THE EUROPEAN SOCIETY OF MEDICINE
Medical Research Archives, Volume 12 Issue 11

RESEARCH ARTICLE

Exploring the Relationship Between Birth Weight and Diabetes Among South Asian-American Women

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OPEN ACCESS

PUBLISHED
30 November 2024

CITATION
Amiji, A., Nagaraj, N., et al., 2024. Exploring the Relationship Between Birth Weight and Diabetes Among South Asian-American Women. Medical Research Archives, [online] 12(11).
https://doi.org/10.18103/mra.v12i11.5907

DOI
https://doi.org/10.18103/mra.v12i11.5907

ISSN
2375-1924

ABSTRACT

The purpose of this study is to examine if a relationship exists between birth weight and diabetes among South Asian American women aged 18 or older living in the U.S. A quantitative web-based cross-sectional survey was designed and distributed to recruit a diverse sample of eligible participants (N=2634). The survey assessed very low birth weight, low birth weight (LBW), pregnancy, type 2 diabetes mellitus, and gestational diabetes mellitus. Of the study population, 21.9% were born very low birth weight, 30.8% were born low birth weight, 12.4% had type 2 diabetes, and 25.9% had a gestational diabetes diagnosis.

After controlling for covariates, women who were born with very low birth weight have 6.54 higher odds of developing type 2 diabetes than women who were not born with very low birth weight. Additionally, women who were born with low birth weight have 4.251 higher odds of developing type 2 diabetes compared to women who were not born with low birth weight. South Asian American women who were born with low birth weight and very low birth weight have 2.5 and 2.59 higher odds of developing gestational diabetes, respectively, compared to participants not born with these conditions.

South Asian American women born with very low birth weight or low birth weight are more likely to develop type 2 diabetes and gestational diabetes. This is one of the first studies to explore birth weight and diabetes among South Asian American women and provides evidence for the need to develop culturally relevant diabetes prevention interventions for a growing population in the United States.

Keywords: South Asian women, type 2 diabetes, gestational diabetes mellitus

Introduction

Currently, 5.4 million South Asians live in the United States (US). This is a fast-growing population, as the US census accounted for only 3.5 million reported South Asians in 2010.[1,2] South Asian Americans (SAAs) refer to people with ancestry from Bangladesh, Bhutan, Nepal, Pakistan, India, Sri Lanka, and the Maldives.[1] In the US, approximately 23% of South Asians are living with both diagnosed and undiagnosed diabetes compared to 12.1% among non-Hispanic White individuals.[3] GDM, one of the most common pregnancy complications in the US, occurs in 2-10% of pregnancies in the US annually.[4] A recent report released by the Centers for Disease Control and Prevention (CDC) in July 2022 found that Asian-Indian women comprise the highest incidence of gestational diabetes mellitus cases in the US at 16.7%.[5] Moreover, a diagnosis of gestational diabetes presents an increased lifetime risk of developing type 2 diabetes.[6] According to the American Heart Association, a risk factor for developing type 2 diabetes mellitus is an infant being born with a low birth weight or weighing less than 2,500g or 5lbs 8oz.[7,8] Given both the rapid population growth and the high prevalence of diabetes among South Asians, it is important to investigate potential risk factors, such as birth weight, for the development of diabetes in this population.

Globally, 48% of babies with a low birth weight are born in South Asia, a statistic attributed mainly to wasting and low body-mass index (BMI) among South Asian women.[9] Very low birth weight refers to infants weighing less than 1,500g or 3lbs 4oz.[10,11] A normal or average birth weight is an infant born above 2,500g (5lbs 5oz) and up to 4,500g (10lbs).[11] Low birth weight remains a public health concern, with the U.S. ranking 28 out of 32 OCED countries in birth weight outcomes. In the U.S., 1.4% are born with very low birth weight and 8.1% with low birth weight and very low birth weight. A 2007 study conducted by the National Center for Health Statistics in the U.S. found that, among 102,739 babies born to Asian-Indian American mothers, 0.9% were very low birth weight, and 8% were low birth weight.[12] These outcomes were comparable to those babies born to White mothers (n=3,826,996), where 0.7% were very low birth weight and 4.3% were low birth weight. However, the rate of diabetes among Asian-Indian American mothers was 7.2%, more than double the 2.5% seen among White mothers.[12]

