Gestational Diabetes and Postpartum Persistence of Glucose Abnormality: Ethnic Variability- Bangladesh Perspective



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GDM study group



Agenda

- Ethnic variability and Bangladesh perspective of -
  - Prevalence of GDM: Impact of diagnostic criteria
  - Risk factors of GDM
  - Genetic predisposition for GDM
  - Outcome of GDM
  - Post-partum persistence of AGT and its predictability

Ethnicity & GDM

- Belonging to a social group that has a common national or cultural heritage
- Ethnic groups that are considered high-risk for GDM include Hispanic, African-Americans, Native American, South or South East Asian, Pacific Islander or Indigenous Australian
- May differ with regards to peri-natal and maternal outcomes

Prevalence of GDM:
Impact of Diagnostic Criteria

Defining Hyperglycemia in pregnancy

- **Diabetes in pregnancy (DIP)**
  1. Diagnosed before the start of pregnancy
  2. Diagnosed as DM first time during pregnancy
- **Gestational diabetes mellitus (GDM)**

Diagnostic criteria

	WHO 1999	WHO 2013		ADA 2016	
	GDM	GDM	DM	DIP (before 24 wks)	GDM (after 24 wks)
FPG	≥ 7.0	5.1-6.9	≥ 7.0	≥ 7.0	≥5.1
01h PG	None	≥ 10.0	None	None	≥ 10.0
02h PG	≥ 7.8	8.5-11.0	≥ 11.1	≥ 11.1	≥8.5

Diabetes in Pregnancy Study Group India (DIPSI) criteria

	Normal	DM	Gestational glucose intolerance	GDM
FPG	None	None	None	None
01h PG	None	None	None	None
02h PG	<6.7	≥ 11.1	6.7-7.7	7.8-11.0

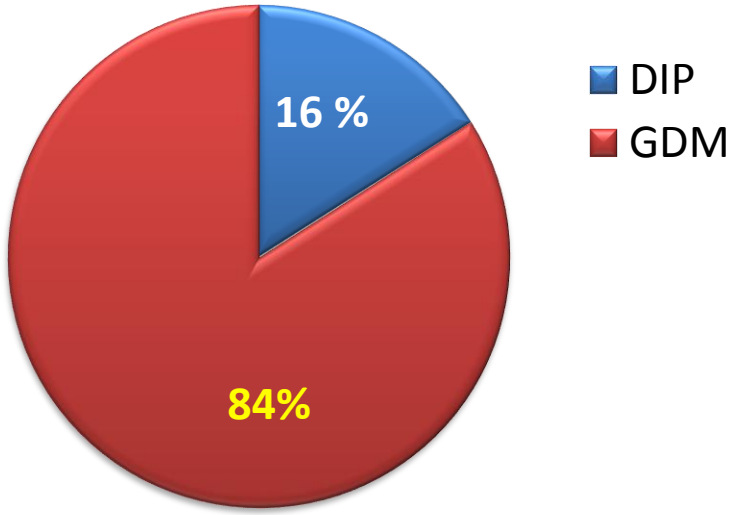
Epidemiology of GDM

- IDF (2015) estimates that 16.8% live births - complicated with some form of hyperglycemia in pregnancy

- Among them

  DIP:16%

  GDM: 84%



Epidemiology of GDM

- The highest risk belong to women from South Asia
- Prevalence increasing worldwide: 1% to 4% (1964)
  - In Black Americans- 3.1% (1992)
  - South and East Asians- 7.6% (1992)
  - Indians- 11.3% (1992)
  - HAPO Study: 9.3 to 25.5% (2008)
  - Prevalence in Bangladesh, Rural: 12.9% (2013)
  - Recent studies by GDM Group in BSMMU found far higher frequencies: 31 to 36% (2012-2014)
- Prevalence varies worldwide depending on associated risk factors as well as on testing methods using various cut-offs among racial and ethnic groups

Screening for GDM

- Selective testing based on risk factors

- Universal testing for all:

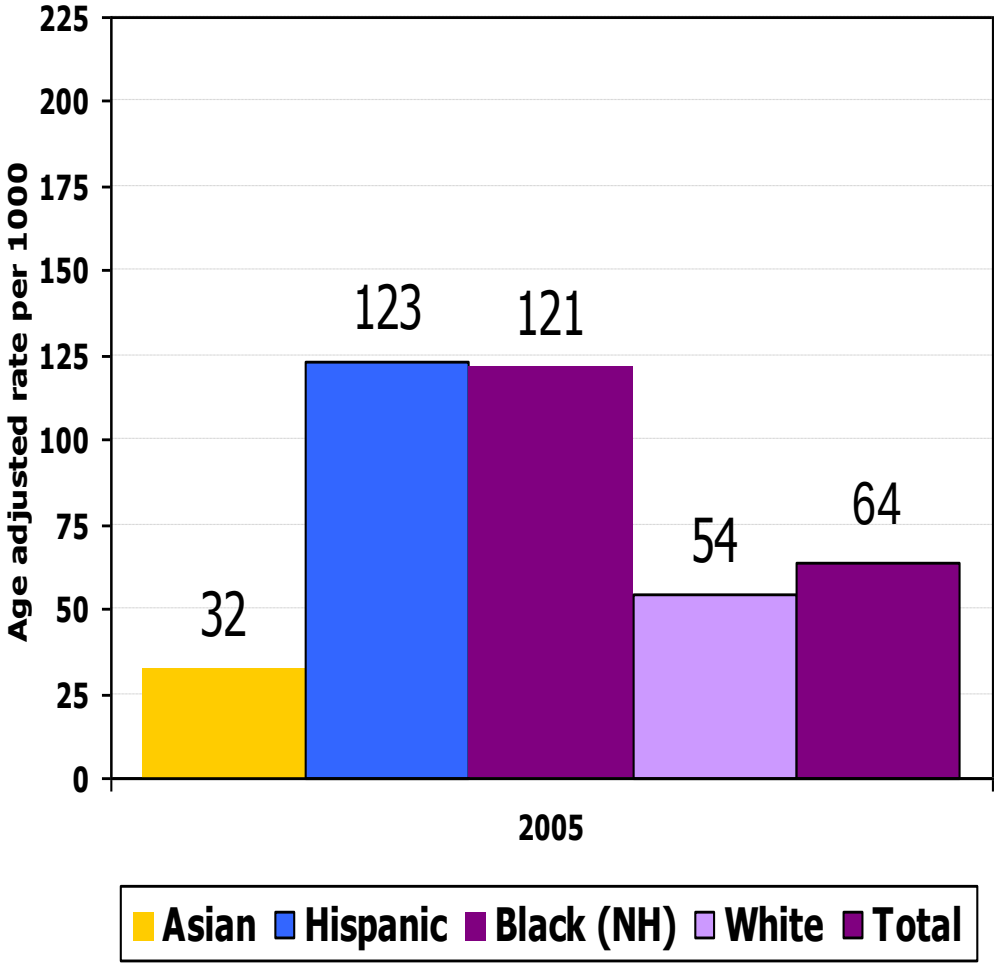
  advocated by most of the authorities

As being Asian, because of ethnicity, we belong to high risk group, universal testing at first prenatal visit should be done

Screening and Diagnostic Criteria

- No universally accepted/ gold standard criterion as yet
- After release of reports from the land mark study-HAPO, IADPSG proposed new criterion with lower cut-offs for GDM in 2010. This criterion is accepted by most of the world authorities including ADA & IDF
- Until 2013, WHO 1999 criterion was practiced commonly
- But ACOG still follows the older criterion
- No unanimously accepted criterion in Asian countries

Prevalence of Diabetes Varies by Race/Ethnicity in Massachusetts



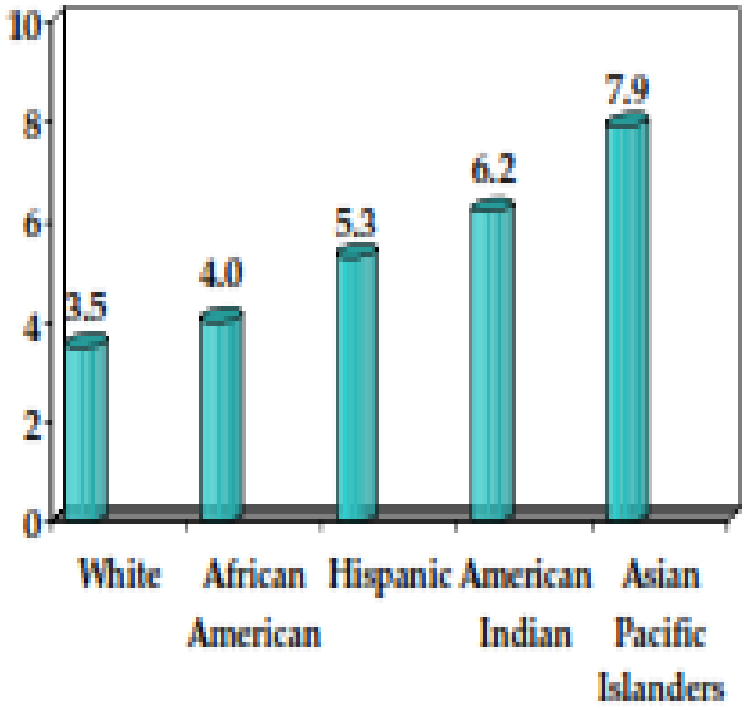
Source: MDPH, Bureau of Health Information, Statistics, Research and Evaluation, Health Survey Program

Gestational Diabetes Mellitus (GDM) Among Asian Subgroups, California, 2002

Anura Ratnasiri, MS, Renato Littaua DVM, MPVM, Emmett Gonzalez, MD

Maternal, Child and Adolescent Health Program
Center for Family Health, California Department of Public Health

