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Abstract: Low birth weight (LBW) and premature births remain leading causes of neonatal morbidity and mortality, particularly in low-resource settings. In Pakistan, these outcomes are closely linked to maternal health, nutrition, and access to antenatal care, yet district-level data remains scarce. This study aimed to identify the factors associated with low birth weight and premature births among pregnant women in District Tando Muhammad Khan. A cross-sectional descriptive study was conducted among 377 pregnant women attending health facilities in District Tando Muhammad Khan, from November 2024 to April 2025, using a structured, pretested questionnaire. Data collection focused on maternal sociodemographic characteristics, nutritional status, antenatal care utilization, pregnancy complications, psychosocial stress, substance use, and environmental factors. Anthropometric measurements and gestational age were recorded to determine the prevalence of LBW and prematurity. Data were analyzed using SPSS version 29.0; descriptive statistics, frequency distributions, and cross-tabulations were applied to examine associations between variables. The prevalence of low birth weight was 53.8% and premature births were reported in 69.5% of cases. Among the participants 64.2% did not receive any antenatal care, and only 14.6% consumed a balanced diet during pregnancy. Hypertension (36.6%), infections (19.6%), and diabetes (11.4%) were the most common complications. Psychosocial stress was reported by 45.9%, and tobacco use was high at 51.7%, with 26.3% using illicit drugs. Additionally, 47.5% of the participants had the family history of low birth weight and premature births. Multifactorial maternal, behavioral, and environmental risks contribute to adverse birth outcomes in rural Sindh, highlighting the need for integrated maternal health interventions.

Introduction

Low birth weight (LBW, birth weight <2,500 g) and prematurity (gestational age <37 weeks) are major contributors of neonatal and infant mortality and morbidity worldwide. These conditions not only increase the risk of early death but also contribute to long-term developmental and health challenges

such as stunted growth, impaired cognitive development, and increased susceptibility to chronic diseases in adulthood.¹ The burden is particularly heavy in low- and middle-income countries (LMICs), where access to quality maternal and neonatal care is often limited. In such settings, the consequences of LBW and prematurity are exacerbated by systemic issues such as poverty, malnutrition, inadequate prenatal care, and insufficient healthcare infrastructure.²

Addressing the global burden of preterm birth (before 37 weeks of pregnancy) is critical to reducing neonatal and childhood mortality and to achieving Sustainable Development Goal #3—to ensure healthy lives and to promote well-being for all at all ages.^{1, 2, 3}

The World Health Organization (WHO) estimates that there are 15 million preterm births every year.⁴ This staggering number means that on average, more than one in ten babies are born too early, often with underdeveloped organs and a lower chance of survival.^{2,4}

In LMICs, particularly rural areas, the lack of early antenatal visits and ultrasound services limits accurate gestational age assessment. In contrast, birth weight can be easily and accurately measured at birth using a simple scale, making it a more practical if less precise indicator for assessing neonatal risk in such settings.⁴

LBW and/or preterm birth are important causes of neonatal mortality. Infants who are small for Gestational Age (SGA) have an increased risk of neonatal mortality regardless of their association with preterm birth.^{4, 5, 6}

Premature infants often require care in neonatal intensive care units (NICUs), with specialized equipment and skilled health personnel, but such resources are scarce in many developing countries. In such settings, even basic neonatal resuscitation, infection prevention, and thermal regulation are difficult to achieve consistently. Additionally, follow-up services for at-risk new-borns are limited, resulting in long-term developmental impairments and increased infant and child mortality.^{7,8}

In the Pakistan 2017–2018 Demographic Health Survey (PDHS), the NMR for the five years preceding the survey was 42 deaths per 1000 live births. Again, because of the lack of a functioning vital statistics system, these numbers are at best estimates and the number of deaths is likely to be underreported. Pakistan's neonatal mortality rate remains one of the highest in the region and significantly above the global average.⁹ These high mortality rates reflect systemic issues in maternal and new-born care, including poor health service coverage, low facility-based delivery rates, and a lack of trained birth attendants. Furthermore, disparities in access to healthcare based on geographic location, wealth, and education further exacerbate the problem.^{10, 11, 12}

In Pakistani women the pregnancy outcomes are much worse than those in the other Global Network sites. Reasons for these poorer outcomes likely include that the Pakistani sites' reproductive-aged women are largely poorly educated, undernourished, anemic, and deliver a high percentage of preterm and low-birth weight babies in settings of often inadequate maternal and newborn care.¹³

This study aims to assess the prevalence and identify the factors associated with low birth weight and premature birth in the study setting. By examining factors such as maternal nutrition, access to prenatal care, socio-economic status, and healthcare infrastructure, the study seeks to inform targeted interventions to address these issues.

