) was urban (Table 1).

Table 2 reports data regarding the management of the GDM. Table 2 indicates that 63.0%, 82.2%, and 77.0% of the women under study were aware of the risks associated with consuming high amounts of carbohydrates, food that should be avoided, and the importance of maintaining a balanced diet during pregnancy, respectively.

Table 3 shows that the effect of gestational diabetes on mother, slightly three-fifths (60.3%) of them had weight gain followed by preeclampsia (21.6%), more than three-quarters (78.9%) had caesarean section. Table 3 also shows that there were no complication in the intraoperative and postoperative period (68.8% and 67.7%, respectively).

Table 4 shows that less than half (47.9%) of the studied pregnant mothers had birth weight >3.5 kg and less than two-thirds (62.2%) of them had full term newborn, while neonatal birth weight and neonatal blood glucose mean ± SD were 90.17 ± 28.56 and 3.46 ± 0.78, respectively. The vast majority of sample (96.7%) had no admission to intensive care unit.

Table 5 indicates that more than one-fifth (24.7%) knew the causes of hypoglycemia diet and less than two-thirds (65.5%) of them mentioned reason of high blood sugar as not getting enough insulin or other diabetes medicine. As symptoms of hypoglycemia, more than one-third (32.9%) mentioned vision change. Also, less than half (47.1%) followed up the glycemic level every one month.

Table 6 shows that there was a statistically significant difference between Apgar score and risk factors, overweight/obese, and history of GDM during pregnancy (*P* value = 0.000 and 0.000, respectively).

Table 1. Distribution of women according to their sociodemographic characteristics (N = 365).

	Number (365)	**Percentage**
Age: (years)		
<30	136	37.3%
30 to < 35	127	34.8%
≥35	102	27.9%
Mean ± SD (range)	30.77 ± 5.11 (19.0–42.0)	
Educational level		
Illiterate/read and write	93	25.5%
Basic education	52	14.2%
Secondary	115	31.5%
University or higher	105	28.8%
Occupation		
Working	88	24.1%
Not working	277	75.9%
Residence		
Urban	212	58.1%
Rural	153	41.9%

Table 2. Distribution of women according to lifestyle management of gestational diabetes mellitus (diet).

	Number (365)	Percentage
Balanced diet during pregnancy at a time		
Yes	230	63.0%
No	135	37.0%
Time of balanced diet (230		
1st trimester	22	9.5%
2nd trimester	105	45.7%
3rd trimester	103	44.8%
Foods not allowed to eat		
Incorrect	65	17.8%
Correct	300	82.2%
Impact of unhealthy diet		
Incorrect	134	36.7%
Correct	231	63.3%
Hazards of large carbohydrates		
Incorrect	84	23.0%
Correct	281	77.0%

Table 3. Distribution of women according to their maternal outcome.

	Number (365)	Percentage
Effect of gestational diabetes on mothers#		
Weight gain	220	60.3%
Bleeding	39	10.7%
Preeclampsia	79	21.6%
Hydramnios	53	14.5%
Type of delivery		
Vaginal	77	21.1%
Cesarean section	288	78.9%
Intraoperative complications#		
No complication	262	71.8%
Birth injury	37	10.1%
Prolonged labor	22	6.0%
Shoulder dystocia	8	2.2%
Intrauterine fetal death	1	.27%
Hemorrhage	21	5.8%
Uterine rupture	11	3.0%
Wight gain	24	6.6%
Postoperative complications#		
No complication	247	67.7%
Wound infection	13	3.6%
Maternal hyperglycemia	57	15.6%
Hemorrhage	62	17.0%

#More than one answer.

Table 4. Distribution of women according to their neonatal outcome.

	Number (365)	Percentage
Effect of gestational diabetes on fetus		
No abnormality	95	26.0%
Birth weight >3.5 kg	175	47.9%
Hypoglycemia	59	16.2%
Stillbirth	7	1.9%
Respiratory distress	106	29.0%
Jaundice	61	16.7%
Malformation	28	7.7%
Time of delivery		
Full-term	227	62.2%
Pre-term	138	37.8%
Neonatal		
Single	356	97.5%
Multiple	9	2.5%
Neonatal birth weight (kg)		
Mean ± SD	3.46 ± 0.78	
Range	2.0–5.0	
Neonatal blood glucose (mg/dL)		
Mean ± SD	90.17 ± 28.56	
Range	40.0–173.0	
ICU admission		
Yes	12	3.3%
No	353	96.7%

Table 5. Distribution of women according to their lifestyle management of gestational diabetes mellitus (glycemic control).

