

## STRUCTURAL MODEL OF MATERNAL BEHAVIOR IN COMMUNITY SETTING TO PREVENT LOW BIRTH WEIGHT IN EAST NUSA TENGGARA, INDONESIA

Simplicia Maria Anggrahini<sup>1</sup>, Hari Basuki Notobroto<sup>2</sup>, Irwanto<sup>1</sup>, Ahmad Suryawan<sup>1</sup>

<sup>1</sup>Department of Child Health, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Hospital, Surabaya

<sup>2</sup>Department of Biostatistics and Population Studies, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia

### ABSTRACT

Low birth weight (LBW) is still a magnitude problem in Indonesia with a multifactorial causes. Studies revealed that one of cause of LBW-infants birth is mother's behavior in treating her pregnancy, including traditional pregnancy care practices. The purpose was to develop the structural model on community setting that might describe the LBW infants-birth. A case-control study on 50 post-partum mothers with LBW and 50 with normal birthweight infants was held in Kupang, East Nusa Tenggara, Indonesia, November 2016 - May 2017. Mother who have spontaneous birth, singleton, and received integrated ANC were included. Several data such as maternal characteristics, pregnancy knowledge, perceived behavioral control (PBC), maternal health status, obedience to traditional pregnancy care, were collected using questionnaire and medical records tracing. Statistical analysis was performed using path analysis from SmartPLS 3.2.7 and considered significant path when the coefficients were not zero with P value <0.05. Outer and inner model analysis showed two significant paths, both are come from maternal characteristic that influence the LBW infants-birth through pregnancy knowledge (0.489, P=0.000) and PBC (0.425, P=0.000). In the first path, PBC affect maternal health status (0.217, P=0.021) which in turn will cause LBW (0.201, P=0.001). The second path, PBC affect the obedience to traditional pregnancy care (0.474, P=0.000) and then influence to LBW (0.316, P=0.000). As conclusion, maternal characteristics, pregnancy knowledge, PBC, maternal health status, and obedience to traditional pregnancy care are key points that might be used as a significant variables in preventing LBW-infants birth.

**Keywords:** Structural model approach; low birth weight

### ABSTRAK

Bayi berat lahir rendah (BBLR) masih menjadi masalah besar di Indonesia dengan penyebab multifaktorial. Studi mengungkapkan bahwa salah satu penyebab kelahiran BBLR adalah perilaku ibu dalam merawat kehamilannya, termasuk praktik perawatan kehamilan tradisional. Penelitian ini bertujuan untuk mengembangkan model struktural pada konteks masyarakat yang menggambarkan kejadian BBLR. Sebuah studi kasus-kontrol pada 50 ibu yang melahirkan BBLR dan 50 ibu dengan bayi berat lahir normal, diadakan di Kupang, Nusa Tenggara Timur, Indonesia, November 2016 - Mei 2017. Kriteria inklusi: ibu dengan kelahiran spontan, bayi tunggal, dan mengalami ANC terintegrasi. Beberapa data seperti karakteristik ibu, pengetahuan kehamilan, perceived behavioral control (PBC), status kesehatan ibu, kepatuhan pada perawatan kehamilan tradisional, dikumpulkan menggunakan kuesioner dan penelusuran rekam medis. Analisis statistik dilakukan dengan menggunakan analisis jalur dari SmartPLS 3.2.7 dan dikatakan signifikan ketika koefisien jalur tidak nol dengan nilai P <0,05. Analisis outer dan inner model menunjukkan dua jalur yang signifikan, keduanya bermula dari karakteristik ibu yang mempengaruhi kejadian BBLR melalui pengetahuan kehamilan (0,489, P = 0,000) dan PBC (0,425, P = 0,000). Pada jalur pertama, PBC mempengaruhi status kesehatan ibu (0,217, P = 0,021) yang pada gilirannya akan menyebabkan BBLR (0,201, P = 0,001). Jalur kedua, PBC mempengaruhi kepatuhan pada perawatan kehamilan tradisional (0,474, P = 0,000) dan kemudian menyebabkan BBLR (0,316, P = 0,000). Dapat disimpulkan bahwa karakteristik ibu, pengetahuan kehamilan, PBC, status kesehatan ibu, dan kepatuhan terhadap perawatan kehamilan tradisional adalah poin kunci yang dapat digunakan sebagai variabel signifikan dalam mencegah kelahiran BBLR.

