

Disposal of household burned garbage and risk of low birth weight in Central Sulawesi Province, Indonesia

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Abstrak

Latar belakang: Pembakaran sampah di dalam rumah tangga dapat mempengaruhi berat badan bayi lahir rendah (BBLR). Pada tulisan ini disajikan pembakaran sampah di rumah tangga terhadap risiko BBLR.

Metode: Analisis data menggunakan sebagian data studi potong lintang Riskesdas 2013 di Provinsi Sulawesi Tengah. Data yang dianalisis ialah data bayi berusia 0-11 bulan. Berat badan bayi waktu lahir berdasarkan catatan berat bayi saat lahir yang tercatat dalam kuesioner Riskesdas. Bayi dikategorikan BBLR jika berat badan waktu lahir kurang dari 2500 gram.

Hasil: Di antara 281 bayi yang mempunyai catatan berat badan lahir terdapat 10,6% (23 bayi) yang BBLR. Bayi yang tinggal di rumah tangga dengan perilaku pengelolaan sampah dengan cara dibakar dibandingkan dengan selain dibakar mempunyai risiko 2,3 kali lipat mengalami BBLR (RRa=2,28; 95% CI=1,18-8,61).

Kesimpulan: Bayi yang tinggal di rumah tangga dengan sampah dibakar dibandingkan dengan tanpa sampah dibakar mempunyai risiko lebih tinggi BBLR di Provinsi Sulawesi Tengah, Indonesia. (*Health Science Indones 2014;2:89-93*)

Kata kunci: berat badan lahir rendah, pembakaran sampah

Abstract

Background: The management of household waste by burning can affect the incidence of low birth weight (LBW). This paper aims to identify the burning of garbage at home and risk of low birth weight.

Methods: This analysis used a part of Riskesdas 2013 data in the Central Sulawesi Province. Subjects analyzed were infants aged 0-11 months. Baby's weight was based on the baby's birth weight which was recorded in the questionnaire of Riskesdas. The infants were categorized as LBW, if the recorded birth weight was less than 2500 grams.

Results: Out of 392 babies, 281 babies had recorded birth weights which could be proved by documentary evidence. The majority of babies were boys (50.9%) and lived in rural areas (58.7%). The proportion of babies who had LBW was 10.6% (23 infants). The babies who were living in households with exposure to burned garbage had 2.3-fold increased risk to be LBW [adjusted relative risk for gender and availability of window (RRa) = 2.28; 95% confidence interval (CI) = 1.18 - 8.61].

Conclusion: The babies who live in households exposed to burned garbage condition had an increased risk to be LBW in Central Sulawesi Province, Indonesia. (*Health Science Indones 2014;2:89-93*)

Key words: low birth weight, burned garbage disposal

The Indonesia Demographic and Health Survey (IDHS) in 2012 stated that infant mortality rate (IMR) in Indonesia was 32 per 1000 live births. In the Millennium Development Goals (MDGs), Indonesia is targeting a reduction of IMR of 17 per 1000 births in 2015.

A World Health Organization (WHO) news release reported that newborn or neonatal deaths account for 40% of all deaths among children under five. One of the main causes of newborn deaths is low birth weight (LBW), which contributes to 60% to 80% of all neonatal deaths. The global prevalence of LBW is 15.5%.¹

A previous study stated that compared with infants of normal birth weight, infants with LBW were almost 40 times more likely to die in the neonatal period, because infants with very low weight at birth had a relative risk of neonatal mortality for almost 200 times.² Furthermore, LBW's infants may be more at risk for motor and social development or learning disabilities, potential negative effects on their operational dynamics, hyperactivity disorders, developmental issues related with school achievement, and may experience increased chronic diseases in later life.³⁻⁶

Several factors contributed to the LBW. Previous studies noted that intrinsic and extrinsic factors in addition to economic status and maternal nutritional status affected LBW. The intrinsic factors: unhealthy behavior, maternal age (between 20-35 years), range between one pregnancy to another pregnancy, and infectious disease. While extrinsic factors that may affect the LBW are social support, psychology factor, spousal support, access to health services and antenatal care.⁷

Furthermore, several studies suggested that reducing the possibility of infants born with LBW can be achieved by improving the air quality.⁸⁻⁹ Burning household waste is one of the common sources of air pollution beside stoves in the home, motor vehicles, industrial facilities, and forest fires. Dioxin and particulate matter are some pollutants that emit from garbage burned and have been known as a major public health concern. Several studies showed there is an association between indoor and outdoor air pollution, especially solid cooking fuel and garbage burned, with LBW.¹⁰⁻¹¹

Riskesdas 2013 reports the prevalence of infants with LBW in Indonesia is about 10.2%. Central Sulawesi Province was recorded as having the highest LBW in Indonesia (17%). Moreover, Riskesdas results showed that the Province of Central Sulawesi had one of the 4-highest-levels of air pollution in the

household because 80% of the people still use firewood as cooking fuel and more than 50% still burn their household waste.¹²

This study aimed to determine the effect of garbage burned in households in Central Sulawesi Province and the risk of LBW.

