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Risk of low birth weight and exposure to type of cooking fuel in India

Abstract

Introduction: Recently, there has been an increasing interest in the health effects of exposure to biomass smoke. Despite significant improvements in child health measures, low birth weight is still a pragmatic issue. We aimed to examine the association between household use of unhygienic fuels for cooking and birth weight.

Data and methods: Using national Family Health Survey-IV, this study aimed at quantifying the determinants of low birth weight in India. Cross-tabulation and logistic regression have been used to carry out this study.

Results: The result found that the availability of separate kitchen and use of hygienic fuel decreases the odds of low birth weight. The result further found that various background characteristics like mother's age, education, anaemic status, ANC visits, and BMI also have an impact on low birth weight.

Conclusion: After launching Pradhan Mantri Ujjwala Yojana to provide the LPG connection to poor families, the government shall now focus on promoting the use of these cylinders.

Keywords: low birth weight, unhygienic cooking fuels, India

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Introduction

Around 3 billion people worldwide were found to be using solid fuels.[1] Various studies have found an association between low birth weight and the use of solid or unhygienic fuel and unavailability of the separate kitchen in the household.[2–8] Low birth weight is one of the important risk factors for early infant death. A study found that nearly 130 million babies are born every year, and of those, about 4 million die in the neonatal period itself.[9] Nearly 28 percent of the neonatal deaths are attributed to the low birth weight.[10] Over the last decade, various measures have been taken to tackle this menace of use of solid fuel; still, it is a dream far-sighted. Women usually continue with their domestic and cooking role throughout pregnancy, so the developing foetus is also indirectly exposed.[8] Therefore, this study explores the possible association between the use of hygienic or unhygienic fuel and low birth weight in India.

Data and methods

Data source

This study uses the fourth round of National Family Health Survey (NFHS), also known as Demographic Health Survey (DHS) - India, conducted in 2015-16. Anthropometry measures including height and weight were measured for children using a standard instrument that included SECA 417 infantometer (for the height of children under two years), SECA 213 stadiometer (for the height of children under 24-59 months and adults) and SECA 874 (for weight of other children and adults) in this survey. The sample of the current study included only the married women who gave birth in the past five years and their last-born child. The total sample of the study includes 26,972 women aged 15-49 years.

Measures

The study variables included the mother's age, body mass index (BMI), parity, anemia, ANC visits during their last pregnancy, education of the mother, place of delivery, place of residence, wealth index, use of the type of kitchen, type of fuel. Study variables for children included low birth weight (LBW) and Adverse Pregnancy Outcomes. LBW was determined using the birth weight of the child as given in the data wherein children weigh less than 2500 grams were considered as LBW. Adverse Pregnancy Outcome was determined using children who were born with low birth weight or died during the last pregnancy.

Methods

The data was analyzed using bivariate (Chi-square for finding the association) and multivariate techniques (Logistic regression) in SPSS v25. Adjusted odds, as well as unadjusted odds, were calculated to measure the difference between the target variable.

Results

Table 1 shows the prevalence of low birth weight and adverse Pregnancy Outcomes (APOs) by various background characteristics. The result found that the low birth weight and APOs are highest among the youngest mothers aged 15-24 years. Nearly one in every five underweight mothers delivered a low birth weight baby. Around 18 percent of first parity women deliver a baby with low birth weight. Around 23 percent of severe anaemic mothers delivered a baby with low birth weight, whereas, about 17 percent of women who were not anaemic delivered a baby with low birth weight. The higher number of ANC visits and increasing wealth index decrease the prevalence of low birth weight. The prevalence of low birth weight children is higher among uneducated women than in women with higher education. The availability of separate kitchen in the household and use of hygienic fuel decreases the prevalence of low birth weight. The prevalence of low birth weight child is higher among the mothers using unhygienic fuel than in mothers using hygienic fuel.

