

A CROSS-SECTIONAL STUDY ON THE ASSOCIATION BETWEEN MATERNAL CONSUMPTION OF SUGAR-SWEETENED BEVERAGES AND ADVERSE BIRTH OUTCOMES

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ABSTRACT

Background: Maternal consumption of sugar-sweetened beverages (SSBs) is a prevalent dietary habit, yet its specific impact on birth outcomes in vulnerable populations remains inadequately explored. This study investigated the association between SSB intake and adverse birth outcomes at a tertiary care hospitals in Karachi, Pakistan.

Methods: A hospital-based cross-sectional study was conducted with 80 pregnant women. Data on SSB consumption and sociodemographics were collected via a structured questionnaire from Sohail University, Insaf Medical Complex and Diagnostic Lab, Jinnah Medical and dental hospital and Karachi Medical and Dental College (KMU), Abbasi Shaheed Hospital. The birth outcomes were extracted from medical records. Logistic regression was used to determine associations, calculating adjusted odds ratios (AORs) and p-values (<0.05 significant).

Results: The cohort was predominantly young, of low socioeconomic status, and with high (77.5%) moderate-to-high SSB consumption. High SSB intake was significantly associated with increased odds of low birth weight (AOR=2.32, p=0.036) and preterm birth (AOR=2.32, p=0.036). No significant association was found between SSB consumption and stillbirth (AOR=1.07, p=0.859).

Conclusion: Maternal SSB consumption is a significant, modifiable risk factor for low birth weight and preterm birth in this setting. Public health initiatives and antenatal counseling should emphasize limiting SSB intake to improve perinatal health. Further longitudinal studies are recommended to confirm causality.

Keywords: Sugar-sweetened beverages, maternal nutrition, low birth weight, preterm birth, Pakistan.

INTRODUCTION

Maternal nutrition is a cornerstone of prenatal care and a critical determinant of fetal health and pregnancy outcomes (1). The consumption of sugar-sweetened beverages (SSBs), characterized by

high concentrations of free sugars and often caffeine, represents a prevalent dietary pattern worldwide. However, its specific impact during

pregnancy, particularly in vulnerable populations, requires further investigation (2).

Existing literature increasingly links poor maternal dietary intake to adverse perinatal outcomes. Diets rich in ultra-processed foods, a category that includes many SSBs, are associated with an elevated risk of preterm birth and low birth weight (LBW) (3, 4). This association is not merely general; specific beverage types have been implicated. For instance, maternal caffeine consumption has been scrutinized for its potential to restrict fetal growth and impact long-term child neurodevelopment (5, 6). More directly, a recent cohort study found that energy drink consumption before and during pregnancy significantly increased the risks of preterm birth and being small-for-gestational-age (2).

In low-resource settings like Pakistan, the convergence of nutritional transitions and limited public health awareness creates a high-risk environment (3). At institutions like Abbasi Shaheed Hospital, Karachi, serving a diverse and often at-risk population, understanding modifiable risk factors for adverse birth outcomes is a public health priority. While the harms of broad unhealthy dietary patterns are established, the specific role of SSB consumption in this local context remains a significant evidence gap.

Therefore, this study aims to bridge this gap by investigating the association between maternal SSB intake and adverse birth outcomes, specifically LBW, preterm birth, and stillbirth, among pregnant women at Sohail University, Insaf Medical Complex and Diagnostic Lab,

Jinnah Medical and dental hospital and Karachi Medical and Dental College (KMU), Abbasi Shaheed Hospital, Karachi. The findings are expected to provide critical local evidence to inform targeted dietary guidance and antenatal counseling in this community.

Methodology

A hospital-based cross-sectional study was conducted at Sohail University, Insaf Medical Complex and Diagnostic Lab, Jinnah Medical and dental hospital and Karachi Medical and Dental College (KMU), Abbasi Shaheed Hospital. A total of 80 pregnant women presenting for delivery were recruited. Data were collected using a structured questionnaire, which was devised and adapted from previously validated instruments used in similar studies (5, 6, 7). This questionnaire gathered information on sociodemographic characteristics and detailed SSB consumption patterns. Birth outcomes, including birth weight, gestational age at delivery, and incidence of stillbirth, were extracted directly from hospital medical records. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 16.0. Logistic regression analysis was employed to determine the association between maternal SSB consumption and adverse birth outcomes, calculating odds ratios with 95% confidence intervals. A p-value of less than 0.05 was considered statistically significant.