Birth weight is a key marker for the intrauterine environment and has been studied in relation to disease risk. The relationship between low birth weight and very low birth weight and the increased risk of developing type 2 diabetes later in life is well-established in the literature.[13] The "fetal origins hypothesis," also known as the Barker hypothesis, suggests that poor nutrition during fetal development leads to permanent changes in glucose metabolism and insulin resistance; this metabolic shift toward insulin resistance preserves glucose in the brain.[13] Another theory, the fetal insulin hypothesis, proposes genetic variants reducing insulin secretion can lead to low birth weight.[14] A landmark study by Hales et al. demonstrated that low birth weight was linked to a higher prevalence of impaired glucose tolerance and diabetes in adult life, possibly due to fetal programming that affects pancreatic development and insulin sensitivity.[15] Further research supports this, showing that individuals with low birth weight tend to have fewer pancreatic beta cells, which impacts insulin production.[13] Moreover, epigenetic changes resulting from poor fetal nutrition may affect genes involved in glucose regulation, exacerbating the risk of diabetes later in life.[16]

In South Asian populations, low birth weight as a risk factor for developing type 2 diabetes later in life is well documented.[24] South Asians born with low birth weight are particularly prone to diabetes due to their lower pancreatic beta-cell reserves, compounded by additional adult risk factors, including more significant abdominal obesity.[17] This combination heightens their susceptibility to impaired insulin secretion and type 2 diabetes. Research in India and other South Asian countries highlights this relationship, showing that undernutrition in utero has long-term metabolic consequences, especially in a population already genetically predisposed to lower insulin secretion capacity.[17] Currently, there are no US-based studies that have explored the relationship between type 2 diabetes and fetal birth weight amongst South Asians.[16,18]

Additionally, studies have demonstrated that women who are born with low birth weight are at an increased risk for developing gestational diabetes mellitus, with low birth weight being associated with a two-fold higher risk of gestational diabetes.[14] A 2010 cohort study (N=210,089 women) found that the rate of gestational diabetes was highest among Asian Indians (11.1%) compared to non-Hispanic white women.[17] Women with gestational diabetes are also 7.4 times more likely to develop type 2 diabetes compared to women without a gestational diabetes diagnosis, underscoring the need for intervention.[5] Gestational diabetes poses several maternal health risks, including stillbirth, cesarean delivery, preterm birth, macrosomia, and shoulder dystocia. For newborns, gestational diabetes can lead to complications such as breathing problems, jaundice, hypoglycemia, and obesity or diabetes later in life for newborns.[18]

The objective of the present study was to address the data gap on very low birth weight and low birth weight among South Asian women in the U.S. and to provide insights for developing culturally salient interventions to prevent adverse outcomes later in life. This study examined whether, among South Asian American women living in the US, there is a relationship between a woman being born with very low birth weight or low birth weight and a later diagnosis of type 2 diabetes and/or gestational diabetes In South Asian populations, low birth weight as a risk factor for developing type 2 diabetes later in life is well documented.

Methods

STUDY DESIGN AND PARTICIPANTS

A quantitative web-based cross-sectional anonymous survey was created using the Qualtrics platform. A non-probability convenience sampling approach was utilized to recruit a participant sample. The eligibility criteria for participants were individuals above 18 who self-identified as South Asian women living in the US.

A total of 5,270 participants completed the survey; however, after data collection, the dataset was cleaned by removing several cases. These included cis-gendered men, transgender females, participants residing outside of the U.S., and anyone who indicated they were not South Asian as they were not eligible to participate in the study. Data cleaning efforts included examining possible bots given the online recruitment strategy. Therefore, participants who took the survey in under three minutes or responded with recorded end dates and durations within 10-20 seconds of each other were flagged as potential bots and manually removed. If any responses had timing slightly above 20 seconds but fell within an existing flagged group, they were also manually excluded.

The study received Institutional Review Board (IRB) approval from The George Washington University (IRB Number: NCR234807).

DATA COLLECTION PROCESS

Data collection occurred during March 2023. The survey was distributed to organizations' listservs, social media networks, and personal media outlets. The project team reached out to South Asian-focused organizations spanning a variety of domains, including religious and cultural associations. A wide range of survey distribution, including an online advertisement, was used to recruit a sample of eligible South Asian American women for this study. It took approximately 15-20 minutes to complete the survey. Upon completing the survey, participants could enter a raffle for a $50 Amazon gift card.