Methodology

This descriptive cross-sectional study was conducted over a period of six months, from November 2024 to April 2025, at the Institute of Health Management Sciences, Liaquat University of Medical and Health Sciences (LUMHS), with respondents recruited from pregnant women residing in District Tando Muhammad Khan.

A total sample size of 377 was determined using the Raosoft calculator with a 5% margin of error, 95% confidence level, 50% response distribution, and an estimated population size of 20,000. Non-probability convenience sampling was used to select participants who met the inclusion criteria, which included pregnant women of all reproductive ages and gestational stages; non-pregnant women, girls not of childbearing age, and those unwilling to participate were excluded.

Data were collected through a pre-designed questionnaire after obtaining written informed consent from participants. Demographic variables included age, education, place of living, family structure, and socioeconomic status, while study variables focused on factors such as access to health care, availability of health facilities, maternal nutrition and age, antenatal visits, mental health, repeated pregnancies, co-morbid conditions, environmental exposure, cultural beliefs, gender-based care, and social taboos. Data were entered and coded in Microsoft Excel, and analyzed using SPSS version 29. Descriptive statistics such as frequencies and percentages were used for categorical data, and means with standard deviations for continuous variables; results were also presented using charts and graphs.

Ethical approval was obtained from the Research Ethics Committee of LUMHS, and participants were informed of the study's purpose, assured of confidentiality, and their data were used solely for research following standard ethical protocols.

Results

This study assessed the demographic and obstetric characteristics of pregnant women in District Tando Muhammad Khan. Table 1 summarizes the demographic profile of the participants, including their age distribution, educational background, and occupational status, number of children, socioeconomic status, and age at first pregnancy.

The majority of the respondents were aged between 20 and 29 years, with the highest frequency observed in the 25–29 age group (36.34%), followed by the 20–24 age group (29.44%). A smaller proportion of participants were in the 30–34 age range (18.57%), and 14.32% were aged 35–39 years. Only 1.33% of the participants were in the 15–19 age groups.

Regarding education, a significant proportion of the participants (48.8%) were uneducated, while 33.2% had completed primary education, and 18.0% had received secondary education. These findings indicate a relatively low level of formal education among the study population.

In terms of occupation, a large majority of the respondents (81.4%) were housewives, with a smaller proportion engaged in government (7.4%), private (4.0%), or self-employment (7.2%).

The number of children varied, with the majority of participants (44.3%) having three children, followed by 35.5% who had two children, and 13.3% with only one child. A smaller proportion had four (5.6%) or five (1.3%) children.

The socioeconomic status of the respondents was predominantly low, with 75.3% categorized as low-income, 23.9% as medium-income, and only 0.8% as high-income.

Regarding the age at first pregnancy, the majority of participants experienced their first pregnancy between the ages of 18 and 25. The most common age for first pregnancy was 18 years (17%), followed closely by 20 years (14.6%) and 19 years (14.3%).

Table 1: Demographic Characteristics of Participants

Variable	Category	Frequency	Percentage (%)
Age	15–19	5	1.33
	20–24	111	29.44
	25–29	137	36.34