Percent of Women with a Diagnosis of GDM by Race/Ethnicity: 2002

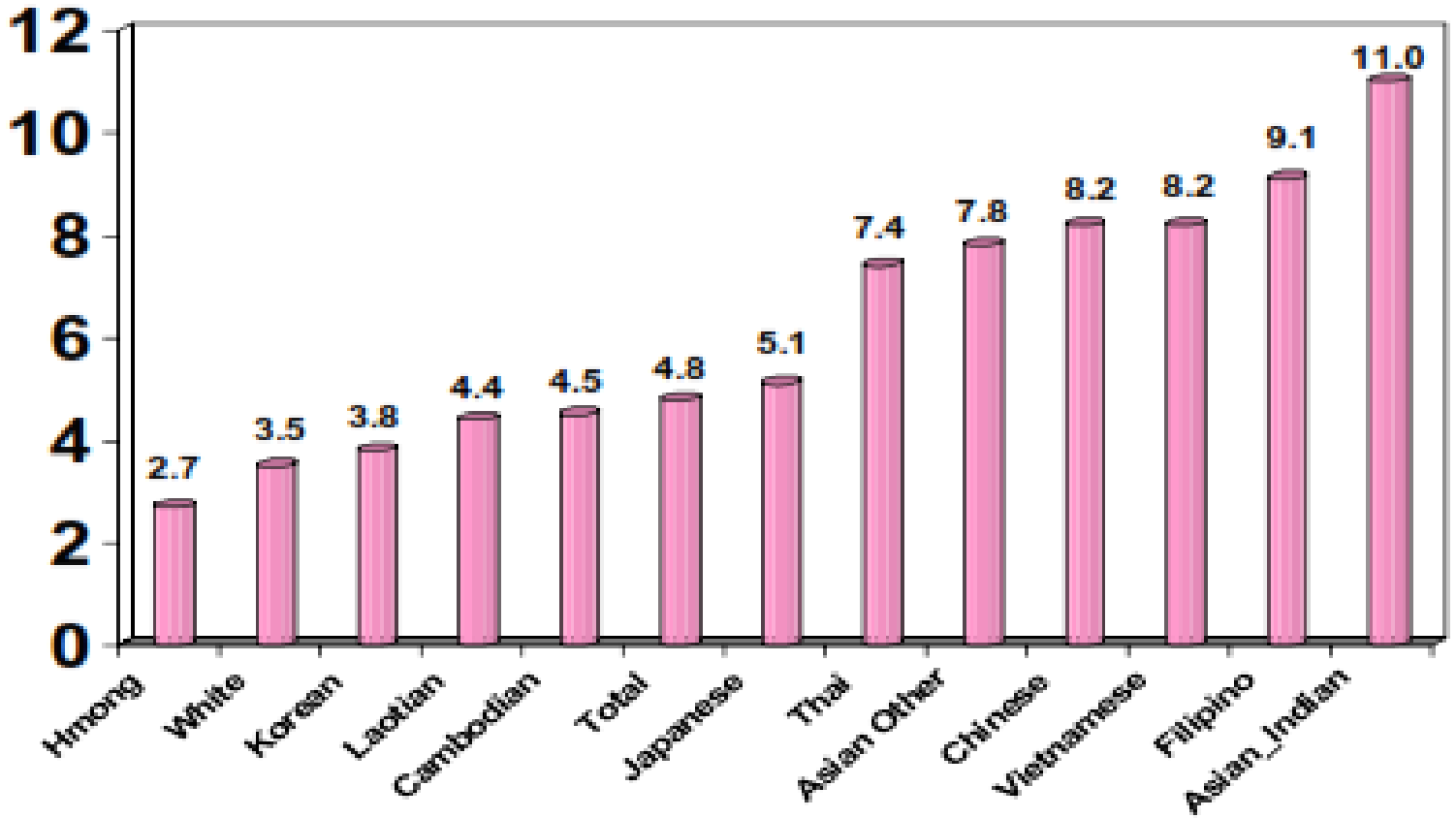


Gestational Diabetes Mellitus (GDM) Among Asian Subgroups, California, 2002

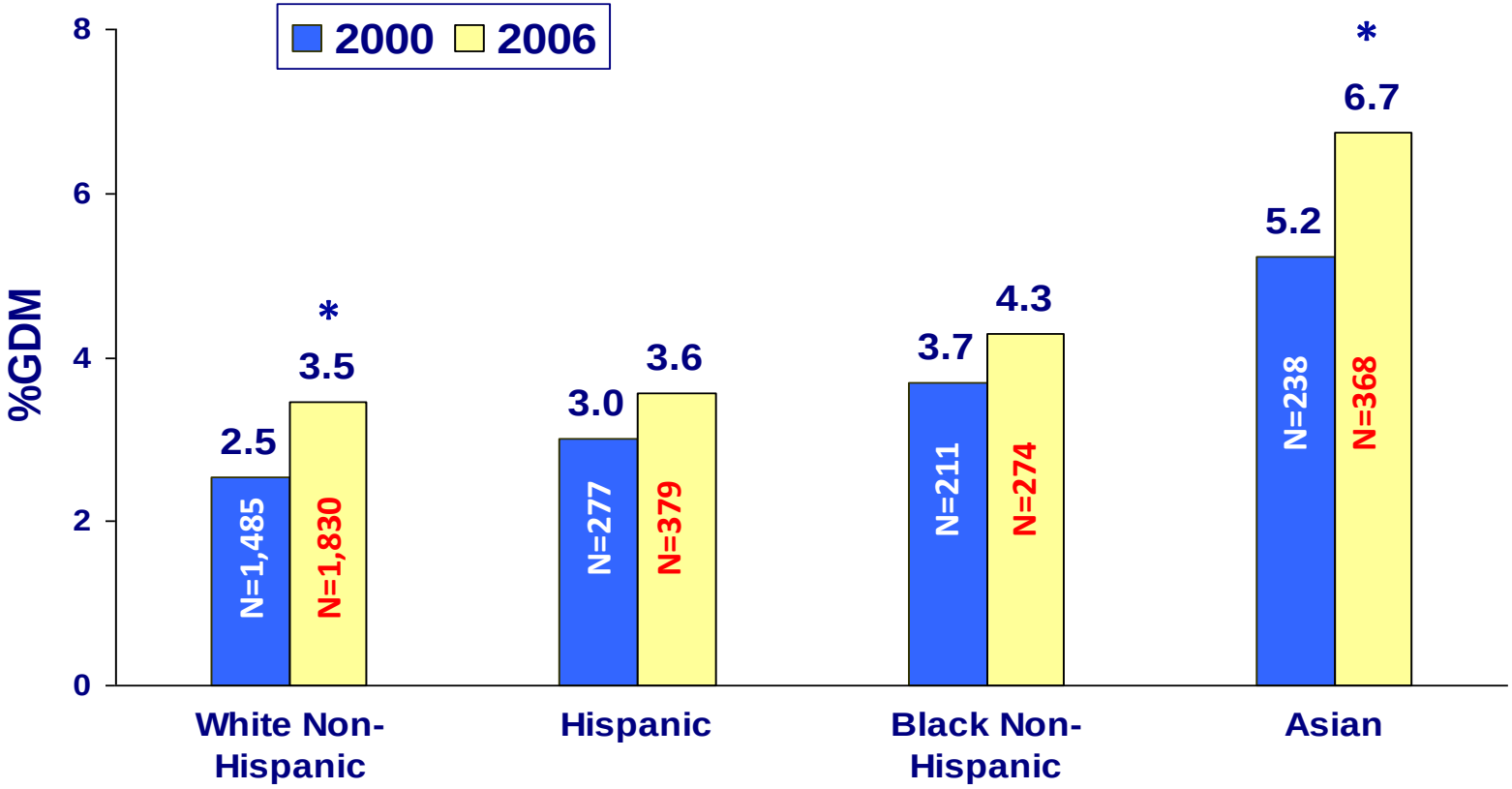
Anura Ratnasiri, MS, Renato Littaua DVM, MPVM, Emmett Gonzalez, MD

Maternal, Child and Adolescent Health Program
Center for Family Health, California Department of Public Health

Percent of Women With a Diagnosis of GDM by Asian Subgroups



GDM by Race and Hispanic Ethnicity Massachusetts: 2000 vs. 2006



* Statistically higher than 2000 rate ($p<0.05$)

GDM Study Group, BSMMU

Alarming Frequency of GDM in Bangladesh

Comparative Study Between 75-g (WHO 1999) and 100-g (O'Sullivan) Criteria

Nusrat et al. 2015 & 2016

Study Reports: Frequency of GDM

Sample size: **385** pregnant participants

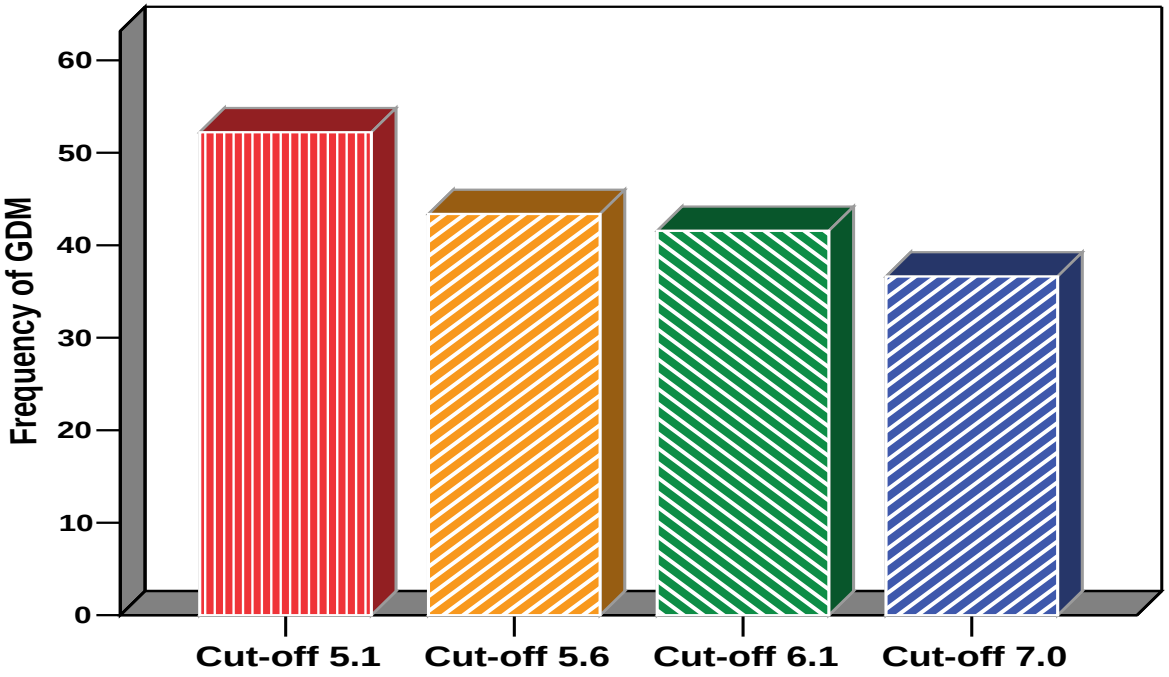
Screening method: 75-g and 100-g OGTT

Results:

Frequency: 32.2% (O'Sullivan); **Sensitivity:** 67.27%

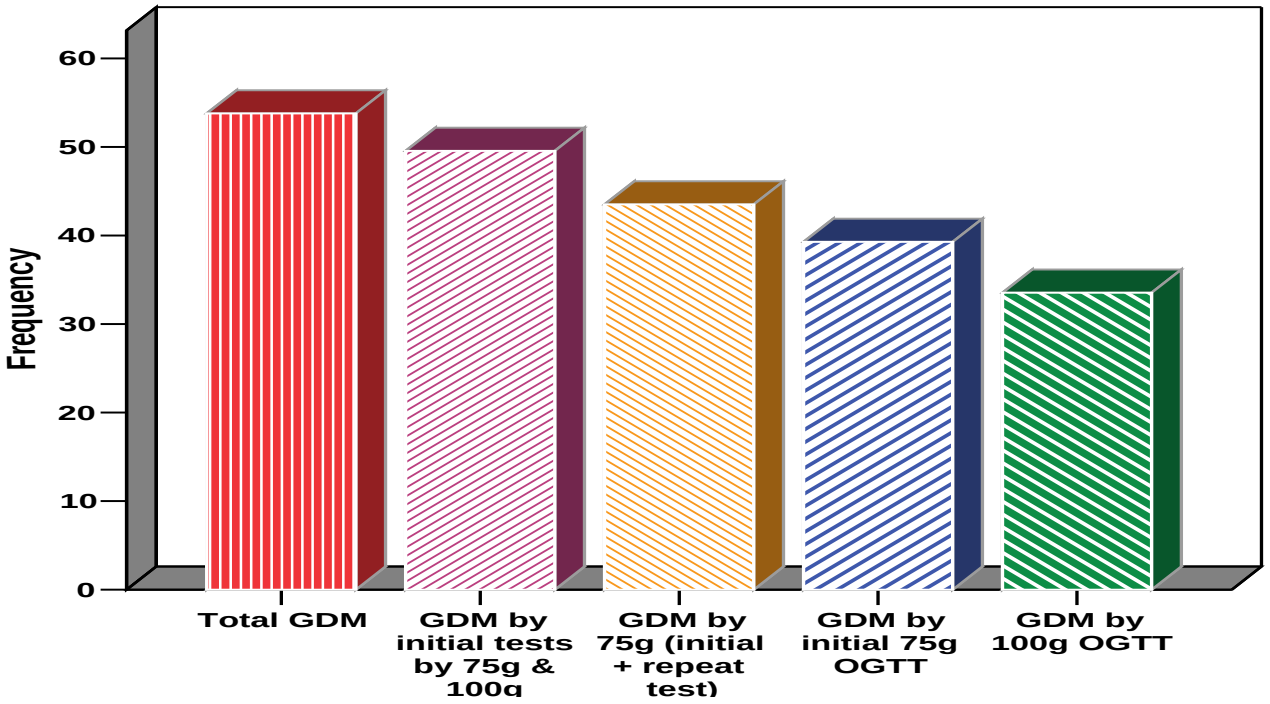
Frequency: 36.6% (WHO 1999); **Sensitivity:** 87.27%

Frequency (%) of GDM by WHO Criteria Under Various Cut-offs for FPG



Nusrat et al. *JCD* 2016; vol 2 (4)-accepted

Frequency (%) of GDM in Different Events of OGTT



Nusrat et al. *JCD* 2015; vol 2 (2)

Publications by GDM Study Group, BSMMU



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Research Article

Association of risk factors in gestational diabetes mellitus among pregnant mothers attending at a tertiary care hospital in Bangladesh

Nusrat-Sultana, M A Hasanat, Sharmin-Jahan, Mashfiqul-Hasan, Yasmin-Aktar, Sandesh-Panthi, M Atiqur-Rahman, M Fariduddin

Department of Endocrinology, Bangabandhu Sheikh Mujib Medical University (BSMMU)

Abstract:

Objective: To observe association of risk factors with gestational diabetes mellitus (GDM) in a tertiary care hospital of Bangladesh.

Materials and methods: Risk factors of GDM were evaluated in pregnant subjects (n=385; age: 26.4±4.9 yrs; body mass index, BMI: 25.3±4.3 kg/m²; mean ± SD) screened by 75 gram oral glucose tolerance test (OGTT) following WHO 1999 criterion irrespective of gestational age in the Department of Endocrinology, Bangabandhu Sheikh Mujib Medical University (BSMMU). BMI, maternal age, parity, trimester and family history of diabetes were considered as risk factors. Plasma glucose was measured by glucose-oxidase method on the same day.

Results: GDM and normal glucose tolerance (NGT) showed significant difference for age (28.2±4.9 vs. 25.3±4.6 yrs, p<0.001), BMI (26.7±4.4 vs. 24.4±3.9 kg/m², p<0.001), family history of DM (55.5% vs. 43.0%, p=0.017) and number of gravida (p=0.048). There was no significant difference of frequencies of GDM among various trimesters (39.4% vs. 42.5% vs. 38.2%; χ^2=0.653, p=0.721). OGTT performed before 24 weeks revealed GDM in about 44% (88/202). Multiple regression revealed age (p<0.001), BMI (p=0.007) and family history of DM (p=0.048) as independent predictors for GDM.

Conclusion: It is concluded that age of mother, increased BMI, family history of diabetes as well as multigravidae are important predictors for GDM.

JCD

ORIGINAL ARTICLE

Screening for Gestational Diabetes Mellitus (GDM): Comparison between WHO 1999 and Modified O'Sullivan Criteria

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Abstract

Objectives: *This study was aimed to compare the efficiency (concordance/discordance, sensitivity) of World Health Organization (WHO) 1999 and modified O'Sullivan criteria for diagnosis of gestational diabetes mellitus (GDM).*

Methods: *We screened 385 pregnant subjects for GDM (age: 26.4±4.9 yrs, BMI: 25.3±4.3 kg/m2; mean ± SD)irrespective of gestational age and presence of risk factors under a cross-sectional pilot protocol. The study was done during December 2011 to June 2013 in the 'GDM Clinic' of Department of Endocrinology, Bangabandhu Sheikh Mujib Medical University(BSMMU). All the mothers performed02 sample 75g oral glucose tolerance test (OGTT) for diagnosis of GDM following WHO 1999 criteria.They wereasked for a (04 sample 100g OGTT following modified O'Sullivan criteria after an interval of 3 to 5 days. Out of 385 performing 75g OGTT, 345 responded for the 100g OGTT. Abnormal glucose tolerance (AGT) detected by any or both the tests were considered as GDM. Plasma glucose was measured by glucose-oxidase method on the same day.*

Results: *Out of 345 subjects, 165 (47.8%) were found to have GDM considering both the criteria which were 36.6% (141/385) by 75g OGTT and 32.2% (111/345) by 100g OGTT respectively.BMI (mean±SD) of he attending mothers was relatively higher (25.3±4.3, kg/m²). About half of the subjects (48.1%) had family 'story of diabetes, 33.5% had history of abortion and 53% were multigravida. Mean (±SD, yr.) age (yrs, .5±5.0 vs. 25.3±4.6) and BMI (kg/m², 26.5±4.1 vs. 24.5±4.0) were significantly higher in the GDM group n that of normal glucose tolerance (NGT) group (p<0.001 for both). There was a fair agreement between two criteria (κ=0.447; p<0.0001). About 15% (53/345) would escape GDM diagnosis by only 100g OGTT; versely,10% (34/345) would escape GDM diagnosis by only 75g OGTT. Holding combined result as gold fard, sensitivity of WHO criteria was 87.27% which for modified O'Sullivan criteria was 67.27%.*

Conclusions: *It is concluded that despite fair agreement, WHO recommended 75g OGTT encompasses AGT in pregnancy more efficiently in comparison to modified O'Sullivan 100g OGTT.*