INSTRUMENT AND MEASURES

This study was a subset of a broader research project on South Asian American women's health, utilizing data collected from a 52-item survey. The survey questions were adapted from several established sources, including the Centers for Disease Control and Prevention (CDC) National Health and Nutrition Examination Survey (NHANES), Adverse Childhood Experiences (ACE) Study, and the Natividad Diabetes Questionnaire.[19-22]

The demographic variables assessed in this study included eligibility criteria such as self-identifying as South Asian, age, South Asian ancestry, U.S. birth status, length of time in the U.S., marital status, educational level, employment status, and combined household income. The length of time living in the U.S. was categorized into four groups: less than five years, 6-10 years, 11-20 years, and more than 21 years. Marital status options included single, in a relationship/dating, married/domestic partnership, and a "separated" category, which combined widowed, separated, and divorced participants. Education level, originally a variable with eight categories and a write-in option, was recoded into four groups: less than high school, high school diploma/general education development (GED), technical/trade school, and higher education. The higher education category included responses from Associate's, Bachelor's, Master's, Doctorate/Professional degrees, and the one write-in response of a Master of Philosophy. Employment status was categorized as full-time, part-time, or not employed. Combined household income was a categorical variable with six intervals ranging from under $25,000 to over $200,000.

The primary independent variables for this research were VLBW and LBW. These variables were initially captured with response options "yes," "no," and "I do not know" but were later recoded into a binary yes/no format., excluding cases with "I do not know" responses. Participants were also asked a series of yes/no questions regarding chronic diseases, including type 2 diabetes and gestational diabetes.

ANALYSIS

Quantitative data analysis of type 2 diabetes, low birth weight, and very low birth weight was conducted on 2,634 participants using SPSS version 29. For the gestational diabetes, low birth weight, and very low birth weight subsamples, the inclusion criteria were limited to participants who responded "yes" to having been pregnant, reducing the sample size to 1,910 participants. To determine the significance of associations, chi-squared tests were conducted between very low birth weight and type 2 diabetes and low birth weight and type 2 diabetes. Additional chi-square tests assessed the relationships between very low birth weight, gestational diabetes, and low birth weight and gestational diabetes. Logistic regression models examined the relationship between birth weight and diabetes, controlling for covariates.

Results

Table 1 presents the sample characteristics of the overall sample, as well as those who indicated they had received a diagnosis of gestational diabetes. The study sample consisted of participants ages 18-50+, with the majority (91.4%) under 39 years old. Participants reported diverse ancestries: 16% from Bangladesh, 10.7% from Bhutan, 24.2% from India, 16.3% from Maldives, 9.7% from Nepal, 8.2% from Pakistan, 4.2% from Sri Lanka, and 10.7% biracial. Nearly 83% (82.5%) of participants were born in the U.S., with durations of residence evenly distributed: less than five years (20.3%), 6-10 years (29.7%), 11-20 years (27.6%), and 21+ years (22.4%).

Regarding relationship status, 56.3% were married, 20.3% were dating/in a relationship, 14.3% were single, and 9.0% were separated. Educational backgrounds varied: 3.4% had less than a high school education, 15.3% had a high school diploma or GED, 21.2% attended technical or trade school, and 60.1% had higher education. A majority of participants worked full-time (75.6%).

Family income was reported as $50,000-74,999 (30.1%) or $75,000-99,999 (27.1%). Regarding specific research measures, approximately 21.9% of the population was born with very low birth weight, defined as less than 1500 grams and 30.8% were born with low birth weight, defined as less than 2500 grams. Additionally, 12.4% of the population had type 2 diabetes mellitus.

For the gestational diabetes subsample population presented in Table 1, which includes 1,910 participants, the majority were aged 30-39 (49.5%) or 18-29 (39.5%). South Asian participants reported ancestry from India (22.2%), the Maldives (17.1%), Bangladesh (16.2%), Nepal (10.7%), Bhutan (10.4%), biracial (10.6%), Pakistan (8.1%), or Sri Lanka (4.7%).

About 84.1% of participants were born in the U.S. Of these, the majority had resided in the U.S. for 11-20 years (33.2%), followed by 6-10 years (28.3%), 21+ years (24.4%), and less than five years (14.0%). Most participants were married or in a domestic partnership (68.9%), with smaller proportions being in a relationship or dating (13.4%), separated (11.3%), or single (6.4%). Educational backgrounds included less than high school (3.9%), high school or GED (15.3%), technical or trade school (20.6%), and higher education (60.2%). Most participants worked full-time (76.9%) and had a combined family income of $50,000-74,999 (31.2%).

