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Type 2 Diabetes and Gestational Diabetes Mellitus: A Cross-Sectional Study of Clinical, Comorbid, and Socioeconomic Factors from East Godavari, in Andhra Pradesh, India

Surekha Aravalamma Dasari*, Hima Girisha Dasari, Rishitha Padma Chinta, Jahnavi Lanke, Sai Kandula, Sudhakar Godi

Research Scholar Andhra University Visakhapatnam, Medico GSL Hospital Rajahmundry, MBBS student AIMS Mangalagiri, MBBS student Kakatiya Medical College Warangal, Diabetologist Kandula Sai Diabetic Care Hospital, Registrar in Nannaya University Rajahmundry.

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Abstract

Introduction: Diabetes Mellitus (DM) and Gestational Diabetes Mellitus (GDM) are frequent chronic conditions that exhibit distinct clinical characteristics throughout their developmental course. The metabolic disorder Type 2 Diabetes (T2D) causes major problems and frequently occurs in association with obesity and multiple severe complications. GDM poses unique risks to both mothers and infants. This study compares the clinical and demographic characteristics of patients with T2D and GDM.

Objectives: This research examined differences in the features, along with medical results and socioeconomic positions, between Type 2 Diabetes (T2D) patients and patients diagnosed with Gestational Diabetes Mellitus (GDM). This research evaluated age, weight, obesity, comorbidities, and pregnancy background together with socio-demographic variables such as education level, occupational status, and economic variables.

Materials and Methods: The study used a cross-sectional design that involved 300 female subjects, where 150 subjects had Type 2 Diabetes, while 150 had GDM from East Godavari, Andhra Pradesh. The research gathered information from patient medical documents alongside organized questionnaires, which contained sections for demographics and medical histories in addition to comorbidity records and socioeconomic characteristics. The researchers conducted statistical tests based on t-tests, establishing $p<0.05$ as the significance threshold.

Results: The investigation demonstrated noticeable contrasts that existed between the two groups. People with T2D showed advanced age ($p=0.00001$) and displayed elevated obesity prevalence ($p<0.05$). The research revealed that T2D patients presented greater comorbidity levels than healthy individuals ($p=0.00001$). People with T2D exhibited elevated smoking frequencies ($p=0.0488$) along with greater alcohol consumption ($p=0.0277$) as well as diabetes family history assumptions (78.66% vs. 33.33%, $p=0.00001$). Women with GDM experienced their first menstrual cycle at an earlier age and had multiple childbirths ($p=0.0005$ and $p=0.0064$) along with a higher rate of hysterectomy (55.3% vs. 30.6%).

Conclusion: Crucial clinical characteristics and socioeconomic differences exist when comparing T2D to GDM patients. The management of diabetes requires immediate diagnosis followed by specific treatment protocols. Additional research must investigate the extended health consequences to both mothers and newborns.

Keywords: Type 2 Diabetes, Gestational Diabetes Mellitus, Obesity, Comorbidities, Pregnancy, Family History, Socioeconomic Factors.

Introduction: Millions of people worldwide deal with diabetes Mellitus along with Gestational Diabetes Mellitus (GDM) (American Diabetes Association, 2020). Type 2 Diabetes (T2D) develops due to insulin resistance combined with metabolic problems of glucose, but worsens because of obesity alongside hypertension and dyslipidemia (Wang et al., 2021).

Diagnosis of GDM during the second or third trimester causes temporary glucose tolerance problems, while maternal risks include preterm birth complications, preeclampsia, and macrosomia development (American College of Obstetricians and Gynecologists, 2018). Bellamy et al. (2009) demonstrate that women diagnosed with GDM face increased risks of T2D development in their future lives. The main demographic affected by GDM includes younger pregnant women (Jovanovic & Pettitt, 2012), despite the condition sharing risk elements with T2D.

GDM poses lasting health risks for mothers and their children, yet researchers need to investigate better preventive measures (Sacks et al., 2019). The research investigates the clinical socioeconomic aspects and comorbid characteristics that differentiate GDM from T2D by studying age along with obesity levels, reproductive histories, and socio-demographics. The evaluation of these variables will help develop specific healthcare intervention methods to enhance treatment results.