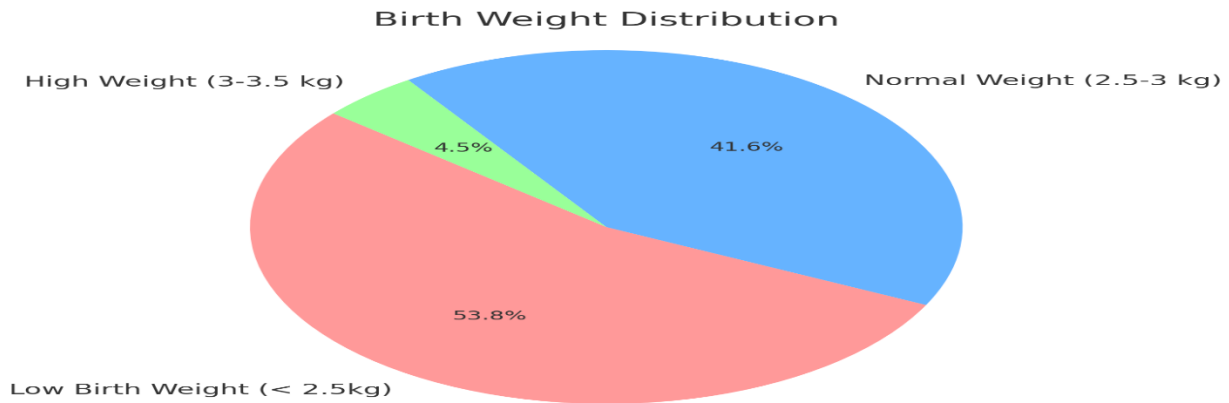
	30–34	70	18.57
	35–39	54	14.32
Education	Uneducated	184	48.8
	Primary	125	33.2
	Secondary	68	18.0
Occupation	Housewife	307	81.4
	Government Job	28	7.4
	Private Job	15	4.0
	Self-employed	27	7.2
Number of Children	1	50	13.3
	2	134	35.5
	3	167	44.3
	4	21	5.6
	5	5	1.3
Socioeconomic Status	Low	284	75.3
	Medium	90	23.9
	High	3	0.8

The data presented in Table 2 reveals a concerning prevalence of low birth weight and premature births among the study population. More than half of the babies (53.8%) were born with low birth weight, defined as less than 2.5 kg, indicating a significant challenge in maternal health and nutrition. This high percentage suggests that a considerable proportion of pregnant women in the study area may not be receiving adequate prenatal care or nutrition during pregnancy, both of which are critical factors in preventing low birth weight. The remaining 41.6% of babies had normal birth weight, while only 4.5% had high birth weight, further reinforcing the need for improved maternal care and nutritional support during pregnancy.

Additionally, the study shows that a majority of the pregnancies (69.5%) resulted in premature births, with only 30.5% of births occurring at full term. This high rate of preterm births could be linked to various factors, such as inadequate access to healthcare facilities, high levels of maternal stress, or socio-economic barriers, which are known to increase the likelihood of premature labor.

Table 2: Prevalence of Low Birth Weight and Premature Births.

Variable	Category	Frequency	Percentage (%)
Birth Weight	Low Birth Weight (< 2.5kg)	203	53.8
	Normal Weight (2.5-3 kg)	157	41.6
	High Weight (3-3.5 kg)	17	4.5
Premature Births	Yes	262	69.5
	No	115	30.5



The table 3 outlines several factors associated with low birth weight (LBW) and premature births among the study population. A critical factor identified was maternal nutrition, with 59.7% of women not following a balanced diet during pregnancy. Additionally, only 9.5% of the participants received regular antenatal care (ANC), while 64.2% received no ANC, suggesting that limited prenatal healthcare access is a major contributing factor to adverse birth outcomes.