Regarding specific measures relevant to the research question, about 25.6% of the population was born with very low birth weight, and 34.5% were born with low birth weight. Among this group, 25.9% have had gestational diabetes.

Table 1: Characteristics of Study Participants

Characteristic	Total Sample Population N = 2634 n (%)
Age	
18-29	1323 (50.2)
30-39	1084 (41.2)
40-49	181 (6.9)
50+	46 (1.7)
South Asian ancestry	
Bangladesh	418 (16.0)
Bhutan	281 (10.7)
India	634 (24.2)
Maldives	426 (16.3)
Nepal	253 (9.7)
Pakistan	215 (8.2)
Sri Lanka	110 (4.2)
Biracial	280 (10.7)
Born in the US	
Yes	2159 (82.5)
Lived in the US	
Less than 5 years	94 (20.3)
6-10 years	138 (29.7)
11-20 years	128 (27.6)
21+ years	104 (22.4)
Marital status	
Single	373 (14.3)
In a relationship/Dating	531 (20.3)
Married/Domestic partnership	1470 (56.3)
Separated (includes widowed, divorced, and separated)	236 (9.0)
Educational level	
Less than high school	88 (3.4)
High school diploma/GED	401 (15.3)
Technical/trade school	555 (21.2)
Higher education	1570 (60.1)
Employment Status	
Full-time (35 hours or more)	1938 (75.6)
Part-time (1-34 hours)	542 (21.1)
Not employed	85 (3.3)
Combined family income (including domestic partnerships)	
Under $25,000	127 (4.9)
$25,000-$49,999	570 (21.9)
$50,000-$74,999	784 (30.1)
$75,000-$99,999	704 (27.1)
$100,000-$199,999	280 (10.8)
$200,000+	137 (5.3)
Very low birth weight (<1500g)	
Yes	513 (21.9)
No	1826 (78.1)
Low birth weight (<2500g)	
Yes	719 (30.8)
No	1612 (69.2)
Type 2 diabetes	
Yes	315 (12.4)

Characteristic	Total Sample Population N = 2634 n (%)
No	2225 (87.6)
Pregnancy	
Yes	1910 (73.2)
No	701 (26.8)
Gestational diabetes* (n=1910)	
Yes	481 (25.9)
No	1374 (74.1)

*This question was only asked to those participants who answered 'yes' to pregnancy.

Logistic analysis for type 2 diabetes

Table 2 displays the adjusted odds ratios from two logistic models: very low birth weight and low birth weight. The odds ratios are adjusted for age, ancestry, U.S. birth, marital status, employment status, combined family income, and educational level.

Model 1 found that women born with very low birth weight (<1500g) had 6.538 times higher odds of developing type 2 diabetes (95% CI: 4.862-8.973) compared to those not born with very low birth weight after adjusting for covariates. Women over 50 were more likely to develop type 2 diabetes (OR: 5.612, 95% CI: 2.313-13.618) than those aged 18-29, with no significant relationship observed in the 30-39 and 40-49 age groups. Women with ancestry from Bangladesh (OR: 0.545; 95% CI: 0.338-0.879) or Nepal (OR: 0.457; 95% CI: 0.245-0.852) were less likely to develop type 2 diabetes than those with Indian ancestry. Similarly, women with Pakistani ancestry (OR: 0.339; 95% CI: 0.160-0.717) also had reduced odds of developing type 2 diabetes. Compared to married participants, single women were less likely to develop type 2 diabetes (OR: 0.473; 95% CI: 0.283-0.791).

Model 2 found that women born with low birth weight had 4.251 times higher odds of developing type 2 diabetes (95% CI: 3.202-5.644) compared to those not born with low birth weight after accounting for covariates. When age was considered, individuals over 50 had higher odds of type 2 diabetes (OR: 4.217, 95% CI: 1.679-10.596) than those aged 18-29. For ancestry, women with Nepalese ancestry were less likely to develop type 2 diabetes (OR: 0.481; 95% CI: 0.267-0.868) compared to those with Indian origin, as were those with Pakistani (OR: 0.313; 95% CI: 0.149-0.657) and Sri Lankan (OR: 0.302; 95% CI: 0.104-0.874) ancestries. Regarding marital status, single participants had lower odds of developing type 2 diabetes (OR: 0.552; 95% CI: 0.334-0.914) compared to married individuals, while those who were separated had higher odds (OR: 1.590; 95% CI: 1.008-2.507).