Data Analysis

Table 1 Sociodemographic and Health-Related Characteristics of the Study Participants

Characteristic	Category	Frequency (n)	Percentage (%)
Age Group (Years)	18-25	35	44.3
	26-35	41	51.9
	>35	3	3.8
Education Level	No Formal Education	18	22.8
	Primary/Secondary	45	57.0

	Intermediate or Higher	16	20.2
Socioeconomic Status	Low (Monthly Income <25,000 PKR)	52	65.8
	Middle (25,000 - 60,000 PKR)	24	30.4
	Upper Middle (>60,000 PKR)	3	3.8
Parity	Primipara (First birth)	22	27.8
	Multipara (2-4 births)	49	62.0
	Grand Multipara (>5 births)	8	10.2
SSB Consumption (WHO Scale)	Low (<1 serving/week)	18	22.5
	Moderate (1-6 servings/week)	29	36.3
	High (≥1 serving/day)	33	41.2
Trimester of 1st ANC Visit	First Trimester	15	19.0
	Second Trimester	38	48.1
	Third Trimester	26	32.9

This profile characterizes a predominantly young, low-income cohort with limited formal education. A significant majority (77.5%) reported moderate-to-high SSB consumption. Notably, over 80% initiated antenatal care after the first trimester,

highlighting a population with potential nutritional and healthcare access vulnerabilities relevant to the study's focus on dietary risks.

Table 2 Predictors of Adverse Birth Outcomes: Odds Ratios from Logistic Regression

Predictor Variable	Low Birth Weight		Preterm Birth		Stillbirth	
	OR	p-value	OR	p-value	OR	p-value
SSB Consumption	2.32	0.036	2.32	0.036	1.07	0.859
Parity	0.40	0.014	2.48	0.088	0.40	0.014

Constant	2.71	0.281	0.01	0.003	2.71	0.281
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Logistic Regression was applied

The logistic regression analysis reveals that maternal SSB consumption is a significant and consistent risk factor for adverse perinatal outcomes. The results revealed that higher SSB intake was associated with significantly increased odds of both low birth weight (OR=2.32, p=0.036) and preterm birth (OR=2.32, p=0.036). In contrast, no significant association was found between SSB consumption and stillbirth. Parity was a significant protective factor for low birth weight and stillbirth. These results underscore SSB consumption as a modifiable behavioral risk factor strongly linked to impaired fetal growth and early delivery in this population.

Discussion

The present study identified a significant association between maternal SSB consumption and increased odds of low birth weight and preterm birth, aligning with a growing body of evidence on the detrimental effects of poor maternal nutrition. Our findings corroborate previous research linking unhealthy dietary patterns to adverse perinatal outcomes (7). Specifically, the twofold increased odds of preterm birth associated with SSBs resonate with studies on ultra-processed foods, which have been implicated in disrupted fetal development and inflammatory pathways (8, 9, 10). The lack of a significant association with stillbirth may be due to the multifactorial etiology of this outcome, where other factors like those documented in broader lifestyle reviews play a more dominant role (11, 12).

The significant relationship with low birth weight adds to concerns about components common in SSBs. While caffeine has been a historical focus, with studies linking it to fetal growth restriction (10, 13), our results suggest high sugar content is a critical risk factor. This is consistent with research on maternal metabolic health, where SSBs can contribute to dysglycemia, a known risk factor for adverse birth outcomes (14, 15).

Our study provides new and critical evidence from a low-resource setting in Karachi, confirming that the risks of SSBs, previously characterized in Western cohorts (9, 16), are equally pertinent here.

Consequently, the hypotheses linking SSB consumption to low birth weight and preterm birth

are supported, while the hypothesis for stillbirth is not. The clinical significance lies in identifying a highly modifiable risk factor; antenatal counseling should explicitly advise limiting SSB intake.

Conclusion

This study provides critical evidence of a significant association between maternal consumption of sugar-sweetened beverages (SSBs) and increased odds of preterm birth and low birth weight in a Pakistani cohort. These findings strongly support the implementation of public health recommendations to limit SSB intake during pregnancy as a modifiable strategy to improve perinatal outcomes. However, the cross-sectional design of this research presents a limitation, precluding definitive causal inferences. Future longitudinal studies with larger, more diverse populations and objective biomarkers of consumption are needed to establish causality, elucidate the underlying biological mechanisms, and inform targeted dietary guidelines for pregnant women in similar low-resource settings.

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