	Number (365)	Percentage
Causes of hypoglycemia#		
Diet	48	13.2%
Medication	90	24.7%
Medical disorder	36	9.9%
Morning sickness	9	2.5%
Symptoms of hypoglycemia#		
Trembling	3	0.8%
Nausea	50	13.7%
Difficult concentration	85	23.3%
Weakness	117	32.1%
Vision change	120	32.9%
Difficult speaking	57	15.6%
Treatment of hypoglycemia#		
Exercise at consistent level	35	9.6%
Take fast sugar or simple carbohydrate	234	64.1%
Eat small well-balanced meal every 3–4 hours	20	5.5%
Keep snack at your bed site	91	24.9%
Action done if blood sugar still high#		

	Number (365)	Percentage
Taking diabetes medicine	310	84.9%
Change diet	118	32.3%
Drink plenty of sugar-free fluids	22	6.0%
Exercise more often	3	.8%
Adjust dose of drugs	7	1.9%
Reason of high blood sugar#		
Not getting enough insulin or other diabetes medicine	239	65.5%
Not getting enough exercise	40	11.0%
Not following the meal plan	91	24.9%
Illness or stress	2	0.5%
Follow-up of glycemic level ever		
One week	7	1.9%
Two weeks	23	6.3%
One month	163	44.7%
More than one month	172	47.1%

#More than one answer.

Table 6. Relation between Apgar score and risk factors.

Risk Factors	Apgar Score at 1 Minute				*P*-value
	<7		*>7*		
	Number	*Percentage*	*Number*	*Percentage*	
Hypertension	27	21.3%	24	10.1%	0.003*
Overweight/obese	36	28.3%	113	47.5%	0.000*
Increasing age	28	22.0%	36	15.1%	0.098
History of GDM during pregnancy	30	23.6%	11	4.6%	0.000*
Family history of diabetes	65	51.2%	101	42.4%	0.110
Multiparous	81	63.8%	122	51.3%	0.022*
Stillbirth	11	8.7%	24	10.1%	0.660
Polycystic ovarian syndrome	20	15.7%	66	27.7%	0.010*

GDM, gestational diabetes mellitus.

DISCUSSION

Lately, the emphasis of gestational diabetes preventive measures has been on encouraging patients to lead healthy lifestyles through physical activity and a balanced diet. Nevertheless, modifying lifestyle requires adequate information in this regard. Improving awareness and readiness during pregnancy aids in the mother's successful passage through this phase of life. Pregnancy thus offers a wonderful chance for educating and counseling expectant mothers and enlightening them about the benefits of leading a healthy lifestyle [12].

In the study, it was discovered that a mere 3.4% of pregnant women were diagnosed with GDM. Furthermore, the research also examined the impact of a lifestyle intervention, which encompassed dietary adjustments, daily physical activity, and weight management, on pregnant women at a high risk of GDM. Our findings suggest that implementing lifestyle modifications was associated with a reduced risk of adverse maternal outcomes and GDM. Numerous observational studies have revealed that different diets or dietary habits before and during pregnancy may have an impact on GDM.

Study shows that the prevalence of GDM among pregnant women was 3.4%. This result inconsistent with a study conducted in Tanzania [4], which reported a GDM prevalence 27.5%. Our results are also inconsistent with other studies that have reported prevalence of GDM as 12.8% [20] and 13.8% [21].

The reported differences in GDM prevalence rates could be due to a variety of factors, including the application of various diagnostic criteria and a wide range of health factors, such as lifestyle factors like nutrition and physical activity, social and economic status, and the accessibility of medical care.

Regarding demographic characteristics of the pregnant woman, less than two-fifths of women in this study were aged less than 30 years old; this is compatible with Khalil et al. [22] who found the mean age of women as 30.6 years and with Atkinson and Teychenne [23] who mentioned that majority of the pregnant women were less than 35 years old.

Furthermore, the present investigation concurs with a study carried out in Assiut by Mohamed and Ahmed [24]. In line with a study carried out in Benha by Said and Aly [25], who discovered that women with GDM in the age group of 30–35 years had a positive relationship with their lifestyle as a result of the educational package based on the health belief model. The women's average age was 27.94 ± 4.20 years.

As observed in the present study, over 75% of the participants were unemployed. This aligns with a study conducted in India [20], which reported a 60.5% unemployment rate. Also agree with other authors who reported that three-fifths (60%) of study samples were home makers and agree with a study that was conducted in India [21], which reported that most of the study (83.3%) were home makers [26].

In terms of residence, the present study revealed that less than three-fifths of the studied women were living in urban areas versus more than two-fifths in in a study conducted in India [26]. This provided support for the findings that GDM incidence is higher in urban regions (10.85%) than in rural areas (5.56%).

According to the residence, the present study disagreed with a study was conducted in Tanta [18], which found that 50% of each group either were from rural.

Less than one-third of the women in the current study had only completed secondary school, compared to 28.8% who had completed college or higher. These findings were in agreement with a study conducted [18], which reported that 48% of women in the study group and 64% in the control group had similar results.

This also agreed with a study conducted in El-Minya [27], which found that most of women (82.14%) had secondary schooling and concurred with a research done in India [20] that found 58.2% of women, or 98, having a secondary education.

The results of this investigation show that over 75% of the study participants underwent caesarean delivery, with the remaining participants delivering their babies vaginally. These findings closely align with those of El-Nagar et al. [18], who reported that 80% of births were caesarean sections.