Keywords: *GDM, WHO 1999 and O'Sullivan criteria*

GDM Study Group, BSMMU

Comparative study between WHO 1999 and WHO 2013 criteria

Sandesh et al. 2015

Study Reports: Frequency of GDM

Sample size: **320** pregnant participants

Glucose load: 75-gm

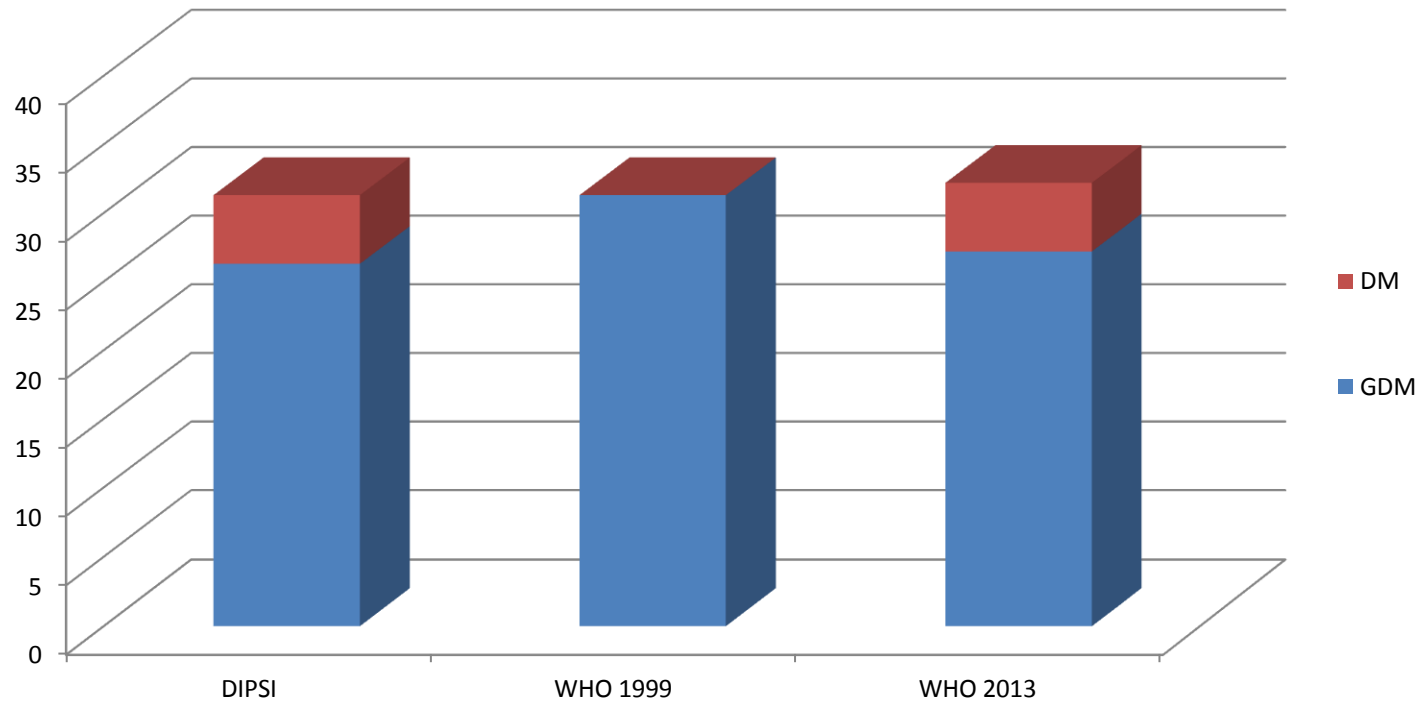
Result:

Frequency: 31.3% (WHO 1999) ; **Sensitivity:** 80.0%

Frequency: 32.2% (WHO 2013); **Sensitivity:** 83.7%

Sandesh-Panthi et al. *JCD* 2015; vol 2 (2)

Frequency of AGT on Initial Screening



DIPSI criterion and WHO 1999 criterion:

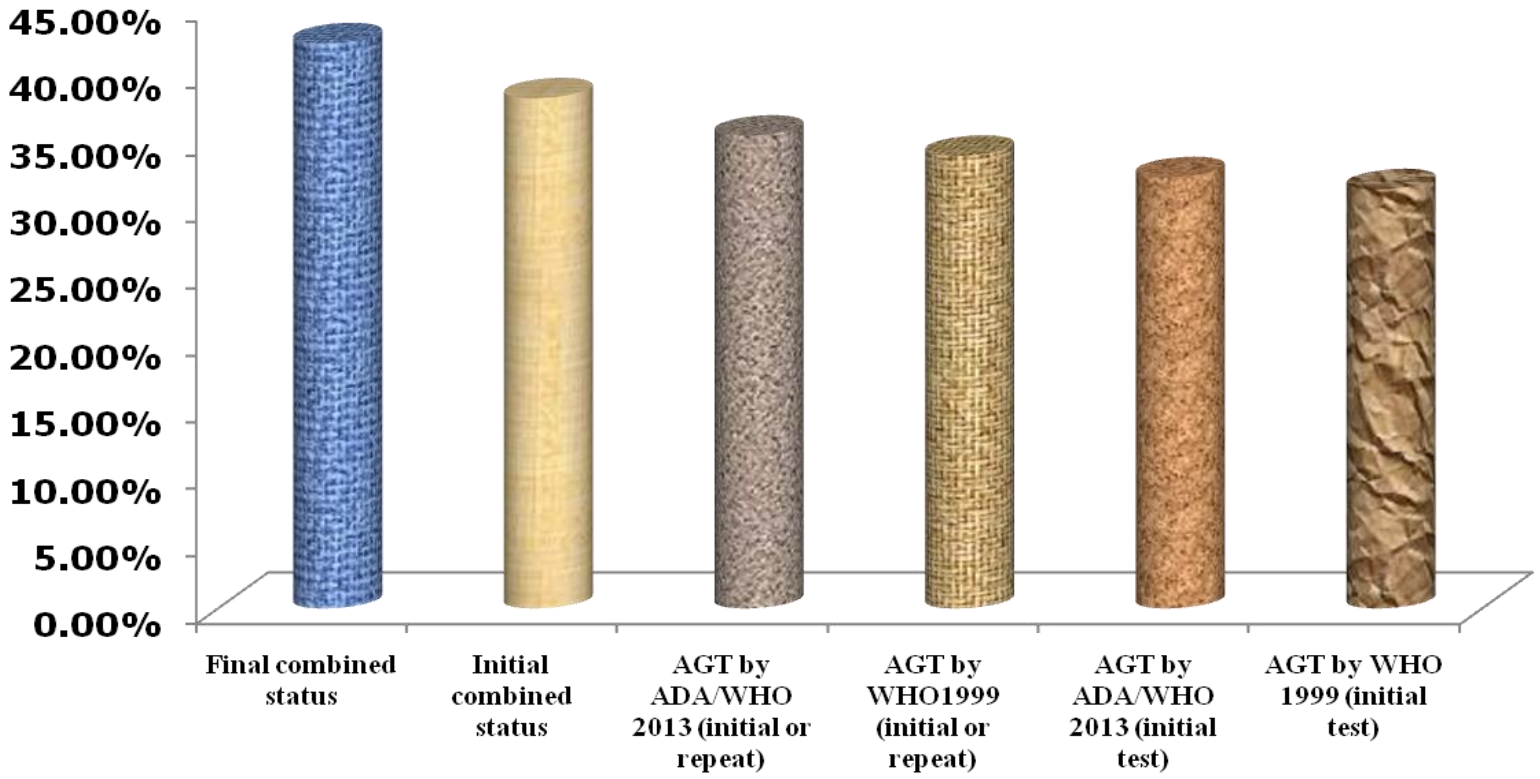
31.3% (GDM 26.3%, 84/320 and DIP 5.0%, 16/302)

WHO 2013 criteria :

32.2% (GDM 27.2%, 87/320 and DIP 5.0%, 16/320

Sandesh-Panthi et al. *JCD* 2015; vol 2 (2)

Frequency (%) of GDM in Different Events of OGTT



Sandesh-Panthi et al. *JCD* 2015; vol 2 (2)

Publication by GDM Study Group, BSMMU



JCD

ORIGINAL ARTICLE

Frequency of Gestational Diabetes Mellitus in Bangladesh Impact of WHO 2013 Screening Criteria : Efficiency of DIPSI and WHO 1999 Criteria

Sandesh-Panthi,M A Hasanat,Mashfiqui-Hasan,Yasmin-Aktar.
Nusrat-Sultana, Sharmin-Jahan, M Atiqur-Rahman, M Fariduddin
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Abstract

Objective: *To observe the frequency of gestational diabetes mellitus (GDM) and assess the impact of WHO 1999 and 2013 criteria.The study also explored diagnostic efficiency of Diabetes in Pregnancy Study Group India (DIPSI) cut-off for mothers doing 75g oral glucose tolerance test (OGTT) in fasting state.*

Methods: *320 pregnant subjects(age: 26.36±4.81 yrs, BMI: 25.39±4.13 kg/m2; mean ± SD) were screened for GDM by 75g OGTT. Among those with normal glucose tolerance (NGT; n=100) before 24 weeks of gestation, 57 repeated the test between 24 to 28 weeks, others failed to respond. Final status was discriminated on basis of either or both of WHO criteria1999 and 2013. Glucose assay was done by glucose-oxidase method.*

Results: *Overall frequency of abnormal glucose tolerance (AGT) was 40.9% (131/320). By WHO 2013 criteria, 30.0% (96/320) were GDM and 5.3% (17/320) were diabetes (DM) in pregnancy, while31.9% (102/320) GDM by WHO 1999 criteria (including repeat test). Of mothers undergoing (57/100) repeat test, 17.6% (10/57) by WHO 2013 and 19.3% (11/57) by WHO 1999 criteria showed AGT. On extrapolation of data (all attended in fasting state), frequency of AGTwas 31.3% (100/320; GDM-26.3%, 84/320 and DM-5.0%, 16/302) by DIPSI cut-offwhich wasexactlysimilar to WHO 1999 criteria (GDM-31.3%; 100/320),but differs from WHO 2013 criteria (GDM 27.2%; 87/320 and DM in pregnancy 5.0%; 16/320). Despite good agreement, some 13.3% (29/218) of NGT by 1999 had intolerance by 2013 criteria; conversely, 8.7% (18/207) of NGT by 2013 had intolerance by 1999 criteria (κ=0.671; p<0.0001). Likewise, 22.6% (19/84) of GDM by DIPSI were NGT by WHO 2013; and 25.3% (22/87) of GDM by WHO 2013 were NGT by DIPSI (κ=0.721; p<0.0001). However, AGT and NGT for DIPSI and WHO 1999 on individual basis was exactly same (McNemar's test). 32 having 02h glucose between 7.8-8.5 mmol/L were GDM by WHO 1999/DIPSI cut-off; but only 13 among them could be detected by WHO 2013 criteria (04 by fasting and 09 by 01h value). Out of 60 having 01h value≥10.0 mmol/L,12 were diagnosed solely by 01h value by WHO 2013 criteria; of these 12, DIPSI could pick 09 GDM by 02h value.*

Conclusions: *Frequency of GDM seems alarming in Bangladesh. Despite near similar overall frequency, judged on individual basis,efficiency of DIPSI/WHO 1999criteria for GDM screening of mothers doing 75g OGTT in fasting state appears more feasible and convenient.Disparity of WHO 2013 criteria with DIPSI/ WHO 1999is attributable to low cut-offs for fasting and relaxation of 02h valuein WHO 2013 criteria that might be liquefied by reduction of 02h value of the WHO 2013 criteria instead of putting emphasis on fasting and 01h value.*

Keywords: *GDM, WHO 1999 and 2013 criteria, DIPSI cut-off value*

Risk factors of GDM

Original Article
EPIDEMIOLOGY/GENETICS

Obesity

Racial/Ethnic Differences in the Prevalence of Gestational Diabetes Mellitus and Maternal Overweight and Obesity, by Nativity, Florida, 2004-2007

Shin Y. Kim[1], William Sappenfield[2], Andrea J. Sharma[1], Hoyt G. Wilson[1], Connie L. Bish[1], Hamisu M. Salihu[3] and Lucinda J. England[1]

Objective: We examined the risk of gestational diabetes mellitus (GDM) among foreign-born and U.S.-born mothers by race/ethnicity and BMI category.

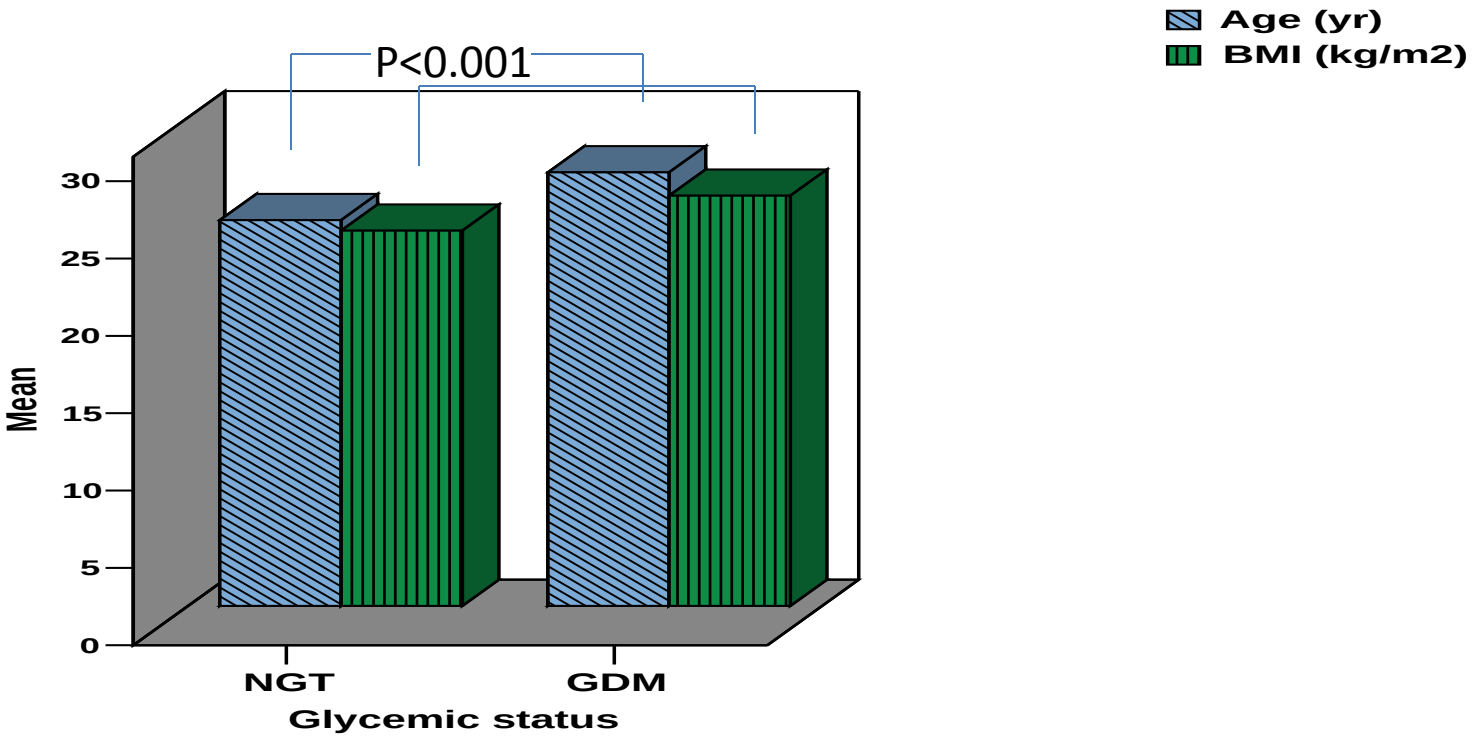
Design and Method: We used 2004-2007 linked birth certificate and maternal hospital discharge data of live, singleton deliveries in Florida to compare GDM risk among foreign-born and U.S.-born mothers by race/ethnicity and BMI category. We examined maternal BMI and controlled for maternal age, parity, and height.