METHODS

This analysis used a part of the data of the National Basic Health Survey (Riskesdas) 2013.

The general information on Riskesdas 2013 is as follows:¹²

The survey was conducted in all 33 provinces in Indonesia. Riskesdas covered several aspects such as some infectious and noninfectious diseases, health care systems, medicine, community behavior, environment and so on. Information about the record of the baby's weight at birth was part of the Riskesdas's questionnaire.

Riskesdas sample households in 2013 were selected based on the Population Census listing (SP) 2010. The household selection process was determined by the Statistics Central Bureau (BPS) which gave a list of selected census buildings from selected census blocks.

The total sample of children under five years in Riskesdas 2013, boys and girls, were 82,666 infants from 33 provinces in Indonesia. The number of infants aged 0 to 11 months in Central Sulawesi Province amounted to 392 babies. However, of that number, 281 had their weight at birth recorded and these were analyzed in this study.

To minimize recall bias, the record of a baby's weight at birth was obtained from documented evidence such as the maternal and child's health (MCH) book. The interviewer asked the mother to show documented evidence on the baby's birth weight. If the mother could show one of them, then the baby's birth weight was recorded in the questionnaire. However, if the mother was not able to show any documentary evidence, the interviewer may not be allowed to record an infant's birth weight to the questionnaire. The data analysis included the mother's age, mother's education and employment, parity, prenatal care, maternal diseases during pregnancy such as malaria and tuberculosis.

The baby's birth weight was categorized into two groups. The first group was the babies with normal birth weights, 2500 grams or more. The second group was the LBW babies who weighed less than 2500 grams.

We categorized the mother's age (between 20-35, and age at risk: <20 years or >35 years); mother's education level (junior high school/higher, and elementary school/lower); mother's work status (yes and no); parity (less than 3, and 3 or more children); mother suffered from malaria during pregnancy (yes and no); mother suffered from tuberculosis during pregnancy (yes and no); residency area (urban and rural); utilization of kitchen (separated room and not separated); availability of window (present and none); cooking fuel (firewood and other); and garbage treatment (burned and other).

The family's economic status (rich and poor) based on the following manner.¹² Riskesdas 2013 used proprietary index for economic status calculation through calculations polychoric correlation (PCA) to the ownership of durable goods, such as houses, cars, motorcycles, bicycles, a refrigerator plus a few other variables. Variables forming the index were: 1) the primary source of water for drinking, 2) cooking fuel, 3) ownership defecation facilities, 4) type of toilet, 5) the final disposal of feces, 6) a source of illumination, 7) motorcycles, 8) TV, 9) water heater, 10) gas cylinder 12 kg, 11) refrigerator, and 12) car.

Furthermore, the index has been formed into five quintiles: lowest (quintile 1), lower middle (quintile 2), medium (quintile 3), high (quintile 4), and the highest (quintile 5). These quintiles represented the economic status in Riskesdas 2013.¹² Particularly for this analysis of LBW, the economic status was facilitated by simplifying those 5 quintiles into 2 categories, namely the family with a rich economic status (quintiles 3-5) and poor (quintiles 1-2). This study analysis used Cox regression with constant time.¹³

RESULTS

Out of 392 infants, 281 infants had recorded birth weights. The majority of the infants were boys (50.9%) and lived in rural areas (58.7%).

Table 1 shows that the percentage of LBW in Central Sulawesi Province was 10.6% (23/213). In terms of residential area, the percentage of LBW in urban areas was lower than in rural areas.