**Kata kunci:** Pendekatan model struktural; bayi berat lahir rendah

**Correspondence:** Simplicia Maria Anggrahini, Pediatric Growth and Development Divison of Dr. Soetomo General Hospital, +6281339418575. E-mail: noniekfernandez@gmail.com

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## INTRODUCTION

Low birth weight infant (LBW) is important indicator to general health status in the world and one of the main causes of neonatal death (World Health Organization 2004). Low birth weight is a condition when the newborn baby weights were less than 2500 gram, despite the age of pregnancy (Kementrian Kesehatan Republik Indonesia 2011, World Health Organization 2004). The prevalence of LBW is 10-20% of all live birth every year (WHO 2011) and has the possibility of 25-30 times for the mortality of the babies compared to newborn with the above cut-off weight (Chang et al 2003, World Health Organization 2011). The short-term impact of LBW is the illness and death of the babies, while the long-term impact is the neurological developmental impairments (VandenBerg 2007).

World Health Organization (2011) has estimated there are about 25 millions of LBW cases annually and 95% of the cases happening in developing countries. Indonesian Basic Health Research (Riskesdas) in 2010 showed the prevalence of LBW infant is 11,1%, with the highest prevalence of 19.2% is on East Nusa Tenggara province and the lowest is on West Sumatra 6.0%. On 2013, Riskesdas showed the decreased prevalence of LBW infant to 10.2% (Riskesdas 2013).

The cause of LBW is multifactorial, which can be specified into: maternal factors as an environmental factor for the fetus, placental and umbilical cord factors, fetal factors, and health care factors (WHO 2004, Stoll & Adams-Chapman 2007, Cunningham et al 2001). From maternal factors, in addition to age, anthropometry, and maternal disease, there are also socio-demographic-cultural factors that will influence pregnant women's behavior and it may increase the case of LBW (Gross & Pattison 2007, Ajiboye & Adebayo 2012, Agus et al 2012, Withers et al 2018). From the preliminary research, there was a belief of traditional pregnancy care that risky for LBW occurrence, namely: delayed in doing standardized antenatal care, dietary restrictions (taboo), abdominal or pregnancy massage, and suggestions to keep working hard during pregnancy, with a philosophy for childbirth to run smoothly. Mother's behavior during pregnancy could influenced by the local culture. The culture could be strong enough and influence mother's behavior who live in the social network (family and kinship). Social dominance theory argues that the major forms of intergroup conflict, are all basically derived from the basic human predisposition to form and maintain hierarchical and group-based systems of social organization (Pratto et al 2006). The purpose of this study was to develop the structural model that could predict, describe, and might

be usefull to prevent the occurrence of LBW in East Nusa Tenggara - Indonesia.

## MATERIALS AND METHODS

This study was an analytic observational research with the case-control design. This research was held in DR. W. Z Johannes hospital, Dedari Child and Mom Hospital, and two community health centers (Sikumana and Bakunase) from November 2016 to May 2017. The research subject is divided into two groups, there were mother who gave birth of LBW babies as a case group and control group is mothers gave birth the normal birth weight babies. The number of sample for each group was 50, counted with the formula:

$$n = \frac{\{Z_{1-\alpha/2} \sqrt{2 P_2 (1-P_2)} + Z_{1-\beta} \sqrt{P_1 (1-P_1) + P_2 (1-P_2)}\}^2}{(P_1 - P_2)^2}$$

The sampling method for the case group was composed in total sample, and control group with systematic random sampling. To eliminate the medical clinical factors which cause LBW (anemia, hypertension, pre-eclampsia, and infection), inclusion and exclusion criterion was applied. The inclusion criteria were: mothers who give birth to normal childbirth, single infants, and have received integrated Antenatal Care (ANC) service. Exclusion criteria: mothers gave birth with twisted umbilical cord, placental weight <500 grams, infant with congenital defect, and incomplete medical record. The dependent variable in this research was LBW, with independent variable such as: maternal characteristic (age, education level, the existence of mother's income, total family income, marital status, parity, distance period of pregnancy, history of having LBW, and child value), pregnancy knowledge, perceived behavioral control (PBC), maternal health status (body mass index (BMI) and the weight gaining during pregnancy), obedience to traditional pregnancy care (non standardized ANC, dietary restriction or taboo, pregnancy massage, and remain in heavy workload during pregnancy). Data were analyzed with Partial Least Squares (PLS), using SmartPLS 3.2.7 version application. The study was approved by the Ethics committee of the "Dr. Soetomo" Hospital (number: 567-KEPK), Surabaya, Indonesia.

## RESULTS

Kupang is a municipality and also the capital city of East Nusa Tenggara province. The city is located on the coast of the Gulf of Kupang, in the northwestern part of Timor Island. As the largest city in the province,

Kupang is a multi-ethnic city. Most of the inhabitants were come from East Timorese, Rote, and Sabu. In addition, there are ethnics of Flores, Lembata, Alor, Sumba, Chinese and a small number of migrants from Java and other regions in Indonesia. Apart from the ethnic diversity that exists, residents of the city will call themselves "Beta orang Kupang". The population of Kupang is very diverse, coming from various regions throughout East Nusa Tenggara as a result of migrant activities due to education and employment, also because of marital relationships (BPS Kota Kupang, 2017).