Logistic analysis for gestational diabetes

Table 3 displays the adjusted odds ratios from two logistic models: very low birth weight and low birth weight. The odds ratios are adjusted for age, ancestry, US birth, marital status, employment status, combined family income, and educational level.

Model 1 found that South Asian American women born with very low birth weight (<1500g) had 2.588 times higher odds of developing gestational diabetes (95% CI: 1.977-3.386) compared to those not born with very low birth weight after controlling for covariates.

Model 2 found that South Asian American women born with low birth weight (<2500g) had 2.500 times higher odds of developing gestational diabetes (95% CI: 1.953-3.201) compared to those not born with low birth weight, after accounting for covariates. Additionally, biracial participants were more likely to develop gestational diabetes (OR: 1.636, 95% CI: 1.066-2.511).

Table 2: Multivariate logistic analysis for Type 2 Diabetes

	Adjusted Odds Ratio (95% CI)	
	Model 1 – Very Low Birth Weight	**Model 2 – Low Birth Weight**
Age		
18-29	REF	REF
30-39	0.890 (0.647-1.226)	0.985 (.718-1.350)
40-49	0.990 (0.512-1.913)	0.904 (0.458-1.783)
50+	5.612 (2.313-13.618)***	4.217 (1.679-10.596)**
Ancestry		
India	REF	REF
Bangladesh	0.545 (0.338-0.879)*	0.652 (0.411-1.035)
Bhutan	0.722 (0.431-1.211)	0.771 (0.470-1.265)
Nepal	0.457 (0.245-0.852)*	0.481 (0.267-.868)*
Pakistan	0.339 (0.160-0.717)**	0.313 (0.149-0.657)**
Sri Lanka	0.427 (0.171-1.067)	0.302 (0.104-0.874)
Maldives	0.687 (0.439-1.076)	0.747 (0.483-1.156)*
Biracial	1.360 (0.862-2.144)	1.538 (0.996-2.375)
Born in the US		
No	REF	REF
Yes	1.386 (0.889-2.160)	1.153 (1.007-2.395)*
Marital status		

	Adjusted Odds Ratio (95% CI)	
	Model 1 – Very Low Birth Weight	**Model 2 – Low Birth Weight**
Married/domestic partnership	REF	REF
Single	0.473 (0.283-0.791)**	0.552 (0.334-0.914)*
In a relationship/dating	1.149 (0.785-1.680)	1.000 (0.668-1.454)
Separated (includes divorced, widowed, and separated)	1.385 (0.861-2.227)	1.590 (1.008-2.507)*
Educational level		
Higher education	REF	REF
Less than high school	2.122 (0.951-4.689)	1.537 (0.703-3.360)
High school diploma/GED	0.948 (0.613-1.466)	0.910 (0.595-1.394)
Technical/trade school	0.823 (0.564-1.202)	0.811 (0.561-1.171)
Employment status		
Full-time (35 hours or more)	REF	REF
Part time (1-34 hours)	1.219 (0.875-1.696)	1.335 (0.968-1.840)
Not employed	1.278 (0.535-3.056)	1.225 (0.523-2.869)
Combined family income		
Under $25,000	REF	REF
$25,000-$49,000	1.437 (0.595-3.468)	1.549 (0.659-3.641)
$50,000-$74,000	2.170 (0.919-5.128)	2.226 (0.970-5.109)
$75,000-$99,999	2.057 (0.851-4.974)	2.056 (0.875-4.831)
$100,000-$199,999	1.315 (0.502-3.444)	1.093 (0.425-2.812)
$200,000+	1.068 (0.343-3.323)	0.880 (0.284-2.722)
Very low birth weight <1500g	6.538 (4.862-8.973)***	
Low birth weight <2500g		4.251 (3.202-5.644)***