Table 2 shows the result for unadjusted odds ratios for low birth weight. The result found that the availability of separate kitchen in the household decreases the odds of low birth weight by around 15 percent. The result further found that mothers using unhygienic fuels

are 1.17 times more likely to give birth to a baby with low birth weight than mothers using hygienic fuel.

Table 1 Prevalence of Low Birth Weight and Adverse Pregnancy Outcomes by Various Background Characteristics, NFHS-4

Characteristics	LBW	APO
AGE -Mother		
15-24	18.65	20.11
25-34	16.06	17.34
35+	16.56	18.58
BMI		
Underweight	20.73	21.99
Normal	16.23	17.39
Overweight	14.27	15.33
PARITY		
1	17.94	19.27
2	16.26	17.32
3 +	16.87	18.82
Anemia		
not anaemic	16.67	18.12
mild	16.87	18.02
moderate	18.25	20.16
severe	23.36	26.43
ANC Visit		
0	18.95	21.28
1	18.12	19.71
2	17.84	19.83
3+	16.51	17.65
Place of delivery		
Home	16.17	18.55
government hospital	17.38	18.8
private hospital	16.58	17.68
others	19.68	21.13
Education		
no education	18.43	20.73
primary	19.03	20.75
secondary	16.99	18.12
higher	13.26	14
Place of residence		
urban	16.43	17.46
rural	17.34	18.92
Wealth index		
poorest	18.5	20.8
poorer	17.85	19.67
middle	17.37	18.73
Richer	17.44	18.36
Richest	14.03	14.72
Place of cooking		
Outdoor	17.76	19.16
Indoor	16.87	18.27
Separate kitchen in house		
No	18.18	20.08
Yes	16.03	18.17

Table 2 Unadjusted odds ratios for low birth weight by type of fuel and availability of kitchen

Characteristics	Odds Ratio	95 % Confidence Interval	
		Lower Limit	Upper Limit
Availability of separate kitchen			
No	1		
Yes	0.85***	0.828857	0.881515
Type of fuel			
Hygienic	1		
Unhygienic	1.17***	1.138921	1.206576

Table 3 shows the result of adjusted odds ratios for the association between low birth weight and background characteristics. The result found that the mother's age is one of the predictors of low birth weight. Youngest mothers aged 15-24 years are more likely to deliver a baby with low birth weight than mothers aged 25-34 years. Obese women are about 30 percent less likely to deliver a low birth weight baby than underweight women. The result found that low birth weight is higher when mother is in their first parity. Severe anaemic women are 1.5 times more likely to deliver a baby with low birth weight than non-anaemic women. The result confirms that higher ANC visits and higher education decrease the odds of low birth weight. Our study found no association between low birth weight and wealth index. The availability of separate kitchen in the household and use of hygienic fuel decreases the odds of delivering low birth weight child.

Table 3 Multivariable adjusted models for the association between low birth weight and various background characteristics

	Odds Ratio	[95% Confidence Interval]	
AGE -Mother		Lower Limit	Upper Limit
15-24	1		
25-34	0.916***	0.878	0.956
35+	0.943	0.877	1.014
BMI			
Underweight	1		
Normal	0.786***	0.754	0.82
Overweight	0.729***	0.686	0.774
Parity			

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Table Continued

	Odds Ratio	[95% Confidence Interval]	
AGE -Mother		**Lower Limit**	**Upper Limit**
1	1		
2	0.894***	0.856	0.934
3 +	0.875***	0.83	0.923
Anemia			
Not anaemic	1		
Mild	1.033	0.994	1.073
Moderate	1.137***	1.076	1.202
Severe	1.455***	1.221	1.733
Anc visit			
0	1		
1	0.889**	0.812	0.975
2	0.891***	0.832	0.955
3+	0.834***	0.789	0.88
Education			
No education	1		
Primary	1.031	0.969	1.096
Secondary	0.895***	0.85	0.943
Higher	0.702***	0.65	0.759
Place of delivery			
Home	1		
Government hospital	1.122***	1.05	1.2
Private hospital	1.293***	1.199	1.394
Others	1.263	1.026	1.555
Place of residence			
Urban	1		
Rural	0.929**	0.888	0.972
Wealth index			
Poorest	1		
Poorer	0.971	0.916	1.03
Middle	1.017	0.954	1.084
Richer	1.076	0.999	1.159
Richest	1.004	0.92	1.096
Separate kitchen			
No	1		
Yes	0.935***	0.898	0.973
Fuel			
Hygienic	1		
Unhygienic	1.084**	1.029	1.142