Results: Overall, 22.4% of the women in our study were foreign born. The relative risk (RR) of GDM among women who were overweight or obese (BMI $\geq$ 25.0 kg m^{-2}) was higher than among women with normal BMI (18.5-24.9 kg m^{-2}) regardless of nativity, ranging from 1.3 (95% confidence interval (CI) = 1.0, 1.9) to 3.8 (95% CI = 2.1, 7.2).Foreign-born women also had a higher GDM risk than U.S.-born women, with RR ranging from 1.1 (95% CI = 1.1, 1.2) to 2.1 (95% CI = 1.4, 3.1). This finding was independent of BMI, age, parity, and height for all racial/ethnicity groups.

Conclusions: Although we found differences in age, parity, and height by nativity, these differences did not substantially reduce the increased risk of GDM among foreign-born mothers. Health practitioners should be aware of and have a better understanding of how race/ethnicity and nativity can affect women with a high risk of GDM. Although BMI is a major risk factor for GDM, it does not appear to be associated with race/ethnicity or nativity.

Obesity (2013) **21**, E33-E40. doi:10.1002/oby.20025

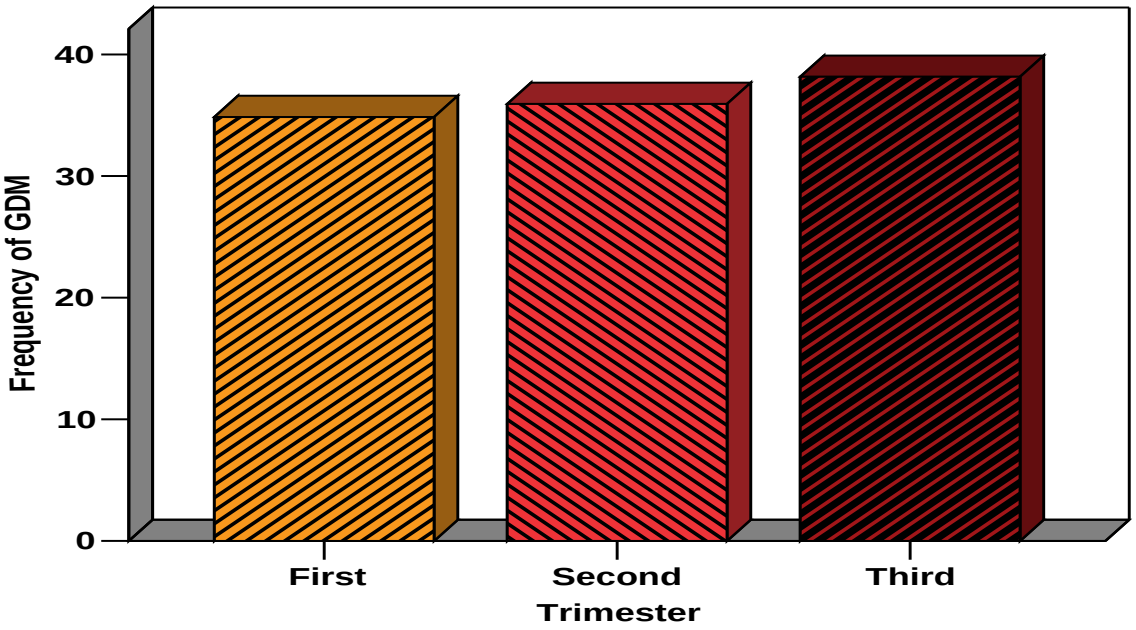
Age (yr) and BMI (kg/m^2) (mean) of the Subjects



Nusrat et al. *JCD* 2015; vol 2 (2)

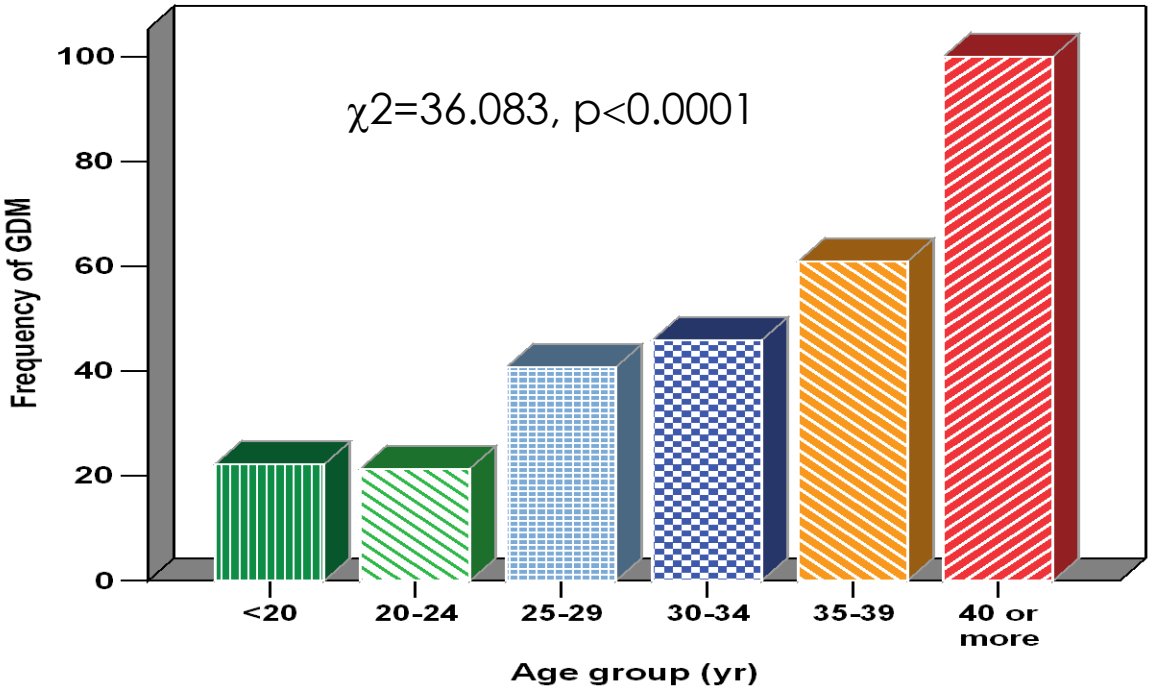
Frequency of AGT at Different Trimesters

$\chi 2=1.198$, $p=0.549$



Nusrat et al. JBD 2016; vol 1 (2)

Frequency (%) of GDM Among Various Age Groups



Nusrat et al. *JBD* 2016; vol 1 (2)

Genetic Predisposition for GDM

Human Reproduction Update Advance Access published May 19, 2013
Human Reproduction Update, Vol.0, No.0 pp. 1–15, 2013
doi:10.1093/humupd/dmt013

human reproduction update

Genetic variants and the risk of gestational diabetes mellitus: a systematic review

Cuilin Zhang[1,*†], Wei Bao[1,*†], Ying Rong[2], Huixia Yang[3], Katherine Bowers[1], Edwina Yeung[1], and Michele Kiely[1]

BACKGROUND: Several studies have examined associations between genetic variants and the risk of gestational diabetes mellitus (GDM). However, inferences from these studies were often hindered by limited statistical power and conflicting results. We aimed to systematically review and quantitatively summarize the association of commonly studied single nucleotide polymorphisms (SNPs) with GDM risk and to identify important gaps that remain for consideration in future studies.

METHODS: Genetic association studies of GDM published through 1 October 2012 were searched using the HuGE Navigator and PubMed databases. A SNP was included if the SNP–GDM associations were assessed in three or more independent studies. Two reviewers independently evaluated the eligibility for inclusion and extracted the data. The allele-specific odds ratios (ORs) and 95% confidence intervals (CIs) were pooled using random effects models accounting for heterogeneity.

RESULTS: Overall, 29 eligible articles capturing associations of 12 SNPs from 10 genes were included for the systematic review. The minor alleles of rs7903146 (*TCF7L2*), rs12255372 (*TCF7L2*), rs1799884 (−30G/A, *GCK*), rs5219 (E23K, *KCNJ11*), rs7754840 (*CDKAL1*), rs4402960 (*IGF2BP2*), rs10830963 (*MTNR1B*), rs1387153 (*MTNR1B*) and rs1801278 (Gly972Arg, *IRS1*) were significantly associated with a higher risk of GDM. Among them, genetic variants in *TCF7L2* showed the strongest association with GDM risk, with ORs (95% CIs) of 1.44 (1.29–1.60, $P < 0.001$) per T allele of rs7903146 and 1.46 (1.15–1.84, $P = 0.002$) per T allele of rs12255372.

CONCLUSIONS: In this systematic review, we found significant associations of GDM risk with nine SNPs in seven genes, most of which have been related to the regulation of insulin secretion.

Key words: gestational diabetes mellitus / single nucleotide polymorphism / gene / genetic factors

GDM Study Group, BSMMU

Association of rs7903146 Polymorphism of the TCF7L2 Gene with GDM

Mashfiqul-Hasan et al. 2015

Study Reports

- Sample size:

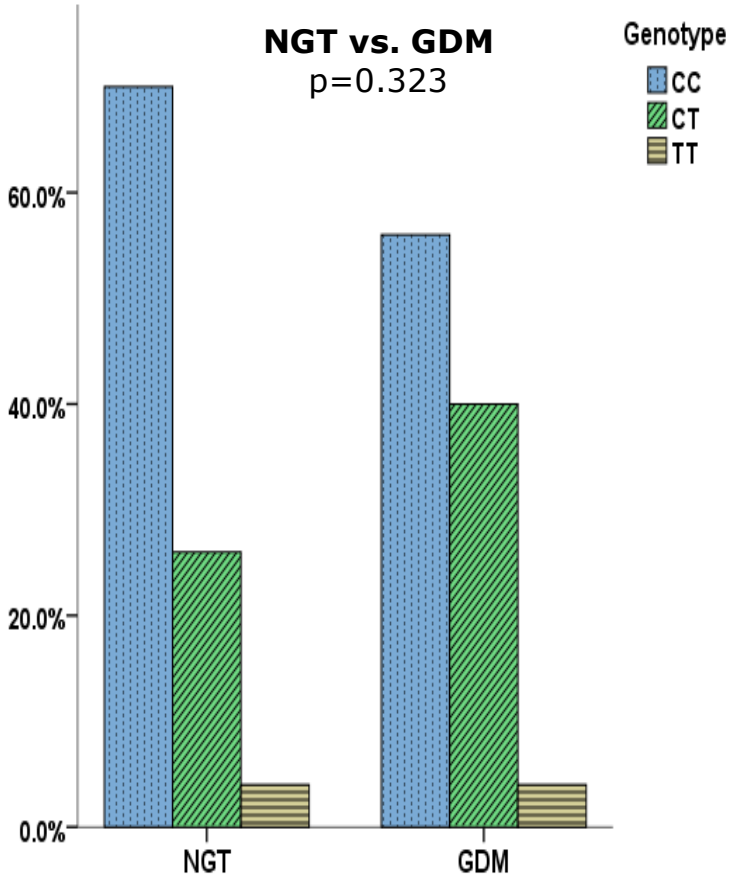
  50 GDM & **50** non-GDM

- Glucose load: 75-gm

Result:

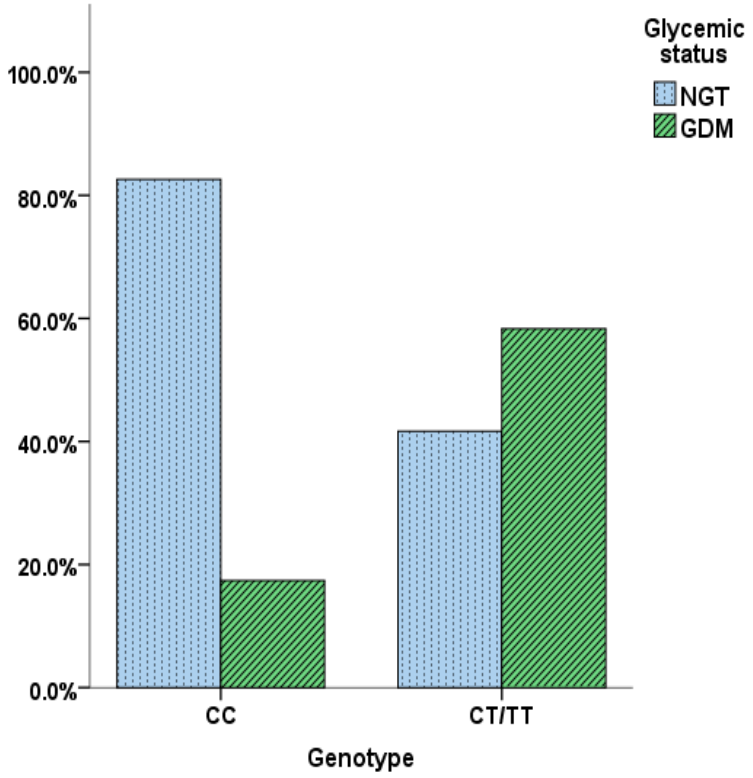
- The CC, CT and TT genotype frequencies of TCF7L2 rs7903146 varied between women with GDM and non-GDM (p=0.323)
- Higher T-allele frequency in GDM (p=0.220)
- 1.8-fold risk of GDM in CT/TT genotype in comparison to CC genotype (p=0.147)