The customs of the inhabitants of Kupang can be said to be the same as various ethnic groups in East Nusa Tenggara, which is dominated by the patriarchal kinship system. The culture related to pregnancy care is on average similar to the culture that exists in various

tribes, in the form of various taboos and recommendations for pregnant women and husbands, for the safety of mothers and babies. Descriptive analysis was done to see the distribution and frequency of various research variables (Table 1).

Path analysis was done to explain the relationship pattern between variables and to predict the direct and indirect effect of a set of independent variables (exogenous) to the dependent variable (endogenous). The structural model is a diagram that associates independent, moderator, mediator and dependent variables (Gozhali 2014). Outer and inner model analysis showed two significant path, that could described the occurrence of LBW infants-birth (Figs. 1 and 2).

Table 1. Frequency distribution based on mother's characteristics

Respondent Characteristics	LBW		Normal weight		Total	
	Frequency	%	Frequency	%	Frequency	%
Age						
Risky (< 20 y, > 35 y)	12	24.0	4	8.0	16	16.0
Not Risky (20-35 y)	38	76.0	46	92.0	84	84.0
Education						
Not graduated from elementary school	2	4.0	0	0.0	2	2.0
Elementary school	8	16.0	17	34.0	25	25.0
Junior high school	4	8.0	7	14.0	11	11.0
Senior high school	32	64.0	18	36.0	50	50.0
University	4	8.0	8	16.0	12	12.0
Mother's income existancy						
Yes	16	32.0	17	34.0	33	33.0
No	34	68.0	33	66.0	67	67.0
Family's Income						
< IDR 1.500.000	32	64.0	29	58.0	61	61.0
≥ IDR 1.500.000	18	36.0	21	42.0	39	39.0
Marital status						
Legitimated	27	54.0	34	68.0	61	61.0
Illegitimated	23	46.0	16	32.0	39	39.0
Child value						
Low	1	2.0	0	0.0	1	1.0
High	49	98.0	50	100.0	99	99.0
Parity						
High	17	34.0	22	44.0	39	39.0
Low	33	66.0	28	56.0	61	61.0
Distance of pregnancies						
Bad	12	24.0	6	12.0	18	18.0
Good	38	76.0	44	88.0	82	82.0
History of having LBW						
Yes	7	14.0	8	16.0	15	15.0
No	43	86.0	42	84.0	85	85.0
Family pattern						
Core	23	46.0	41	82.0	64	64.0
Extended	27	54.0	9	18.0	36	36.0

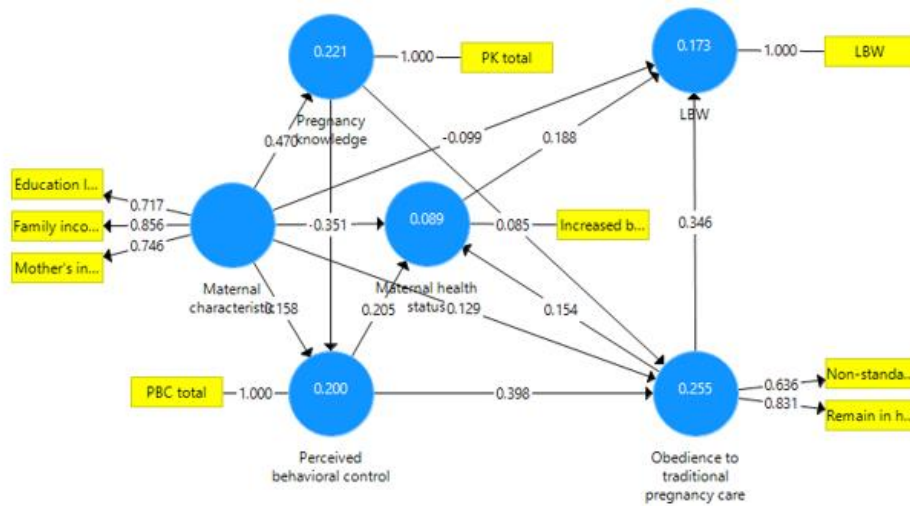


Fig. 1. Final outer model.