Discussion

Low birth weight and background characteristics

Our study found that maternal age is one of the significant predictors of low birth weight. The study found that the lower the age of mothers, the higher the chances of low birth weight. Various studies in developed and developing countries have found that teenage mothers have higher odds of delivering low birth weight child.[11–14] A study carried out in Indian set-up did not find any association between age of the mother at first delivery and low birth weight.15 BMI is also found to be associated with the odds of low birth weight. Obese women are less likely to deliver a low birth child than underweight women. A study found that overweight mothers have lower odds of delivering low birth weight child than normal-weight mothers.[16] Anaemic women are more prone to deliver a baby with low birth weight than non-anaemic women. A study carried out in rural set-up of India and Pakistan has found severe maternal anaemia to be associated with low birth weight.[17]

Higher Ante-natal Care visits are also found to be associated with decreased odds of low birth weight. Previous studies are in agreement with our findings of a positive association between LBW and poor utilization of Antenatal care services.[18–22] Our study also found that an increase in education standard improves the odds of delivering low birth weight child. Various studies across the world and in India have confirmed that educated mothers had reduced odds of low birth weight than uneducated mothers.[23–25] Education acts as a safety net in providing women the overall development, thus reducing the odds of low birth weight deliveries. The overall prevalence of low birth weight is found to be 16.46 percent in India. In a systematic review and meta-analysis study carried out in Ethiopia,[26,27] the pooled prevalence of LBW was found to be 17.3 percent. The Ethiopian study used 30 other studies with 55,085 participants to estimate the pooled prevalence of LBW at 95 % confidence Interval (95 % CI-14.1- 20.4).

Low birth weight and availability of kitchen and type of fuel

Both in the adjusted as well as the unadjusted model, it is confirmed that the availability of a separate kitchen and use of hygienic fuel decreases the odds of delivering a low birth weight child. In the unadjusted model, the availability of separate kitchen decreases the odds of delivering a low birth weight child by 15 percent and in the adjusted model, the availability of separate kitchen decreases the odds of delivering a low birth weight child by about 6 percent. The decline in odds of delivering low birth weight child while having a separate kitchen is minimal but significant. Similarly, the odds of delivering a low birth weight child are around 1.1 times more among women using unhygienic fuel than in women using hygienic fuel. A study carried out in Bangladesh[27] found that the use of unhygienic cooking fuel results in higher odds of having LBW child compared to the use of hygienic fuel.

Conclusion

The study found that unhygienic fuel like biomass combustion is a predictor of low birth weight. In India, the poor have limited access to the hygienic fuel. The Government of India in 2016 has launched the Pradhan Mantri Ujjwala Yojana intending to distribute 50 million LPG connections to the women belonging to the Below

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Poverty Line (BPL) families. In the first year itself, around 22 million connections were distributed. However, while access to LPG gas stoves and cylinders has increased with the help of scheme, the use of LPG cylinders remains low. Ministry of Petroleum and Natural gas, Government of India, claims to distributed 8,03,39,993 cylinders as of September 2019. After achieving the target of distributing the LPG cylinders, what is more, important is to promote the use of cylinders. Many people after taking connections, went back to the primitive methods of cooking and hence are still using unhygienic fuel. A study in India[27] has found that a large number of Pradhan Mantri Ujjwala Yojana beneficiaries have not come back for refilling the cylinder. There is a need to make an effort to increase awareness of the benefits of using LPG cylinders.

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Conflicts of interest

The authors declare that they have no conflict of interests.

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