Variants of TCF7L2 rs7903146

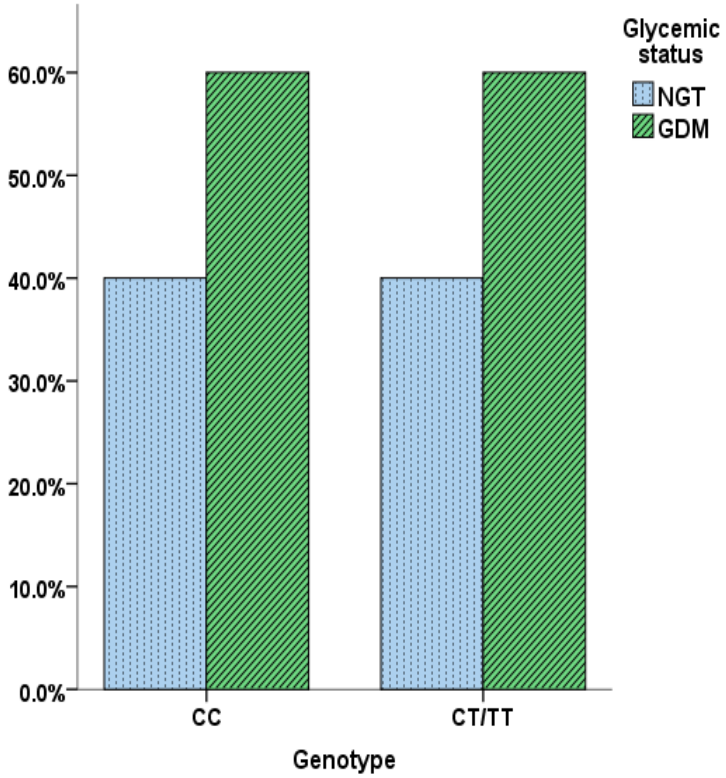


Mashfiqul-Hasan et al. 2015

GDM/NGT: TCF7L2 rs7903146 Polymorphisms Age Cut-off at 25 Years

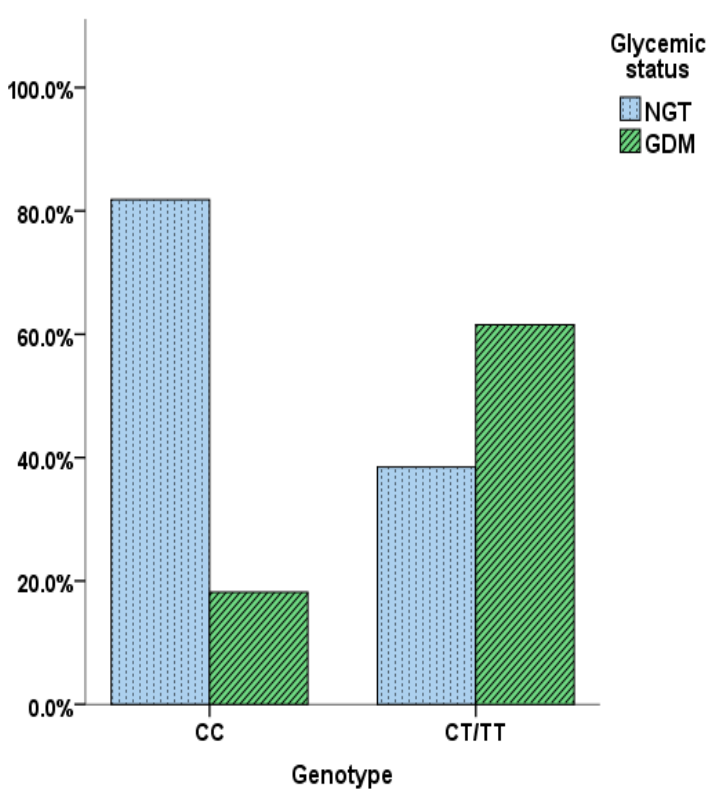


Age <25 years, p=0.022

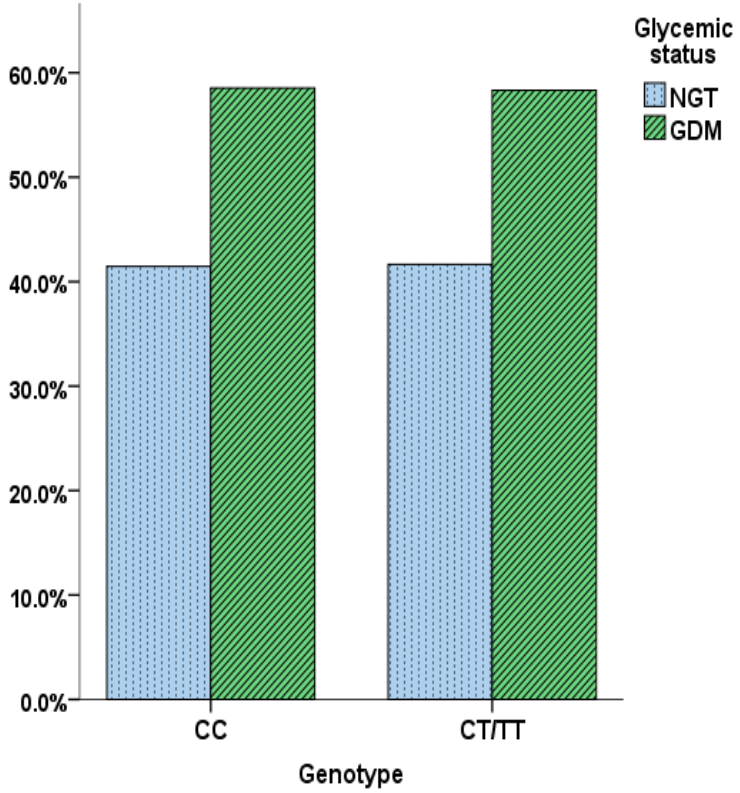


Age ≥ 25 years, p=1.00

GDM/NGT: TCF7L2 rs7903146 Polymorphisms BMI Cut-off at 25 kg/m^2

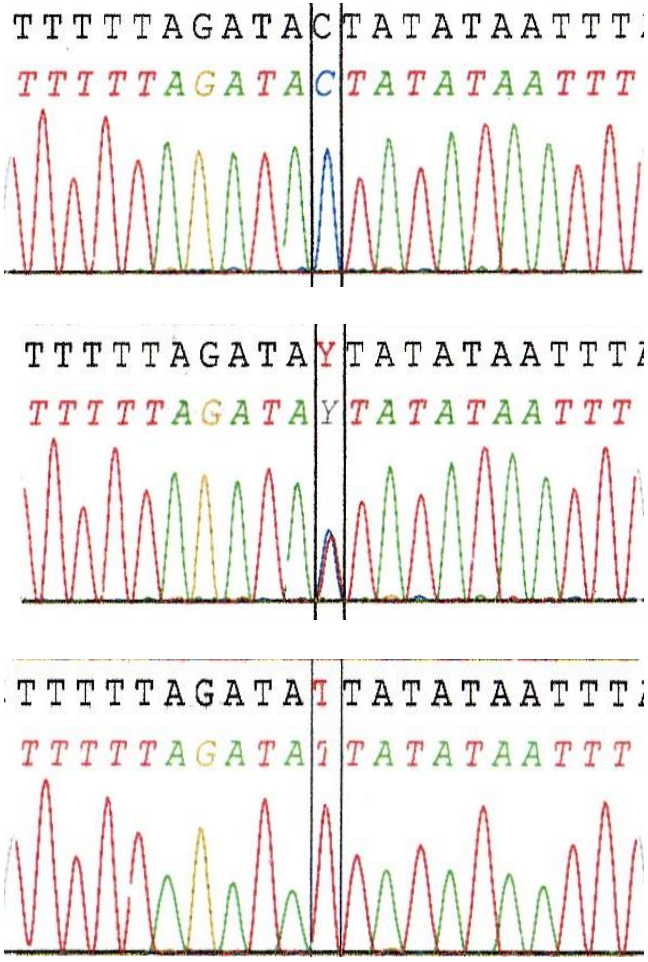


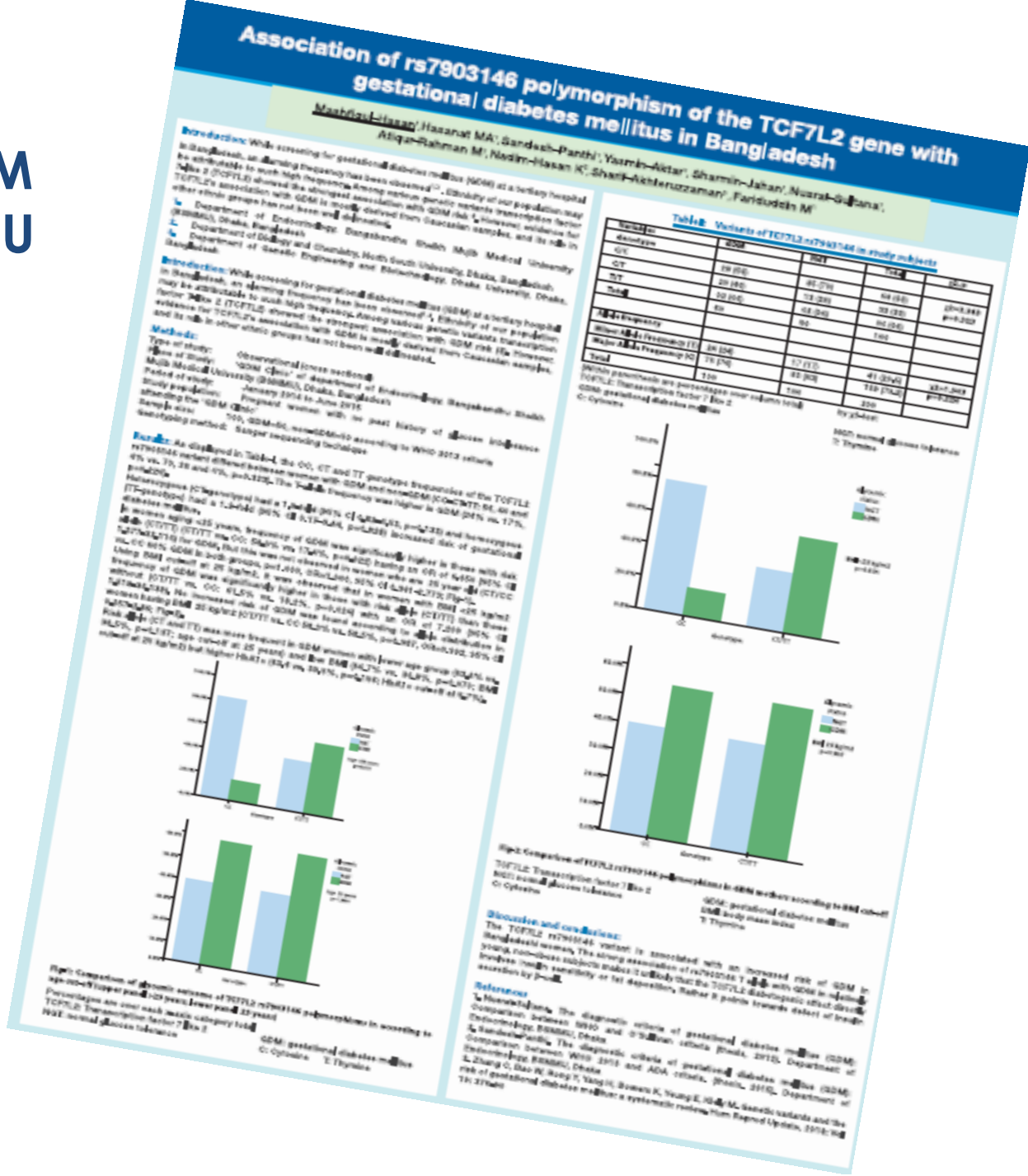
BMI <25 kg/m^2, p=0.024



BMI ≥ 25 kg/m^2, p=0.987

Presentation in Conference by GDM Study Group, BSMMU





Outcome of GDM

Ethnic Differences in Perinatal Outcome of Gestational Diabetes Mellitus

Jana Kaida Silva et. al. *Diabetes Care* 29:2058–2063, 2006

A retrospective review of all women referred to the largest outpatient GDM program in the state of Hawai from 1995 to 2005:

Intrapartum and neonatal characteristics by ethnicity and combined sample

	Native Hawaiian/ Pacific Islander	Japanese	Chinese	Filipino	Caucasian	Combined
Preeclampsia						
Yes	30 (7.1)	12 (4.2)	3 (2.8)	34 (6.2)	3 (2.8)	82 (5.6)
No	395 (92.9)	272 (95.8)	106 (97.2)	519 (93.8)	103 (97.2)	1,395 (94.4)
Chorioamnionitis						
Yes	7 (1.2)	7 (1.7)	2 (1.2)	10 (1.3)	2 (1.4)	28 (1.4)
No	594 (98.8)	416 (98.2)	159 (98.8)	772 (98.7)	144 (98.6)	2,085 (98.6)
Arrest of dilation						
Yes	28 (4.7)	21 (5.0)	6 (13.7)	36 (4.7)	7 (4.8)	98 (4.7)
No	573 (95.3)	402 (95.0)	155 (96.3)	745 (95.3)	139 (95.2)	2,015 (95.3)
Arrest of descent						
Yes	33 (5.5)	22 (5.2)	9 (5.6)	37 (4.7)	8 (5.4)	109 (5.2)
No	568 (94.5)	401 (94.8)	152 (94.4)	745 (95.3)	139 (94.6)	2,005 (94.8)
Shoulder dystocia						
Yes	6 (1.0)	2 (0.5)	2 (1.2)	10 (1.3)	1 (0.7)	21 (1.0)
No	595 (99.0)	421 (99.5)	159 (98.8)	772 (98.7)	146 (99.3)	2,093 (99.0)
Fetal distress						
Yes	45 (7.5)	15 (3.6)	12 (7.5)	53 (6.8)	9 (6.2)	134 (6.4)
No	553 (92.5)	405 (96.4)	148 (92.5)	726 (93.1)	137 (93.8)	1,969 (93.5)
Type of delivery*						
Vaginal	418 (68.3)	307 (71.1)	115 (70.6)	527 (66.2)	100 (67.1)	1,467 (68.1)
Assisted vaginal	14 (2.3)	16 (3.7)	15 (9.2)	43 (5.4)	6 (4.0)	94 (4.4)
Cesarean section	180 (29.4)	109 (25.2)	33 (20.2)	226 (28.4)	43 (28.9)	591 (27.5)
Neonatal weight (g)†	3,573.4 ± 552.1[a]	3,218.9 ± 430.1[c]	3,262.7 ± 424.7[b,c]	3,274.9 ± 472.6[c]	3,399.1 ± 486.1[b]	3,356.4 ± 506.8
<4,000	487 (79.3)	416 (96.3)	157 (96.3)	737 (92.5)	144 (96.6)	1,941 (90.0)
≥4,000	127 (20.7)	16 (3.7)	6 (3.7)	60 (7.5)	5 (3.4)	214 (10.0)
Neonatal hypoglycemia†						
Yes	44 (7.2)	7 (1.6)	3 (1.8)	29 (3.6)	11 (7.0)	94 (4.0)
No	570 (92.8)	425 (98.4)	160 (98.2)	768 (96.4)	138 (93.0)	2,061 (96.0)
Neonatal hyperbilirubinemia*						
Yes	29 (4.8)	6 (1.4)	3 (1.9)	34 (4.3)	8 (5.6)	80 (3.8)
No	577 (95.2)	418 (98.6)	159 (98.1)	750 (95.7)	136 (94.4)	2,040 (96.2)
Sepsis						
Yes	8 (1.3)	3 (0.7)	1 (0.6)	12 (1.6)	0 (0)	24 (1.1)
No	598 (98.7)	421 (99.3)	161 (99.4)	771 (98.4)	143 (100)	2,094 (98.9)
Asphyxia						
Yes	0 (0)	1 (0.2)	0 (0)	2 (0.3)	0 (0)	3 (0.2)
No	611 (100)	430 (99.8)	163 (100)	793 (99.7)	148 (100)	2,145 (99.8)
Polycythemia						
Yes	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.04)
No	611 (99.8)	431 (100)	163 (100)	795 (100)	148 (100)	2,148 (99.96)
Respiratory distress syndrome						
Yes	15 (3.8)	7 (2.3)	1 (0.9)	10 (1.9)	5 (4.8)	38 (2.6)
No	381 (96.2)	299 (97.7)	114 (99.1)	530 (98.1)	99 (95.2)	1,423 (97.4)
Fetal demise						
Yes	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.05)
No	611 (99.8)	432 (100)	1,623 (100)	796 (100)	148 (100)	2,149 (99.95)
Special care admission						
Yes	30 (4.9)	9 (2.1)	3 (1.8)	29 (3.6)	7 (4.7)	78 (3.6)
No	584 (95.1)	423 (97.9)	160 (98.2)	767 (96.4)	142 (95.3)	2,076 (96.4)

Data are *n* (%) or means ± SD. *P < 0.05; †P < 0.0001, based on ANOVA comparing the intrapartum or neonatal characteristic across ethnic groups. Levels that do not share the same letter are significantly different based on Tukey-Kramer honestly significant difference post hoc analysis.