In the present study, more than fifths of the study participants delivered by vagina and the most of the women delivered by cesarean section. This finding disagreed with El Toony et al. [28], who reported that 53.3%) and 46.7% were delivered by vagina and cesarean section, respectively.

The current study showed that effect of gestational diabetes on mothers more than three fifths had weight gain and more than one fifth had preeclampsia. This finding disagreed with a study that was

conducted in India [26], which reported that maternal complication of GDM during pregnancy uterine tract infection (UTI) and pregnancy-induced hypertension (PIH) was 28.95% and 26.32%, respectively.

The current study showed that 8.1% of the mothers with GDM had preeclampsia. This result was in conflict with a research carried out in Zimbabwe by Kusemwa et al. [29] who found that less than fifth (19.5%) had high blood pressure. This also agree with another study [21], which reported that 3.3% had preeclampsia. The present study showed that 1.9% of women's had stillbirth. This finding dis agreed with an earlier study [21],which reported that 6.7% women had stillbirth. Additionally, this result disagreed with a study done in Samoa by Price et al. [30], who found that 14% of women suffered stillbirths.

In the present study, the incidence of polyhydramnios in pregnant women's less than fifth, which is in disagreement with a previous study [26], which reported that more than one-fifth (21.05%) had polyhydramnios.

According to the current study, 71.8% of the women had no issues during labor, which is more than three-fifths of the women in the study group. This finding is consistent with that of study participants in a previous study [18].

The current study showed that 8.5% had hemorrhage, and this finding agrees with a study conducted conducted in China by Liu et al. [31], who found lower incidence rates of postpartum hemorrhage. It also agrees with Panigrahi and Panda [21], who reported that 10.7% had postpartum hemorrhage.

The current study revealed that about one-third (37.8%) had preterm delivery and this agrees with Larebo and Ermolo [32], who reported that 39.7% had preterm delivery. It also agrees with a study conducted in Samoa [30], which reported that 50% of women had preterm delivery.

The current study showed that less than half (47.9%) of women had neonatal complications: (weight at birth 3.5 kg) The current study contradicts a study in Tanta [18] that revealed that, in comparison to the study group, the control group's most common rates of newborn problems were hypoglycemia, jaundice, respiratory distress syndrome, and birth trauma.

As noted from the current study, 29% of women suffered from respiratory distress. The current study disagrees with a study conducted in India [26], which reported respiratory distress in 60.23% of women. Also, the current study showed that neonatal had hypoglycemia 16.2% these findings are matching with another study [26], which found that in their study hypoglycemia in 18.42% of participants.

The current study showed that less than fifth of neonatal had hypoglycemia and less than half of neonatal had macrosomia. These findings disagree with El Toony et al. [28], who reported that 5% and 10% of participants had hypoglycemia and macrosomia, respectively. Also, these findings disagree with a study conducted in Tanzania [4], which reported that more than fifth (20.6%) had macrosomia.

In the present study, less than one third of neonatal had no abnormality. The current study disagrees with a study conducted in Assiut [28], which reported that 83.33% fetal outcome no abnormality.

In the present study, more than three-fifths of neonatal had normal Apgar score, which agrees with El-Nagar et al. [18], who found that majority (88.0%) of neonatal had normal Apgar.

In the present study more than a third (34.8%) of neonatal had abnormal Apgar score. The current study disagrees with a previous study [26], which found that less than one-fifth (16.2%) of those had an Apgar score of less than 7 at 1 minute. This finding agreed with Makwana et al. [26], who reported that less than fifth (18.42%) had hypoglycemia.

The present study illustrated that less than one-third of neonatal had respiratory distress and this disagrees with Makwana et al. [26], who reported that more than three-fifths (60.23%) had neonatal respiratory distress.

It is evident from the current study's findings that less than one-fifth of the fetus developed jaundice. This outcome was in line with a study conducted in India by Panigrahi and Panda [21], where it was revealed that jaundice developed in 16.7% of the fetuses, which was less than one-fifth of the total fetuses.

Based on the results of this investigation, it is evident that 3.3% of fetuses had admission to intensive care unit, and this finding disagrees with a previous study [18], which reported that one-fifth of the fetus had admission to intensive care unit.

The vast majority (84.9%) of respondents in the current study controlled GDM with insulin. This finding disagreed with El Toony et al. [28], who reported that most of the enrolled women controlled GDM with medical nutritional therapy and only 38.3% needed insulin.

CONCLUSION

Pregnant women visiting ante-natal care clinics in Assiut city's west sector had a 3.4% frequency of GDM. The Apgar score and the risk variables (obesity/overweight and a history of GDM) during pregnancy showed a statistically significant difference (P value = 0.000 and 0.000, respectively).

Recommendations

1. Public orientation through mass media should be directed toward women at risk of GDM to prevent and/or reduce its related maternal and neonatal complications.
2. Further research can be done to investigate the effectiveness of health education programs on maternal and fetal outcomes

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