*= p<0.05; ** = p<0.01; *** = p<0.001

Table 3: Multivariate logistic analysis for Gestational Diabetes

	Adjusted Odds Ratio (95% CI)	
	Model 1	**Model 2**
Age		
18-29	REF	REF
30-39	0.858 (0.659-1.117)	0.902 (0.693-1.175)
40-49	0.619 (0.362-1.058)	0.638 (0.373-1.090)
50+	0.445 (0.142-1.396)	0.305 (0.086- 1.085)
Ancestry		
India	REF	REF
Bangladesh	0.854 (0.565-1.291)	0.861 (0.572-1.295)
Bhutan	1.438 (0.926-2.233)	1.440 (0.935-2.218)
Nepal	0.817 (0.504-1.325)	0.761 (0.471-1.231)
Pakistan	0.975 (0.591-1.607)	0.946 (0.577-1.551)
Sri Lanka	0.867 (0.455-1.652)	0.725 (0.370-1.421)
Maldives	1.173 (0.793-1.733)	1.222 (0.830-1.798)
Biracial	1.624 (1.047-2.519)	1.636 (1.066-2.511) *
Born in the US		
No	REF	REF
Yes	0.976 (0.681-1.398)	1.072 (0.749-1.536)
Marital status		
Married/domestic partnership	REF	REF
Single	1.111 (0.676-1.825)	1.132 (0.696-1.839)
In a relationship/dating	1.196 (0.837-1.708)	1.160 (0.813-1.655)
Separated (includes divorced, widowed, and separated)	0.882 (0.573-1.356)	0.981 (0.647-1.488)
Educational level		
Higher education	REF	REF
Less than high school	1.357 (0.649-2.835)	1.396 (0.679-2.868)
High school diploma/GED	1.068 (0.728-1.566)	1.055 (0.721-1.544)
Technical/trade school	1.282 (0.934-1.759)	1.248 (0.912-1.706)
Employment status		
Full-time (35 hours or more)	REF	REF
Part time (1-34 hours)	1.056 (0.781-1.428)	1.101 (0.819-1.481)

	Adjusted Odds Ratio (95% CI)	
	Model 1	**Model 2**
Not employed	2.017 (0.796-5.111)	1.421 (0.557-3.626)
Combined family income		
Under $25,000	REF	REF
$25,000-$49,000	0.965 (0.448-2.076)	0.915 (0.425-1.923)
$50,000-$74,000	1.558 (0.740-3.279)	1.458 (0.711-2.991)
$75,000-$99,999	0.1.843 (0.861-3.947)	1.763 (0.845-3.679).
$100,000-$199,999	1.903 (0.850-4.259)	1.536 (0.699-3.375)
$200,000+	1.091 (0.409-2.910)	1.095 (0.423-2.834)
Very low birth weight <1500g	2.588 (1.977-3.386) ***	
Low birth weight <2500g		2.500 (1.953-3.201) ***

*= p<0.05; ** = p<0.01; *** = p<0.001

Discussion

The findings in this study contribute significantly to the existing literature on the relationship between low birth weight, very low birth weight, and the heightened risk of developing type 2 diabetes and gestational diabetes and adds to the evidence-base by examining South Asian American women specifically. The results in this study indicate that South Asian American women born with low birth weight and very low birth weight are at significantly higher odds of developing both type 2 diabetes and gestational diabetes later in life, a trend that aligns with previous research in other populations. This is particularly important given the high and rising rates of diabetes in the South Asian American community, highlighting the necessity of understanding early-life risk factors such as birth weight.

Previous research has established a strong link between birth weight and the risk of metabolic diseases, especially type 2 diabetes. The "fetal origins hypothesis," or Barker hypothesis, suggests that inadequate nutrition during fetal development can lead to long-term alterations in glucose metabolism and insulin resistance, both key precursors to type 2 diabetes.[13] This hypothesis postulates that when a fetus is exposed to an undernourished intrauterine environment, adaptive mechanisms prioritize glucose for the developing brain at the expense of other organs, leading to impaired development of pancreatic beta cells and reduced insulin sensitivity. This can result in long-term metabolic consequences, including a higher risk of T2DM in adulthood. In this study, South Asian American women born with very low birth weight had 6.54 higher odds of developing type 2 diabetes, and those born with low birth weight had 4.25 higher odds, reinforcing this hypothesis.

Furthermore, the study's findings align with existing studies showing a high prevalence of low birth weight and very low birth weight among South Asians, both in South Asia and the diaspora. Nearly half of the global burden of low birth weight occurs in, where maternal malnutrition, lower body mass indices, and higher rates of intrauterine growth restriction (IUGR) are major contributing factors.[9] The predisposition of low birth weight may help explain why South Asian populations have such a high incidence of type 2 diabetes.