Bivariate analysis of the association between fetal macrosomia (>4,000 g) and maternal and fetal characteristics

	<4000 g	≥4,000 g	*P* value
Age (years)	31.5 ± 5.8	29.9 ± 5.6	<0.0001
Prepregnancy weight (lb)	147.6 ± 38.4	188.5 ± 51.2	<0.0001
Prepregnancy BMI (kg/m^2)	27.1 ± 6.3	32.6 ± 8.1	<0.0001
Maternal weight (lb) at intake	167.3 ± 39.0	211.9 ± 51.9	<0.0001
Maternal weight (lb) at delivery	171.9 ± 39.2	222.5 ± 51.0	<0.0001
A1C at intake	5.4 ± 0.7	5.8 ± 1.0	<0.0001
Family history of diabetes			
Yes	509 (55.3)	63 (67.0)	0.0260
No	412 (44.7)	31 (33.0)	
Diabetes treatment type			
Diet controlled	1,582 (81.6)	144 (67.3)	<0.0001
Insulin requiring	330 (17.0)	66 (30.8)	
Insulin before 20 weeks of gestation	27 (1.4)	4 (1.9)	
Fetal sex			
Male	983 (51.8)	130 (61.6)	0.0066
Female	914 (48.2)	81 (38.4)	

Data are means ± SD or *n* (%). Associations between continuous characteristics and fetal macrosomia were analyzed by *t* test, and associations between categorical characteristics and fetal macrosomia were analyzed by χ^2 analysis.

Results: Neonates born to Native-Hawaiian/Pacific-Islander mothers and Filipino mothers had 4 and 2 times the prevalence of macrosomia (but not other complications) respectively, compared with neonates born to Japanese, chinese, and Caucasian mothers.

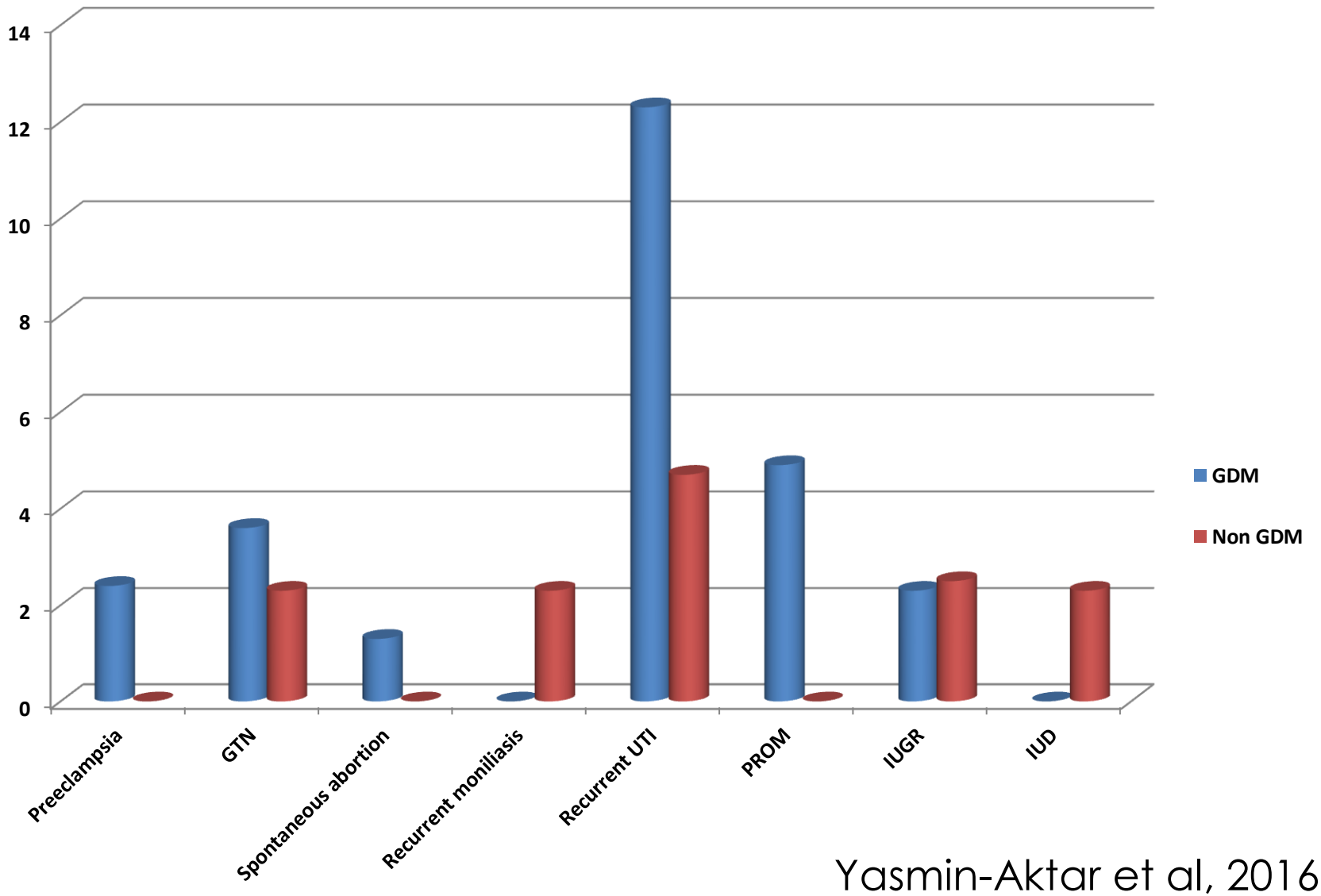
Inference: Significant ethnic differences in perinatal outcomes exist across Asian and Pacific-Islander women with GDM.

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Adverse Pregnancy Outcome of GDM

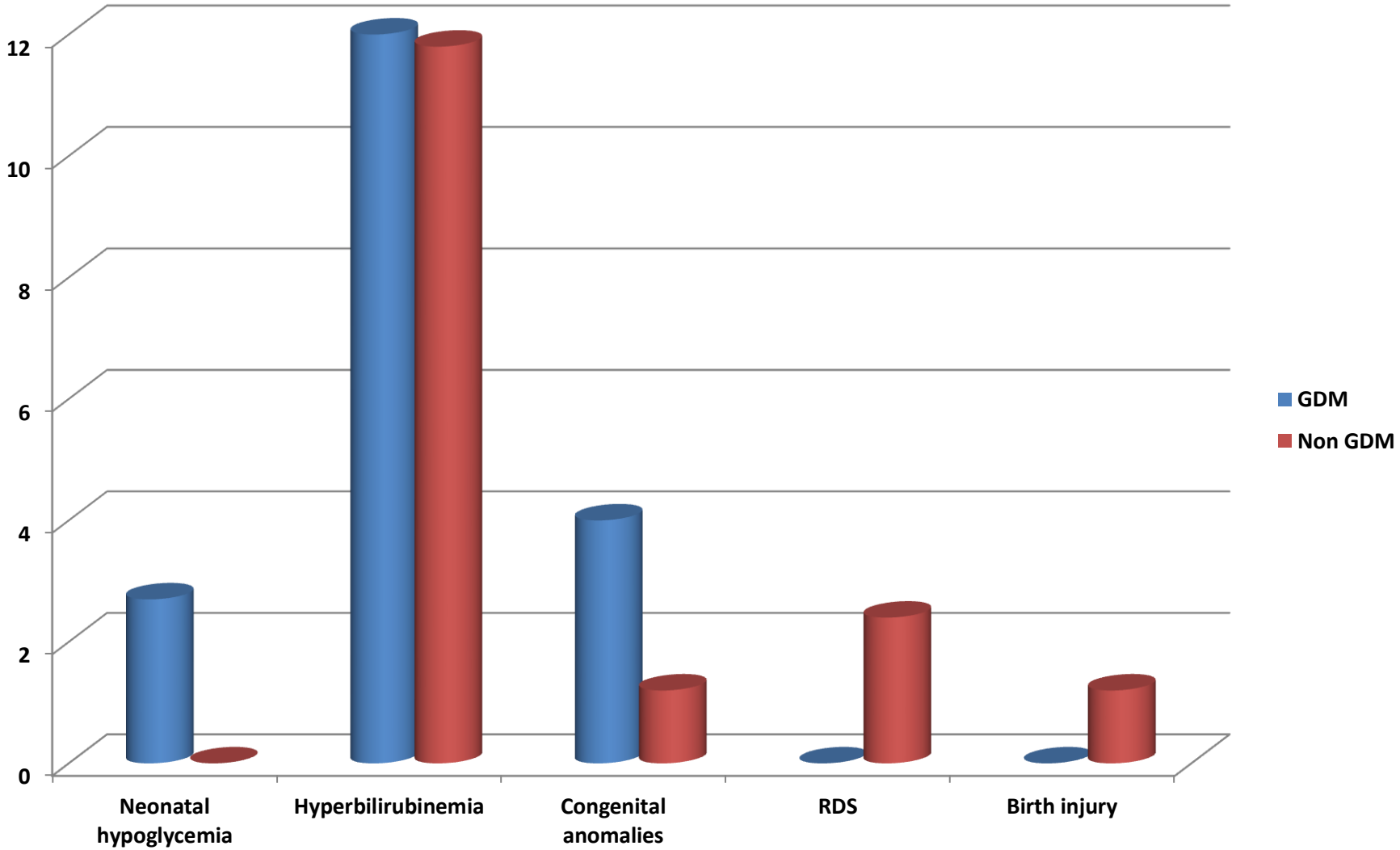
Yasmin-Aktar et al, 2016

Frequency of Maternal Complications Among GDM & Non GDM



Yasmin-Aktar et al, 2016

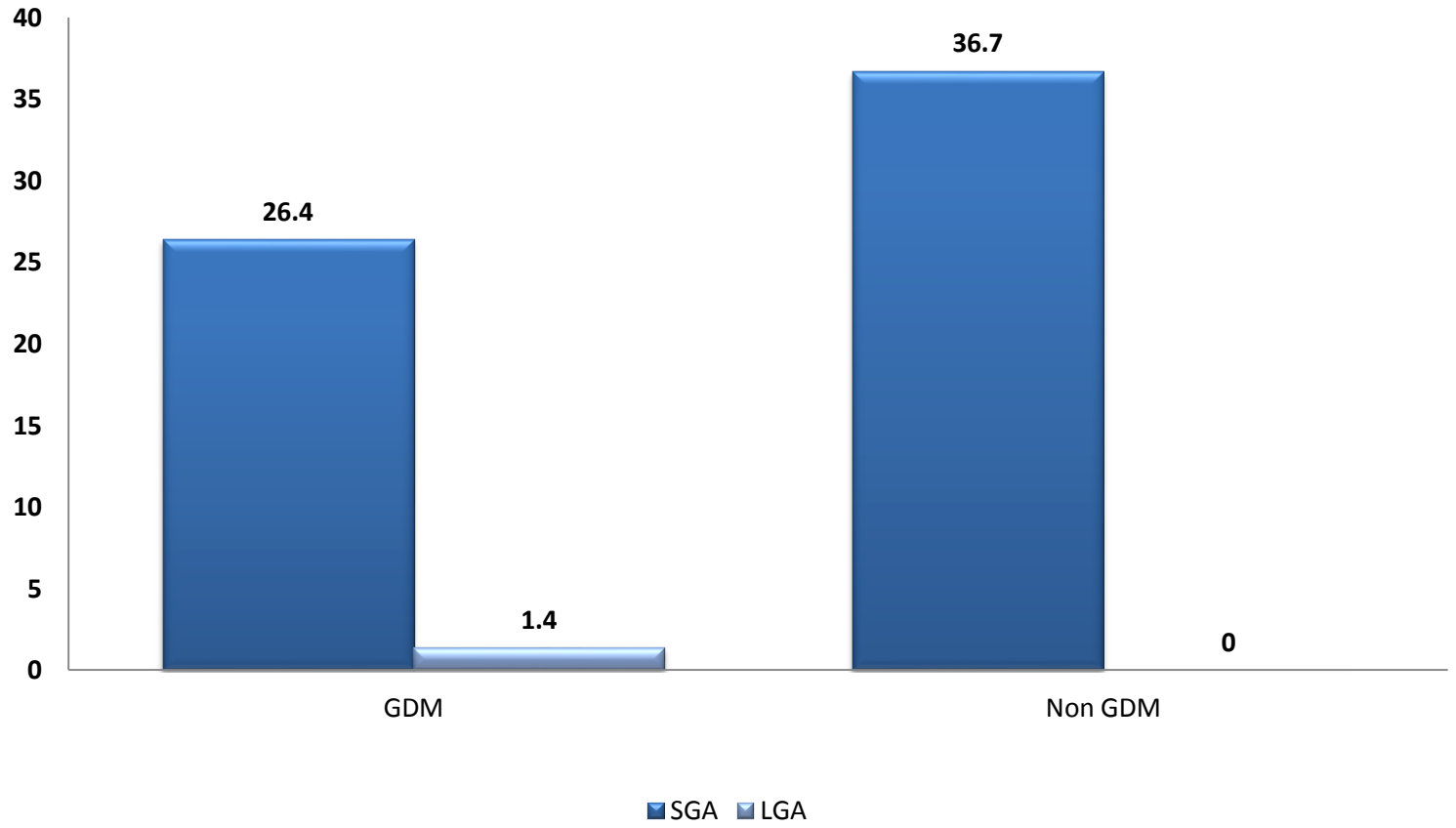
Frequency of Fetal Outcomes Among GDM & Non GDM Mothers