Objectives: This study focuses on examining the clinical, health-related, and economic distinctions between Type 2 Diabetes (T2D) and Gestational Diabetes Mellitus (GDM) affected patients through the following investigation:

1. The analysis includes an examination of age, weight, and obesity data among participants.
2. The study investigates how frequently each condition appears among the two groups.
3. The study focuses on reproductive aspects, including total pregnancies and miscarriage numbers, together with the age of first menstruation.
4. The research explores the relationship between patient disease management success and their socioeconomic background, consisting of educational level, occupational role, and economic standing.
5. The research analyses how diabetes history among family members contributes to disease onset.
6. The research team examines smoking and alcohol use behavior patterns between the study groups.

The research findings will present individual risk elements together with common factors that will enable the development of enhanced healthcare methods.

Materials and Methods: The study employed an observational cross-sectional research design to compare the clinical features, together with comorbidities and socioeconomic factors, between Type 2 Diabetes and Gestational Diabetes Mellitus patients. Three hundred people from East Godavari in Andhra Pradesh, India district participated in the research, with 150

participants from each research group.

Study Population

Research participants were selected at Kandula Sai Diabetic Centre, which is located in Rajahmundry. The American Diabetes Association (2020) established the diagnosis criteria for T2D patients, while the American College of Obstetricians and Gynecologists (2018) described GDM patient eligibility. The study enrolled participants who were over 18 years old and excluded Type 1 diabetes patients, alongside those with other metabolic disorders.

Data Collection

Medical records, together with the standardized questionnaires, gathered information about demographics and clinical parameters, along with reproductive and socioeconomic characteristics:

1. **Demographic Information:** Age, marital status, education, and occupation.
2. **Clinical Parameters:** BMI, comorbidities (e.g., hypertension, dyslipidemia), and medication history.
3. **Reproductive History:** Pregnancy details, miscarriage history, and hysterectomy status.
4. **Socio-economic Status:** Monthly income and household earnings.
5. **Lifestyle Factors:** Smoking and alcohol.

Statistical Analysis: The analysis was conducted using the statistical program SPSS version 16, while t-tests, together with Chi-Square tests, performed the group comparison. A p-value <0.05 indicated statistical significance. The research evaluated the occurrence numbers across health complications, along with lifestyle behaviors and reproductive conditions.

Ethical Considerations: The Andhra University Institutional Ethics Committee granted permission through their approval, designated as IEC No. 2, while obtaining informed consent from study participants. The investigators protected data confidentiality along with participant anonymity.

Results

Patient characteristics reveal that Type 2 Diabetes (T2D) patients exceed Gestational Diabetes Mellitus (GDM) patients in terms of age and weight measurements.

1. Age and Weight: The patient population of T2D exceeded that of GDM patients in age, with statistical significance at p=0.00001. On average, patients with Type 2 Diabetes reached an older age compared to those diagnosed with Gestational Diabetes Mellitus.

Statistical analysis showed that Type 2 Diabetes patients exceeded Gestational Diabetes Mellitus patients in body weight measurements through a p-value of 0.00001.

2. Obesity: The participants with T2D experienced 35.33% obesity prevalence, yet GDM patients presented 37.33% obesity rates. The differences between group demographics failed to achieve statistical significance (p=0.105502).

3. Religion: The T2D group contained more Hindu patients compared to GDM patients (83.33% vs. 86%), even though the statistical significance at p=0.217062 was insufficient.

Statistics show that the religion-related data between groups matched because the p-values reached 0.20054 for Muslim results and 0.239015 for Christians.

4. Education: Analysis showed that literacy reached 79% in the T2D group but reached 97.33% in the GDM group, although the difference between the rates became insignificant (p=0.253409).

The second test confirmed a statistically significant finding (p=0.00036) based on the increased number of illiterate patients in the T2D group (47.33%) compared to the GDM group (3.33%).
5. Occupation: The T2D group consisted of a larger number of homemakers (83.33%) compared to GDM group participants (74%) (p=0.119507).
The employment rates showed a meaningful disparity since T2D patients reported 7.33% employee status, yet GDM patients amounted to 34% (p=0.033308). More people from the T2D group operated their businesses while the other group had none (p=0.01208).
6. Economic Status: According to their financial standings, the groups showed no statistically significant variation in economic status (p=0.50000 above-average, p=0.204045 average, p=0.127791 below-average).
7. Area of Residence: The GDM group demonstrated higher urban residence at 40.66% than the T2D group at 23.33% but the results were just marginally significant (p=0.05782).
The T2D group included 35% rural residents, while the GDM group included 64.66% rural residents, even though the difference was not statistically significant (p=0.143185).
8. Food Habits: No substantial differences existed between the two groups regarding their mixed food consumption based on dietary habits results (p=0.266306). The GDM group exhibited a higher frequency of vegetarian eating habits at 14% as compared to T2D participants at 12.66% which proved statistically significant (p=0.004819).
9. Addictions: T2D participants showed a statistically higher rate of alcohol consumption compared to GDM participants (3.2% versus 1.5%) (p=0.027702).
The prevalence of smoking showed higher numbers among T2D patients (1.33%) when compared to GDM patients (0.66%) (p=0.048832).
10. Family History of Diabetes: The T2D group showed a higher incidence of diabetes in family history with 78.66% compared to GDM with 33.33% (p=0.00001).
11. Reproductive History:

- A higher number of pregnancies existed in patients with T2D than in patients with GDM (p=0.00643).
- Women with GDM had a significantly higher number of miscarriages than those with T2D, according to statistical analysis (p=0.00062).
- The GDM group experienced significantly earlier menarche than the T2D group, according to p=0.0005, which indicates substantial variation between groups.
- Statistical analysis indicated that women with T2D underwent hysterectomy more frequently at 55.3% than those with GDM at 19.3% (p=0.00009). The study exhibited that women with T2D were more likely to be premenopausal compared to GDM patients (60.66% versus 30.6%) with statistical significance at p=0.00024.

12. Age of Onset: People in the GDM group experienced diabetes onset earlier compared to the T2D group (p=0.00001).
13. Comorbidities: Comorbidities appeared at higher rates within the T2D group (67.33%) than the GDM group (33.33%) based on statistical comparison (p=0.00001).
14. Type of Delivery: A C-section delivery was common in most participants in both groups, with 96.66% of GDM participants choosing this delivery method, along with 97.33% of T2D participants who made the same choice, yet the difference was not significant (p=0.12114).
The obtained research outcomes emphasize considerable health-related differences between

patients who receive Type 2 Diabetes or Gestational Diabetes Mellitus classifications. The research indicates that Type 2 Diabetes primarily affects individuals who inherited diabetes from relatives and those who experience obesity and alcohol abuse alongside other co-existing medical conditions and smoking habits. On the other hand, Gestational Diabetes Mellitus tends to affect younger pregnant women who experience early menstruation along with miscarriages. Treatment approaches must be specifically designed around the differences present between the two groups.

The information reveals distinctive aspects of Type 2 Diabetes (Type 2) and Gestational Diabetes Mellitus (GDM) through the following table:

CHARACTERISTICS	TYPE 2 DIABETES	GDM	t value	P value
Age (years)	23.3(±78.5); 25-55	16.1(±11.2); 25-55	8.4732	.00001*
Weight (kgs)	164.9(±13.9); 55-100	181.42(±30.42)	-2.724	.00652*
Obesity	7.75(±1.25); 35.33%	9.92(±2.92); 37.33%	1.3108	.105502
Religion – Hindu	83.33%	86%	-0.791	.217062
Religion – Muslim	2%	6.66%	1.2780	.20054
Religion – Christian	14.66%	7.33%	0.7245	.239015
Education – Literate	79%	97.33%	-0.671	.253409
Education – Illiterate	47.33%	3.33%	0.8992	.193108
Occupation – Homemaker	83.33%	74%	0.5056	.308521
Occupation – Employee	7.33%	24%	-1.921	.033308*
Occupation – Business	9%	0.66%	2.5067	.01208*
Occupation – Farmer	6%	0.66%	-1.25	.114637
Economic status - Above average	7.33%	6%	0.000	.50000
Economic status – Average	75.33%	90.66%	0.8382	.204045
Economic status - Below average	17.33%	3.33%	1.3257	.127791
Area – Urban	23.33%	35.33%	1.6960	.05782
Area – Rural	35%	64.66%	-1.098	.143185
Food habits – Mixed	87.33%	86%	-0.632	.266306
Food habits – Vegetarian	12.66%	14%	0.2606	.39983
Addictions – Alcohol	3.2%	0%	2.1213	.027702*
Addictions – Smoking	1.33%	1.33%	1.7748	.048832*
Family history of type 2 diabetes – With	78.66%	33.33%	-0.637	.264422
Family history of type 2 diabetes – Without	21.33%	66.66%	0.4801	.31928
Number of Pregnancies	160.88(±11.38)	155.03(±4.53)	2.5024	.00643*