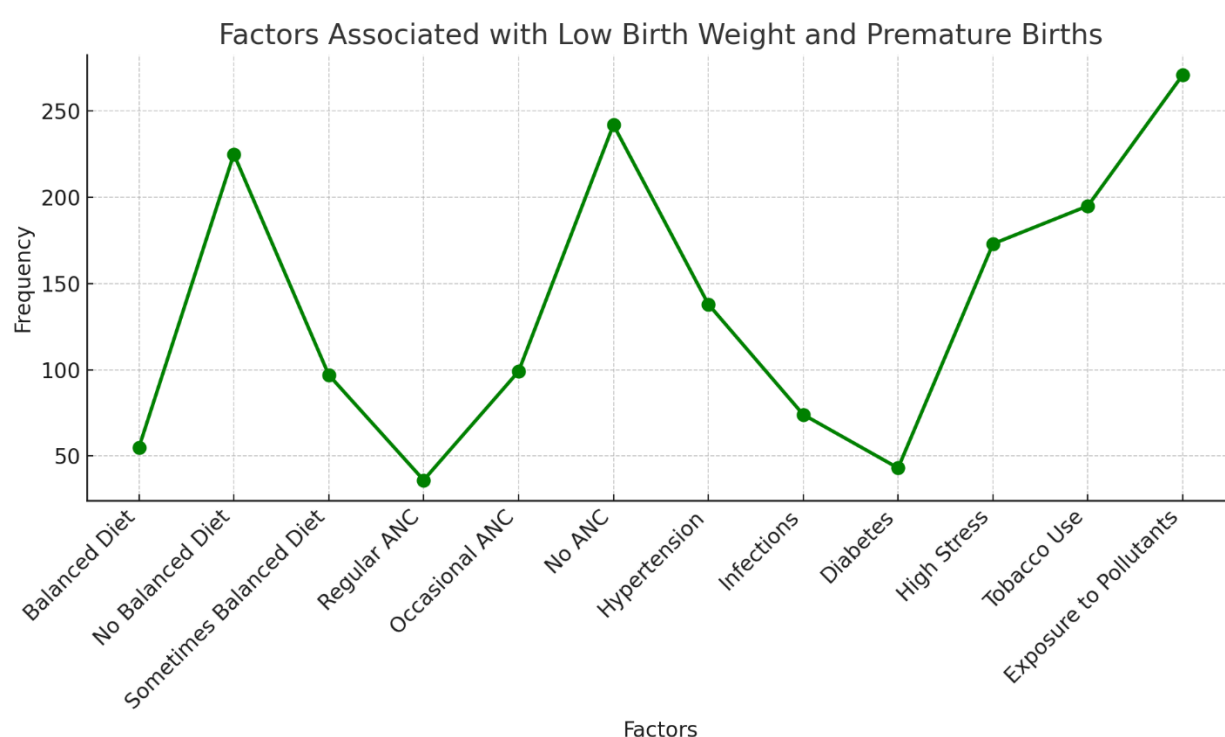
Pregnancy complications such as hypertension, infections, and diabetes were prevalent, with hypertension being the most common (36.6%). These conditions are well-documented risk factors for LBW and premature births, as they can affect placental function and fetal development. Furthermore, maternal stress was reported by 45.9% of women, and substance use (including tobacco and illicit drugs) was high, with 51.7% of participants using tobacco.

Environmental exposures were also a significant factor, with 71.9% of participants reporting exposure to pollutants, highlighting the impact of poor environmental conditions on pregnancy outcomes. Family health history was another noteworthy factor, as 47.5% of women had a family history of LBW or premature births, indicating a possible genetic predisposition. Furthermore, 50.4% of women engaged in physical labor during pregnancy, which can lead to excessive strain, potentially contributing to preterm birth and low birth weight. Further 58.6% of participants reported inadequate rest and sleep during pregnancy, while 41.4% experienced adequate rest and sleep.

Table 3: Factors Associated with Low Birth Weight and Premature Births.

Variable	Category	Frequency	Percentage (%)
Nutritional Status	Balanced Diet	55	14.6
	No Balanced Diet	225	59.7
	Sometimes Balanced Diet	97	25.7
Antenatal Care (ANC)	Regular ANC	36	9.5
	Occasional ANC	99	26.3
	No ANC	242	64.2
Pregnancy Complications	Hypertension	138	36.6
	Infections	74	19.6
	Diabetes	43	11.4
	Others	122	32.4
Maternal Stress	High Stress	173	45.9

	No Stress	204	54.1
Substance Use	Tobacco Use	195	51.7
	Illicit Drugs	99	26.3
Environmental Exposures	Exposure to Pollutants	271	71.9
	No Exposure to Pollutants	106	28.1
Family Health History	Family History of LBW/Preterm	179	47.5
	No Family History	198	52.5
Physical Labor During Pregnancy	Yes	190	50.4
	No	187	49.6
Rest and Sleep	Adequate Rest and Sleep	156	41.4
	Inadequate Rest and Sleep	221	58.6



Discussion

The results of this cross-sectional study revealed significant insights into the prevalence and determinants of LBW and prematurity, many of which are consistent with patterns seen across low- and middle-income countries (LMICs), especially in South Asia.^{14,15}

The majority of respondents were aged 20–29 years (65.7%), with a smaller percentage below 20 years (1.3%) or above 35 years (14.3%). Although this suggests a lower proportion of adolescent pregnancies in the study area, the risks associated with both young and older maternal ages remain significant. Adolescent pregnancies are known to result in physiological immaturity, leading to a higher risk of LBW due to underdeveloped maternal anatomy and poor nutritional reserves. Conversely, advanced maternal age is linked to an increased risk of hypertension, gestational diabetes, and placental insufficiency—all of which were reported complications in this study.^{16,17}