Yasmin-Aktar et al, 2016

Comparison of Birth Weight Between GDM & non-GDM

SGA- Small for gestational age: < 10th Percentile
LGA- Large for gestational age: >90th Percentile



Yasmin-Aktar et al, 2016

Post-partum Persistence of AGT and its Predictability

Ethnic Variation in Persistence

- Ethnicity is one of the key determinants in cumulative risk of persistence
- Varies from 70% in Sioux Indians, 13% in Chinese and 3.4% in Swedish Caucasians (Sivaraman et al. 2013)
- May be due to the inheritance of the "Thrifty phenotype" in this subset of population

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Persistence of glucose intolerance in GDM patients during post-partum follow-up

Predictors of post-partum persistence of AGT: Association with cardio-metabolic risk factors in GDM

Sharmin-Jahan et al. 2015

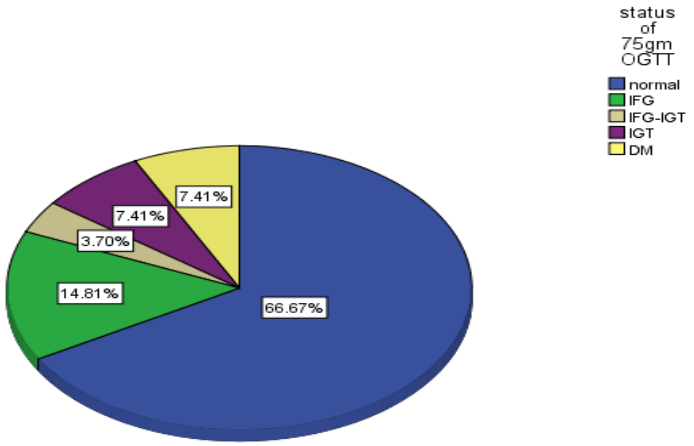
Study Reports

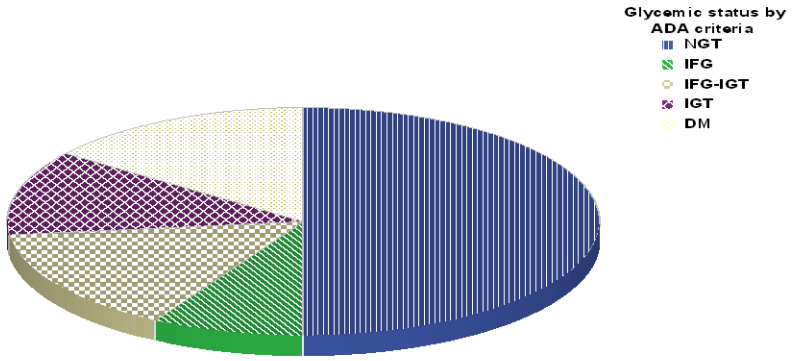
- Sample size: **108** GDM
- 75-gm OGTT done at 6-12 weeks post-partum

Result:

Status	Number (%)	
	WHO criteria	ADA criteria
Normal	62 (57.4)	54 (50.0)
IFG	01 (0.9)	09 (8.3)
IGT	25 (23.1)	13 (12.0)
IFG-IGT	04 (3.7)	16 (14.8)
DM	16 (14.8)	16 (14.8)
Total	**108**	**108**

Glycemic status as defined by WHO (upper panel) and ADA criteria (lower panel)





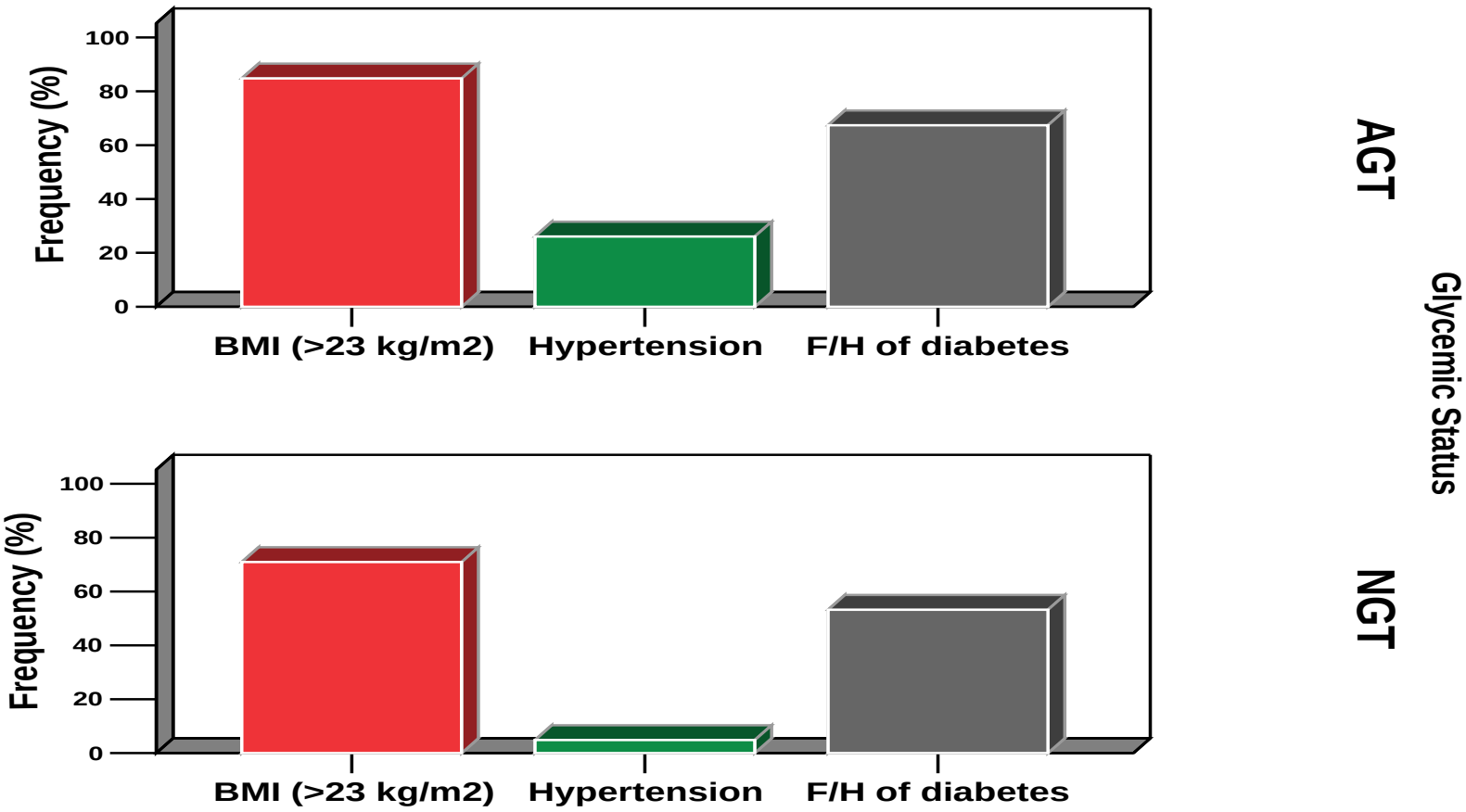
Sharmin-Jahan et al. 2015

Comparison of Risk Variables Between AGT and NGT

Variable	AGT (n=46)	NGT (n=62)	p
Age(Mean±SD, year)	31.3±5.8	28.1±4.5	<0.001
BMI(Mean±SD, Kg/m^2)	27.9±4.7	25.3±4.5	0.004
Parity			
1	13 (38.2)	21 (61.8)	
2	14 (38.9)	22 (61.1)	0.0517
≥ 3	19 (50.0)	19 (50.0)	
Family H/O DM			
Present	31 (48.4)	33 (51.6)	0.138
Absent	15 (84.1)	29 (65.9)	
Insulin during pregnancy			
Yes	19 (82.6)	04 (17.4)	<0.001
No	27 (36.5)	58 (68.2)	
Gestational age at diagnosis of GDM:			
< 20 week	19 (55.9)	15 (44.1)	<0.001
≥ 20 week	27 (36.5)	47 (63.5)	
FPG of OGTT of pregnancy (Mean±SEM)	5.9±0.21	5.3±0.08	0.003
Post 2Hr-OGTT of pregnancy (Mean±SEM)	10.7±0.40	9.5±0.18	0.006

Sharmin-Jahan et al. 2015

Frequency of Overweight, Hypertension and Family History of Diabetes



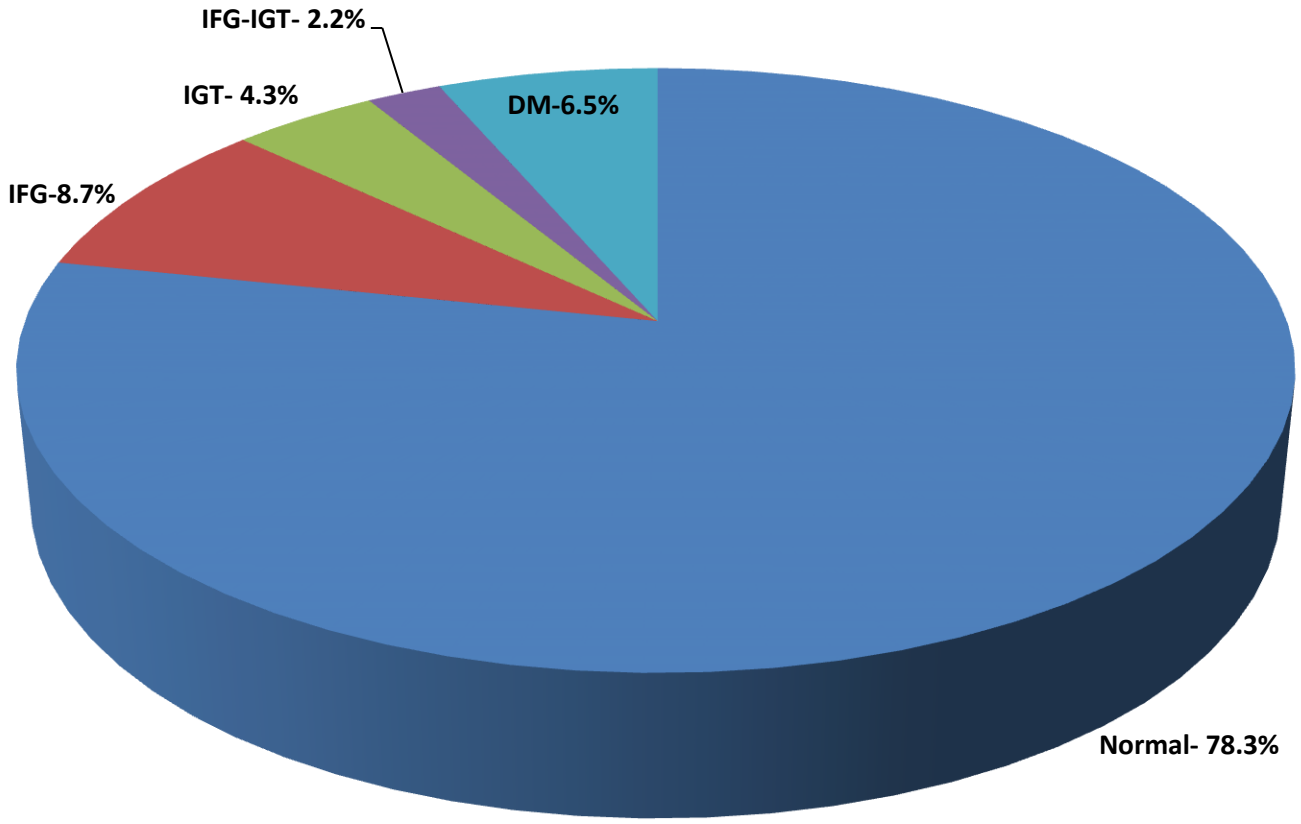
Sharmin-Jahan et al. 2015

GDM Study Group, BSMMU

Persistence of AGT During Post-partum

Yasmin-Aktar et al, 2016

Glycemic Status as Defined by ADA Criteria



- Yasmin-Aktar et al, 2016

Publications by GDM Study Group, BSMMU



Jahan et al., J Diabetes Metab 2015, 6:10
http://dx.doi.org/10.4172/2155-6156.1000609

Diabetes & Metabolism

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Research Article

Predictors of Post-Partum Persistence of Glucose Intolerance and Its Association with Cardio-Metabolic Risk Factors in Gestational Diabetes Mellitus

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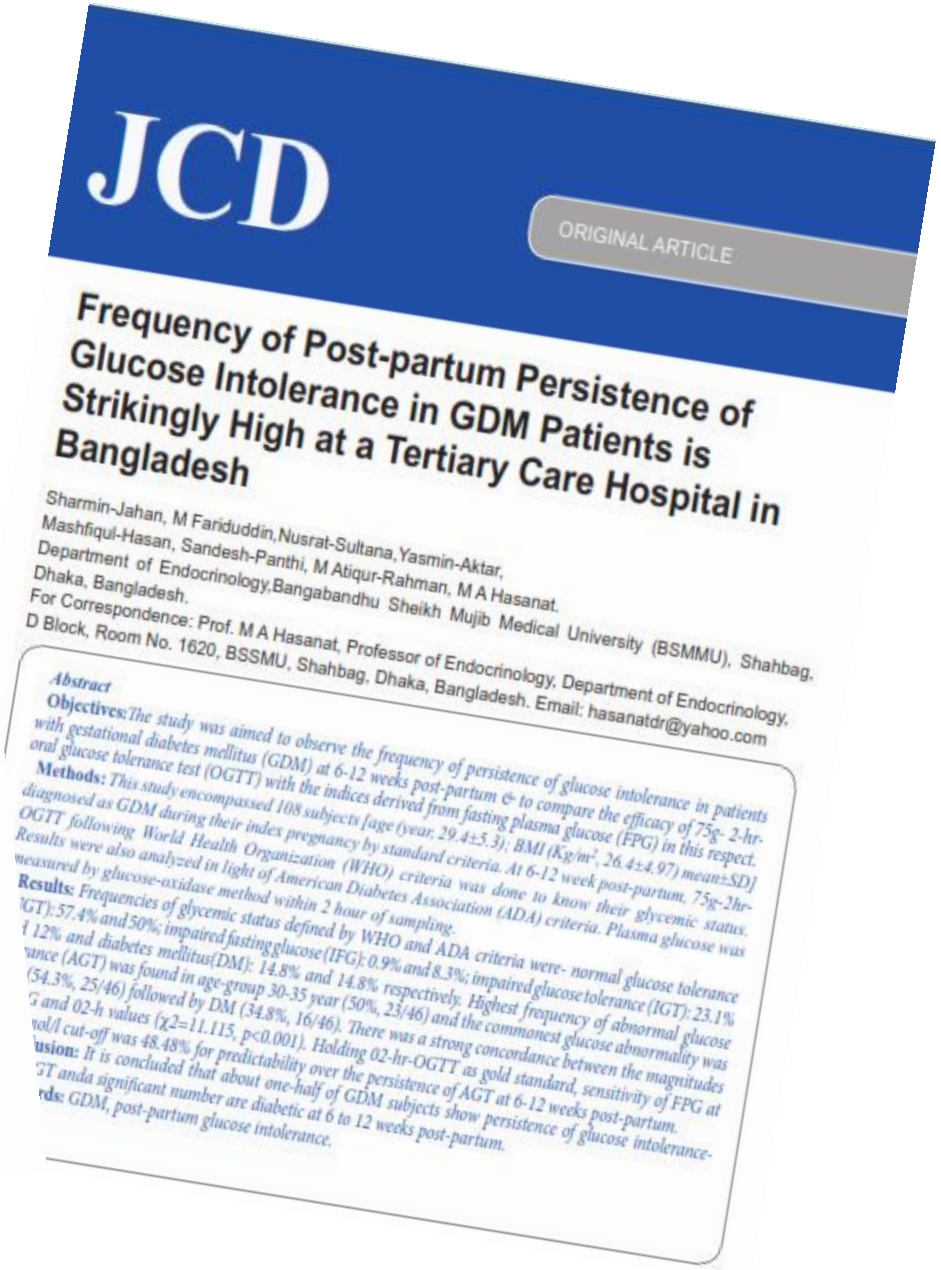
Abstract

Objectives: To observe the impact of predictors [age and body mass index (BMI) of mother, family history of diabetes, parity, use of insulin in pregnancy, gestational age and glycemic status at diagnosis) on persistence of abnormal glucose tolerance (AGT) in GDM at 6-12 week post-partum and its relationship with cardio-metabolic risk factors.