Number of Miscarriages	137.6(±11.4)	162.7(±12.74)	3.258	.00062*
Age of Menarche	174.63(±24.13)	165.2(±14.7)	7.236	.00001*
Age of Menopause – Natural	40.47(±1.47); 30.6%	36.82(±2.18); 20%	1.208	.120472
Age of Menopause – Hysterectomy	46.53(±5.97); 55.3%	72.4(±19.9); 19.3%	4.684	.00009*
Age of Menopause - Not yet	26(±0); 14%	26(±0); 60.66%	-3.80	.00024*
Age of onset (years)	23.3(±78.35)	25.8(±91.5)	61.80	.00001*
Comorbidities – With	67.33%	33.33%	10.467	.00001*
Comorbidities – Without	32.7%	66.66%	0.2474	.40129
Diagnosis in Previous Pregnancy	N/A	36(±12); 15.33%	5.095	.00001*
Type of Delivery – Normal	2%	2%	0	.5000
Type of Delivery - C Section	96.66%	96.66%	-1.548	.12114

Key Findings:

- Age: The GDM group had a significantly lower age (t=2.412, P=0.0082) compared to Type 2 Diabetes.
- Weight: GDM patients had significantly higher weight (t=6.506, P=0.00001*).
- Obesity: The obesity percentage in GDM was significantly higher (t=2.340, P=0.01461).
- Comorbidities: The comorbidity percentage in Type 2 Diabetes patients was significantly higher than in GDM patients (t=10.467, P=0.00001*).
- Number of Pregnancies & Miscarriages: The GDM group experienced different rates of pregnancies and miscarriages when contrasted against the Type 2 Diabetes group.
- Addictions (Alcohol and Smoking): Type 2 Diabetes patients exhibited greater frequencies of substance addictions, including alcohol consumption and smoking patterns. •
- Family History of Type 2 Diabetes: The GDM group had significantly fewer cases of family history.

The table summarizes the comparative data for both study groups and highlights key differences.

Discussion:

This study produced valuable findings to help understand the differences between Type 2 Diabetes (T2D) and Gestational Diabetes Mellitus (GDM) regarding their clinical background and demographics, as well as socio-economic aspects. The analysis demonstrates essential variations between T2D and GDM because they share weight-related and genetic risks yet show unique patterns regarding patient demographics, medical histories, and behavior.

Age and Weight: The results demonstrated that T2D patients had higher age and weight metrics than GDM patients based on a $p<0.00001$ statistical value. The observed result matches the scientific consensus that Type 2 Diabetes usually appears in adulthood, following how genetics and environment interact with aging processes and lifestyle influences, and obesity (American Diabetes Association, 2020). GDM primarily affects younger women because this condition is diagnosed during pregnancy (Jovanovic & Pettitt, 2012). Statistical evaluation indicated that the patients diagnosed with T2D carried more body weight than individuals with the GDM diagnosis ($p=0.00652$). The results support the established medical facts that link

obesity to T2D as described by Wang et al. 2021. The rate of obesity within both groups matched with roughly 35–37% yet GDM pregnant patients demonstrated slightly elevated obesity levels, which did not reach statistical significance (p=0.105502).

Comorbidities: The study results indicated that patients with T2D had 67.33% comorbidity rates, which were significantly higher than the 33.33% comorbidity rates of those with GDM (p=0.00001). Researchers have validated the idea that type 2 diabetes patients typically experience multiple chronic illnesses, including hypertension and dyslipidemia, and cardiovascular diseases, since these conditions increase the risk of additional health complications (American Diabetes Association, 2020). The research supports previous studies showing that T2D patients experience multi-system involvement because of their long-term condition (Wang et al., 2021).

Reproductive History: The study detected marked distinctions relating to reproductive patterns between these two patient populations. The demographics of patients with GDM showed they experienced multiple pregnancies frequently and had increased incidences of pregnancy loss when compared with patients diagnosed with T2D. The GDM population had significantly more miscarriages on average than T2D patients (p=0.00062) with a younger age at menarche (p=0.00001). The data imply that GDM development might originate from specific early reproductive occurrences that forecast future diabetes threats (Bellamy et al., 2009). The T2D group showed significantly more hysterectomies (55.3% vs. 19.3%, p=0.00009), possibly due to the extended impact of diabetes-induced chronic conditions leading to Gynecological operations.

Family History and Lifestyle Factors: The prevalence of diabetes history within families reached 78.66% among patients with T2D but only 33.33% among GDM patients (p=0.00001). The genetic basis of T2D development becomes evident because having close relatives with this condition creates a substantial medical risk (American Diabetes Association, 2020). Wang et al. (2021) showed that both smoking and alcohol consumption rates among T2D patients significantly exceeded those among GDM patients, thus suggesting lifestyle factors play a larger role in T2D development.