The association between low birth weight and the risk of gestational diabetes is equally critical. Gestational diabetes is one of the most common pregnancy complications in the U.S. and is a predictor of future type 2 diabetes.[4,23] This study found that South Asia American women with very low birth weight had 2.59 higher odds of developing gestational diabetes, and those born with low birth weight had 2.5 higher odds. These results support the understanding that low birth weight is a significant risk factor for gestational diabetes in this population, which is notable since many South Asian women already exhibit disproportionately high rates of gestational diabetes compared to other racial and ethnic groups.[23]

This study also highlights postnatal factors that might amplify the risk of type 2 diabetes and gestational diabetes. According to the "thrifty phenotype hypothesis", individuals born with low birth weight may be more likely to develop obesity and insulin resistance if they experience rapid catch-up growth during childhood or adolescence.[15] South Asians are known to have higher rates of abdominal obesity and central adiposity, which may further exacerbate the risk of developing type 2 diabetes.[23] Thus, applying a life course perspective would be an essential framework that can enrich the understanding of the findings in this study. The life course perspective suggests that health outcomes are shaped not only by current behaviors or exposures but by a cumulative sequence of biological, social, and environmental factors experienced from conception to adulthood.[25] Moreover, the life course perspective also integrates postnatal and environmental factors.[25] For South Asian American women, social determinants such as nutrition, socioeconomic status, and healthcare access throughout childhood and adolescence can interact with early biological risk factors compounding their susceptibility to metabolic disorders.[25] This aligns with the "double burden" combination of early-life undernutrition and later-life obesity which adds to the risk for developing metabolic diseases in this population.

Despite the strengths of this study, including a large sample size and a focus on an understudied population, several limitations should be acknowledged. First, the study's cross-sectional design limits our ability to draw causal inferences between birth weight and the development of diabetes. Longitudinal studies are needed to confirm these associations and to explore the potential mechanisms linking birth weight to diabetes. Additionally, the reliance on self-reported birth weight may introduce recall bias, as participants may not accurately remember or know their birth weight. Future studies should aim to use more objective measures of birth weight, such as birth records, to minimize this bias.

Conclusion

In conclusion, this study contributes significantly to the growing body of knowledge on the relationship between low birth weight, very low birth weight, and the heightened risk of developing type 2 diabetes and gestational diabetes, with a specific focus on South Asian American women. The results clearly show that South Asian American women born with low birth weight and very low birth weight are at significantly elevated risk for both type 2 diabetes and gestational diabetes, emphasizing the need for early identification of at-risk populations and the utilization of a life-course perspective. Further, these findings underscore the need for culturally tailored interventions. Given the rapid grown of the South Asian population in the U.S., and the rising rates of diabetes, it is critical to develop strategies for diabetes prevention that take into account the complex interplay between birth weight, metabolic health and culture factors.

Conflict of Interest Statement:

There is no conflict of interest or disclosure of any competing interests that may exist. The following manuscript has not been published elsewhere and is not under review for submission elsewhere.

Funding Statement:

This study was funded by The George Washington University Center of Excellence in Maternal and Child Health under Grant No T76MC35370 from the Health Resources & Services Administration (HRSA) Maternal and Child Health Bureau. This study's contents are the authors' sole responsibility and do not necessarily represent the official views of the Health Resources & Services Administration (HRSA) Maternal and Child Health Bureau.

Informed Consent Requirement:

Informed consent was obtained from all participants involved in this research. The George Washington University Office of Human Research Institutional Review Board approved this study (IRB Number: NCR234807).

Statement and Declarations:

The following manuscript has not been published elsewhere and is not under review for submission elsewhere. This study was funded by The George Washington University Center of Excellence in Maternal and Child Health under Grant No T76MC35370 from the Health Resources & Services Administration (HRSA) Maternal and Child Health Bureau. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Health Resources & Services Administration (HRSA) Maternal and Child Health Bureau. There is no conflict of interest or disclosing of any competing interests that may exist. This study was approved by the Institutional Review Board at the George Washington University Office of Human Research (IRB Number: NCR234807).

Acknowledgements:

The authors acknowledge the assistance and support of the following individuals: Shikha Chandarana, Belicia Badibanga, Hannah Dease, Corina Galindo, Bailey Newton, Addison Montgomery, and Maria Wallace in completion of this study. Funding was provided by the GW Center for Excellence in Maternal and Child Health.

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