Multiparity was common, with 44.3% of women having three or more children. High parity has been

previously associated with maternal nutrient depletion and increased obstetric risk, contributing to adverse birth outcomes. The findings here support the existing understanding that closely spaced and repeated pregnancies without adequate recovery time place mothers and their unborn children at increased risk of complications such as fetal growth restriction and premature birth.¹⁸

Almost half of the women (48.8%) were uneducated, and 75.3% belonged to a low socioeconomic group. These sociodemographic indicators are critical because maternal education and household income directly affect access to healthcare, knowledge about nutrition, and the ability to seek timely medical care. Low levels of education are associated with poor antenatal care utilization, less awareness about pregnancy-related complications, and decreased autonomy in making health decisions. These links are well-established in both global and regional literature and are reaffirmed by the high rates of avoidable complications observed in this study.^{19,20}

Only 9.5% of women reported receiving regular antenatal care, while a staggering 64.2% received none at all. The absence of routine ANC is one of the most alarming findings of this study and is a strong predictor of LBW and preterm births. ANC provides opportunities to monitor fetal development, manage maternal conditions, educate mothers on nutrition and rest, and offer prophylactic interventions such as tetanus toxoid immunization and iron-folic acid supplementation.²¹

More than half of the respondents (54.6%) experienced complications during pregnancy. Among these, hypertension (36.6%) was the most commonly reported condition. Hypertensive disorders in pregnancy—such as preeclampsia and eclampsia—are major contributors to fetal growth restriction and premature labor due to their effects on placental blood flow. Other complications included infections (19.6%) and diabetes (11.4%), both of which are also well-documented causes of poor neonatal outcomes.²²

The findings showed widespread nutritional inadequacy: 59.7% of women did not consume a balanced diet during pregnancy. This underlines the critical role of nutrition in pregnancy outcomes. Poor maternal nutrition contributes to intrauterine growth restriction (IUGR), a primary cause of LBW. Furthermore, the lack of iron, folic acid, and other essential micronutrients contributes to anemia, fatigue, and higher susceptibility to infections.²³

Only 14.6% of participants consistently maintained a balanced diet. These figures are alarmingly low, especially in rural populations where pre-pregnancy nutritional reserves are already limited. The literature consistently shows that maternal under nutrition is one of the strongest predictors of LBW, particularly in South Asia, where diets are often low in protein, micronutrients, and dietary diversity.²⁴

Stress during pregnancy was reported by 45.9% of women, with an additional 29.7% experiencing occasional stress. High levels of stress have been biologically linked to increased levels of cortisol and other stress hormones, which can negatively affect placental function, fetal development, and the timing of labor. This psychosocial factor is increasingly recognized in maternal health research as an independent risk factor for LBW and prematurity.²⁵

The sources of stress in the study population may include economic hardship, marital conflict, household responsibilities, and fear of complications. These findings highlight the need to integrate mental health screening and support into antenatal services, particularly in resource-limited settings where psychosocial issues are often overlooked.²⁶

More than half of the respondents (51.7%) reported tobacco use, and 26.3% reported use of illicit drugs. These rates are remarkably high and present serious threats to fetal development. Tobacco use during pregnancy reduces oxygen supply to the fetus, increasing the risk of intrauterine growth restriction, placental abruption, and stillbirth. Illicit drug use has similar effects and may also result in neonatal

abstinence syndrome.²⁷

The absence of reliable infrastructure and poor living conditions increase maternal physical stress and reduce their ability to maintain hygiene and nutrition, further compounding the risk of adverse birth outcomes.²⁸

This study highlights the need for improved antenatal care, especially in rural Sindh, through expanded ANC services, stronger Lady Health Worker networks, and mobile health units. Addressing maternal malnutrition with community-based programs and awareness campaigns is essential, as is integrating mental health services to reduce stress and substance use. Improving access to clean water, sanitation, and female education, alongside a multisectoral approach, is critical to tackling the root causes of poor pregnancy outcomes.

Conclusion

This study identified key factors contributing to low birth weight and premature births among pregnant women, including poor maternal nutrition, inadequate antenatal care, high stress levels, substance use, and low socioeconomic status. These findings highlight the urgent need for integrated healthcare services, nutritional support, and community-based interventions. Addressing these issues through targeted policies and improved access to maternal care can significantly reduce adverse birth outcomes and improve maternal and neonatal health in rural Pakistan.

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