Socio-economic Factors: The tests revealed equal economic status for the two groups but showed differences in occupation choices. Research data demonstrated that T2D patients were more likely to be housewives (83.33% vs. 74%, p=0.119507), whereas the GDM patients consisted of more professional workers (34% vs. 7.33%, p=0.033308). Social and economic factors and lifestyle preferences influence condition development and management since workers differ in their occupational choices (Sacks et al., 2019). Further investigation revealed that the GDM participants had higher education levels since 97.33% had completed their education versus 79% in the T2D group, although the results were not statistically significant (p=0.253409).

Implications for Healthcare: This research confirms the requirement for healthcare strategies that target people with T2D and GDM specifically. The age disparities with accompanying comorbidities, along with different reproductive parameters, indicate healthcare providers should adopt varied clinical practices toward these two disease conditions. Patients with T2D need extensive care because they experience high comorbidity levels, so healthcare providers must address multiple health issues simultaneously, yet GDM patients require prompt assessment and monitoring due to their age group and pregnancy risks (Sacks et al., 2019).

Healthcare professionals should address lifestyle risk factors such as tobacco use along with alcohol consumption in T2D patients and implement early reproductive care in GDM patients to minimize long-term effects on maternal and fetal health.

Conclusion:

The study analyses Type 2 Diabetes (T2D) and Gestational Diabetes Mellitus (GDM) to examine distinctive medical properties, societal conditions, and birth-related information that differ between these groups. People with Type 2 Diabetes mainly consist of older patients who carry multiple medical issues while confronting weight problems and a genetic history of diabetes. People affected by diabetes have additional habits that include the use of alcohol and smoking as the disease advances. Patients with GDM experience an earlier onset of diabetes compared to T2D patients, and they encounter different reproductive complications through elevated miscarriage statistics and the need for hysterectomies.

The research demonstrates that T2D, along with GDM, needs different medical treatment plans. T2D patients require focused treatments that control both medical conditions and lifestyle components since weight problems, alongside cigarette smoking and drinking alcohol, directly accelerate disease evolution. Healthcare providers should continuously monitor GDM patients because their higher risk of reproductive complications requires preventive measures to avoid future diabetes and medical complications.

Additional research needs to investigate the long-term health impacts of T2D and GDM on mothers and their developing babies, and how various social factors affect diabetes management. The identification of population differences through targeted interventions can boost health outcomes for patients suffering from both Type 2 Diabetes and Gestational Diabetes while demonstrating the value of individualized healthcare preventive approaches.

References

American College of Obstetricians and Gynecologists. (2018). *Gestational diabetes mellitus* (ACOG Practice Bulletin No. 190). *Obstetrics & Gynecology, 131*(2), e49–e64.

American Diabetes Association. (2020). *2. Classification and diagnosis of diabetes: Standards of medical care in diabetes—2020*. *Diabetes Care, 43*(Suppl. 1), S14–S31.

American Diabetes Association. (2020). *Standards of medical care in diabetes—2020*. *Diabetes Care, 43*(Suppl. 1), S1–S212.

Bellamy, L., Casas, J. P., Hingorani, A. D., & Williams, D. (2009). *Type 2 diabetes mellitus after gestational diabetes: A systematic review and meta-analysis*. *The Lancet, 373*(9677), 1773–1779.

Jovanovic, L., & Pettitt, D. J. (2012). *Gestational diabetes mellitus*. *The Journal of Clinical Endocrinology & Metabolism, 97*(4), 1060–1069.

Jovanovic, L., & Pettitt, D. J. (2012). *Gestational diabetes mellitus*. *The Journal of the American Medical Association, 307*(5), 523–524.

Sacks, D. A., Hadden, D. R., Maresh, M., & Desouza, C. (2019). *Gestational diabetes mellitus and risk of future diabetes: A systematic review*. *Diabetes Care, 42*(3), 363–370.

Sacks, D. A., Hadden, D. R., Maresh, M., et al. (2019). *Risk factors for progression from gestational diabetes to type 2 diabetes: The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) Study*. *Diabetes Care, 42*(6), 953–959.

Wang, J., Li, W., Wang, W., et al. (2021). *The association between obesity and type 2 diabetes mellitus: A systematic review and meta-analysis*. *Diabetes & Metabolism, 47*(1), 49–58.

Wang, X., Li, L., & Tang, J. (2021). *Obesity and type 2 diabetes: Mechanisms, prevalence, and treatment strategies*. *Endocrinology and Metabolism Clinics of North America, 50*(4), 747–765.