Methods: This study encompassed 108 GDM subjects [age (year, 29.4 ± 5.3); BMI (Kg/m², 26.4 ± 4.97) mean ± SD] diagnosed by standard oral glucose tolerance test (OGTT) during index pregnancy. At 6-12 week post-partum, 75 g - 2 hr-OGTT was done to know their glycemic status. Data for predictors and cardio-metabolic risk factors were obtained from history, clinical examination and personal records. Plasma glucose was measured by glucose-oxidase method on the same day of sampling.

Results: Age (yr, 31.3 ± 5.8 vs. 28.1 ± 4.5, p<0.001), BMI (kg/m², 27.9 ± 4.7 vs. 25.3 ± 4.5, p=0.004), FPG (5.9 ± 0.21 vs. 5.3 ± 0.08 mmol/L, p=0.003) and 2-hr-OGTT values (10.7 ± 0.40 vs. 9.5 ± 0.18 mmol/L, p=0.006) (mean ± SD) along with gestational age <20 weeks (p<0.001) during detection of GDM at diagnosis, higher parity (p<0.05) and insulin use during pregnancy (p<0.001) were significantly higher in AGT than those of normal glucose tolerance (NGT). However, frequencies for AGT at post-partum considered on trimester of GDM detection (1st trimester: 54.5%, 2nd trimester: 46.6% and 3rd trimester: 33.3%) showed no statistical difference (χ2=2.382, p=0.304). On stratification of FPG values during GDM detection, frequencies decreased for both AGT and NGT with increments of FPG at post-partum. Frequency of AGT was significantly higher than NGT with increment of FPG (χ2=11.976, p=0.007) which was also evident on dichotomization of FPG during GDM detection (at cut-off 5.1 mmol/L: p=0.582; at cut-off 6.1 mmol/L: p=0.003 and at cut-off 7.0 mmol/L: p=0.001). Unlike overweight/obesity and family history of DM (p value 0.092 & 0.138 respectively), frequency of hypertension in AGT was higher than that of NGT (80% vs. 20 %, p<0.002). FPG and 2-hr-OGTT value in 6-12 week post-partum correlated in both AGT (r=0.802, p<0.001) and NGT (r=0.296, p=0.019). FPG at detection of GDM with post-partum FPG of AGT (r=0.594, p<0.001 post-partum 2-hr-OGTT glucose in AGT (r=0.499, p<0.001). AGT correlated inversely with age of gestation at GDM detection (r=-0.196, p=0.042) whereas positively with hypertension (r=0.304, p<0.001) and use of insulin during pregnancy (r=0.421, p<0.001). Multiple regression revealed that age of the subjects (p=0.009) and use of insulin during pregnancy (p=0.035) were independent predictors of AGT at post-partum.

Conclusion: It is concluded that advanced age, higher BMI, magnitude of both FPG and 02-hr glucose value of OGTT, earlier gestational age at diagnosis of GDM and use of insulin during pregnancy are important predictors for AGT during post-partum period and hypertension as a cardio metabolic risk factor was strongly associated with AGT.



JCD

ORIGINAL ARTICLE

Frequency of Post-partum Persistence of Glucose Intolerance in GDM Patients is Strikingly High at a Tertiary Care Hospital in Bangladesh

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Abstract

Objectives: *The study was aimed to observe the frequency of persistence of glucose intolerance in patients with gestational diabetes mellitus (GDM) at 6-12 weeks post-partum & to compare the efficacy of 75g- 2-hr-oral glucose tolerance test (OGTT) with the indices derived from fasting plasma glucose (FPG) in this respect.*

Methods: *This study encompassed 108 subjects [age (year, 29.4±5.3); BMI (Kg/m², 26.4±4.97) mean±SD] diagnosed as GDM during their index pregnancy by standard criteria. At 6-12 week post-partum, 75g-2hr-OGTT following World Health Organization (WHO) criteria was done to know their glycemic status. Results were also analyzed in light of American Diabetes Association (ADA) criteria. Plasma glucose was measured by glucose-oxidase method within 2 hour of sampling.*

Results: *Frequencies of glycemic status defined by WHO and ADA criteria were- normal glucose tolerance (NGT): 57.4% and 50%; impaired fasting glucose (IFG): 0.9% and 8.3%; impaired glucose tolerance (IGT): 23.1% and 12% and diabetes mellitus(DM): 14.8% and 14.8% respectively. Highest frequency of abnormal glucose tolerance (AGT) was found in age-group 30-35 year (50%, 23/46) and the commonest glucose abnormality was (54.3%, 25/46) followed by DM (34.8%, 16/46). There was a strong concordance between the magnitudes of 2-h and 02-h values (χ2=11.115, p<0.001). Holding 02-hr-OGTT as gold standard, sensitivity of FPG at mmol/l cut-off was 48.48% for predictability over the persistence of AGT at 6-12 weeks post-partum.*

Conclusion: *It is concluded that about one-half of GDM subjects show persistence of glucose intolerance-IGT and a significant number are diabetic at 6 to 12 weeks post-partum.*

Keywords: *GDM, post-partum glucose intolerance.*

Ongoing Research Activities
GDM Study Group, BSMMU

- A protocol for screening of GDM at community level is under development
- Comparative study between WHO 2013 and DIPSI criteria
- Thyroid functional status in GDM
- Glycogenic hormone levels in GDM

(all projects are still ongoing)

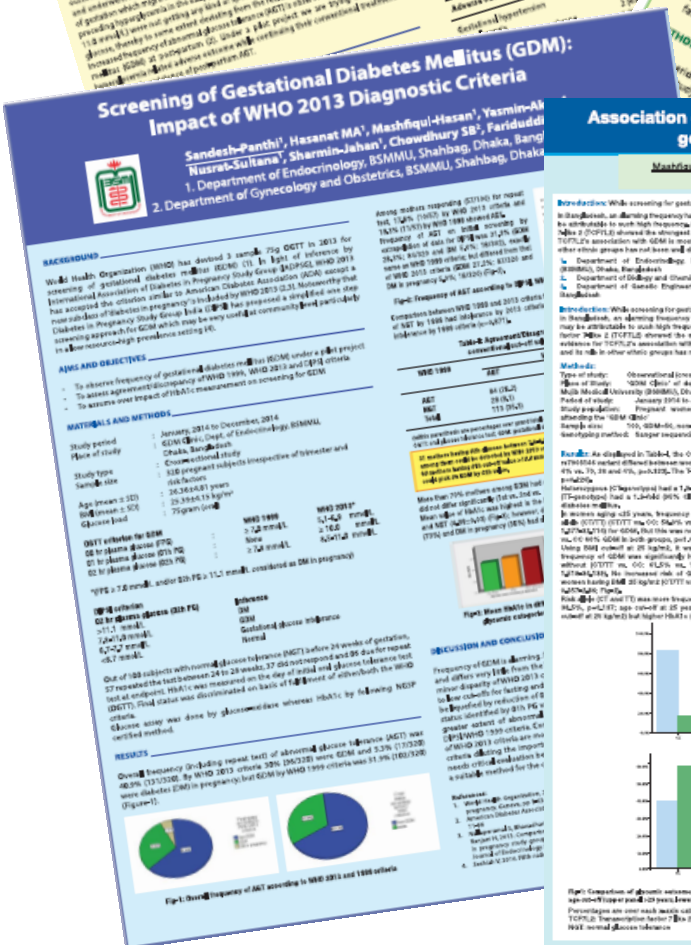
Recommendations for consolidated criterion and cut-offs in our context might be possible after substantial works are done

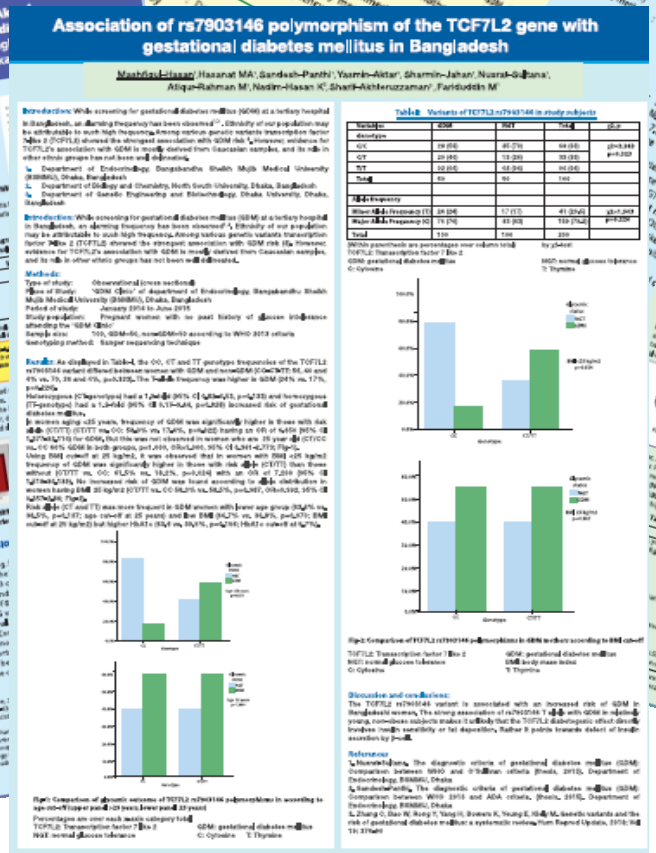
Presentations by GDM Study Group, BSMMU in Conferences

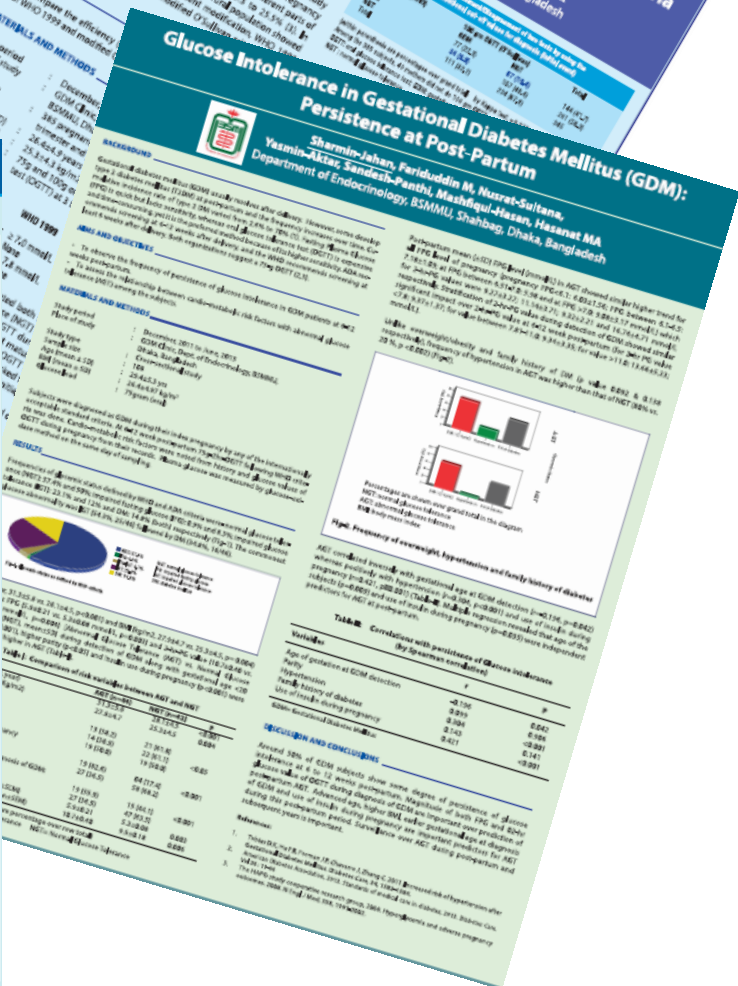












Conclusions

- Prevalence of GDM is increasing worldwide particularly among Asians including Bangladesh
- Ethnicity influences the prevalence and pregnancy outcome in GDM
- Contribution of genetic influence and other risk factors over expression of GDM still need exploration

Conclusions
(Works of GDM Study Group, BSMMU)

- The frequency of hyperglycemia in pregnancy (GDM, DIP) was found to be remarkably high by all of our studies
  Nusrat et al., Sandesh et al.
- Advanced maternal age, higher BMI, family H/O DM in 1st degree relatives were found to be associated risk factors for GDM
  Nusrat et al., Sandesh et al.
- Association of rs7903146 Polymorphism of the TCF7L2 was found to be associated significantly with GDM; subjects bearing TT/CT genotype developed GDM despite of their lower BMI and age
  Mashfiq et al.

Conclusions
(Works of GDM Study Group, BSMMU)

- Post-partum persistence of glucose intolerance was also found to be alarmingly high
  Sharmin et al., Yasmin et al.
- Increased maternal age, higher BMI, family H/O DM, multiparity, insulin use during pregnancy- all were predictors of post-partum persistence of AGT
  Sharmin et al.
- Adverse maternal and fetal outcome were more common in GDM though not statistically significant
  Yasmin et al.



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Thank you