Table 1. Several sociodemographic characteristics, household environment variables and the risk of baby's low birth weight

Characteristic of mother	Baby birth weight				Crude relative risk	95% confidence interval	P
	Normal (n=195)		Low (n=23)				
	n	%	n	%			
Residency							
Urban	84	93.3	6	6.7	1.00	Reference	
Rural	111	86.7	17	13.3	1.45	0.79-5.05	0.147
Economical status							
Rich	133	91.1	13	8.9	1.00	Reference	
Poor	62	86.1	10	13.9	1.06	0.68-3.56	0.291
Age group (years)							
20-35	147	88.6	19	11.4	1.00	Reference	
17-19 or 35 and above	48	92.3	4	7.7	1.49	0.51-4.37	0.470
Formal education							
Junior high school or higher	151	89.3	18	10.7	1.00	Reference	
Illitery-elementary school	44	89.8	5	10.2	0.08	0.36-2.58	0.932
Work status							
Work	68	91.9	6	8.1	1.00	Reference	
Not work	127	88.2	17	11.8	0.79	0.57-3.69	0.429
Parity							
1-2 children	125	90.6	13	9.4	1.00	Reference	
3 children or more	70	87.5	10	12.5	0.67	0.58-3.03	0.501
Malaria disease in pregnancy							
Yes	7	100	0	0.0	1.00	Reference	
No	188	89.1	23	10.9	N/A	0.00-N/A	0.563
Tuberculosis disease in pregnancy							
Yes	1	100	0	0.0	1.00	Reference	
No	194	89.4	23	10.6	N/A	0.00-N/A	0.828
Use of kitchen							
Separated with other room	174	88.8	22	11.2	1.00	Reference	
Not separated with other room	21	95.5	1	4.5	0.88	0.05-3.00	0.377
Cooking fuel							
Other than firewood	78	89.7	9	10.3	1.00	Reference	
Firewood	117	89.3	14	10.7	0.30	0.49-2.56	0.767

Normal and LBW were similarly distributed with respect to a mother's economic status, age group, formal education, work status, parity, history of malaria disease, history of tuberculosis disease, separation of the kitchen from other rooms, and cooking fuel.

Our final model, table 2, shows three dominant risk factors related to LBW. Compared to a baby who lived in a house without burning garbage in house, the baby who lived in a house where garbage was burned had a 2.3-fold greater risk to be LBW [adjusted relative risk for gender and availability of windows (RRa) = 2.28; P = 0.022].

Table 2. Relationship between gender, availability of window, garbage treatment and risk of baby's low birth weight

	Baby's birth weight				Adjusted relative risk	95% confidence interval	P
	Normal (n=195)		Low (n=23)				
	n	%	n	%			
Gender of baby							
Boy	102	91.9	9	8.1	1.00	Reference	
Girl	93	86.9	14	13.1	1.33	0.76-4.09	0.183
Availability of windows							
Present	159	91.4	15	8.6	1.00	Reference	
None	36	81.8	8	18.2	1.58	0.92-4.36	0.115
Garbage treatment							
Not burned in house	97	95.1	5	4.9	1.00	Reference	
Burned in house	98	84.5	18	15.5	2.28	1.18-8.61	0.022

DISCUSSION

This study had several limitation. Incomplete data in Riskesdas 2013 may result in failure to assess a critical variable's influence on LBW. For example, this study found that out of 392 infants, only 281 infants had recorded birth weights. This might due to that study was conducted in area out of Java and most of the subjects deived from rural area, that was in Central Sulawesi Province which usually had less couples to record their new babies. Furthermore, Riskesdas 2013 had limited environmental variables (availability of window, room utilization, type of cooking fuel, and garbage management). There are many variables which may affect LBW which were not available in Riskesdas 2013. For example duration of cooking activity, frequency of garbage burning, or type and concentration of air pollutants. However, this analysis was considered necessary because there were rare community-based study in Indonesia on the relationship environment factor related to LBW.

Using a kitchen which was separate from other rooms showed no significant difference to those which were not separated. Type of cooking fuel also had no significant difference between firewood and other types of fuel.

Our final model suggested that garbage burning increased the risk of low birth weight by 2.3-fold.

This finding was in accordance with a study in Ghana which indicated babies born to mothers who reported garbage burning in their homes during pregnancy would increase the risk of LBW by 195%.¹⁴

Based on theory, garbage burning relates to dioxin, a hazardous chemical substance that has been shown in animal studies to severely impair fetal growth. This is because garbage burned emits smoke which contains a number of pollutants which includes carbon monoxide (CO) and some particulate matters (PM) into the air. If a human inhales CO and PM, it would impair fetal growth. CO blends with hemoglobin to penetrate the placenta and reducing oxygen supply which limits the ability of the placenta to transfer nutrients to the fetus. The PM decreases the lung function of the baby's mother and then as a result, it reduces oxygen delivery to the fetus and causes cell damage.¹⁵⁻¹⁶ In addition, the growth of fetal impairment may lead to an increased of risk of LBW.¹⁶⁻¹⁷

In conclusion, our results showed that the burning of garbage at home increases the risk of LBW in Central Sulawesi Province. Therefore, it is suggested that treatment of household garbage should be transported by local officers or a party designated by an authorized official to reduce the risk of LBW in Central Sulawesi Province.

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