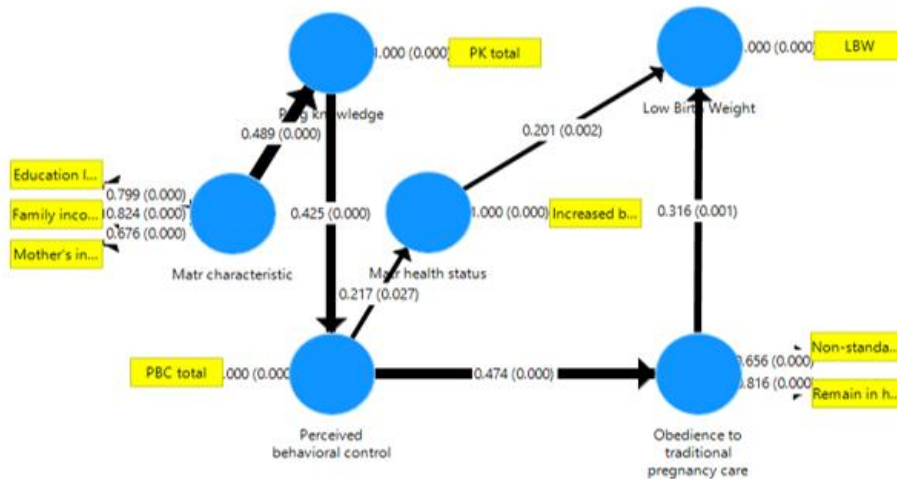


Fig. 2. Final inner model.

Table 2. Path coefficient, T statistics and p value of the inner model

	Coefficient	T Statistics	P Values
Mother characteristic → Pregnancy knowledge	0.489	5.931	0.000
Pregnancy knowledge → Perceived behavioral control	0.425	4.666	0,000
Perceived behavioral control → Maternal health status	0.217	2.302	0.027
Maternal health status → Low birth weight	0.201	3.089	0.002
Perceived behavioral control → Obedience to traditional pregnancy care	0.474	6.067	0.000
Obedience to traditional pregnancy care → Low birth weight	0.316	3.238	0.001

From Fig. 1, it can be seen that the significant indicators for the latent variable of maternal characteristics are: maternal education, maternal income, and total family income. The indicator for maternal health status is weight gain during pregnancy, and indicator for obedience to traditional pregnancy care are non-

standardized pregnancy examinations and continued heavy work during pregnancy. After obtaining the final measurement model illustrated in Figure 1, a structural (inner) model analysis was carried out using the bootstrap method owned by PLS. The results of structural model analysis can be seen in Figure 2, while

the path coefficients and p values can be seen in Table 2 below.

It can be mentioned here that there are two significant pathways for the incidence of LBW. First, mothers' characteristic affect mothers' knowledge of pregnancy in which influence their perceived behavioral control, then affect the maternal health status in which result in the occurrence low birth weight. Second, also begin with maternal characteristic, affect mother's knowledge of pregnancy, then influence to perceived behavioral control resulting in mother's obedience to traditional pregnancy care, which can result in LBW infants-birth.

## DISCUSSION

### The relationship between maternal characteristics and LBW

Table 1 describe that the mother's age who classified as the risky age for pregnancy had more LBW babies than non risky age. This result along with another study that stated mother with risky age for pregnancies had more incidence of LBW (Rizvi et al 2007, Viengsakhone et al 2010, Isiogo-Abanihe & Oke 2011, Sutan et al 2014). In this study, maternal age had no significant association with LBW which is consistent with studies conducted by Negi et al and Pinzon-Rondon et al (Negi et al 2006, Pinzón-Rondón et al 2015). Mother who had LBW infant had better education than whom not, with 72% of them had senior high school level and above. This study is contradiction with Rini and Trisna (2013), where mothers who had low education had risk of 19,2 times to have LBW infant (Rini & Trisna 2012). Among mothers who had a heavy workload during pregnancy, there more LBW infant than whom not (50% vs 32%). Irelandia studies result there were significant correlation between mothers who had heavy activities with LBW infant occurrence (Niedhammer et al 2009). Most respondent (67%) doesn't have her own income, with low total family's income but there were no significant difference of LBW occurrence in both groups. From marital status data, 39% of them had illegitimate marital status. Illegitimate marital status is the condition where the marriage has not been settled customarily or religiously. The large number of illegitimate marital status because in all ethnic groups in NTT there were a dowry culture called belis, which is need much money and many family couldn't finished their marriage obligation. This illegitimated status could have an impact on the mother's psychological status and affect her pregnancy care practice. There were 30% respondent who lived in with parents and 8% lived in with parent in-law. This study along with Sharma et al's (2015) study in Nepal, which stated that extended

family had more LBW-SGA infant birth than core family.

### Effect of maternal characteristics to pregnancy knowledge

This study indicates that indicators of maternal characteristics that influence pregnancy knowledge are maternal education, maternal income and total family income with outer loadings of 0.717; 0.746; and 0.856 (figure 1). Mothers with higher education, owning their own income and high family income tend to have sufficient and good knowledge about pregnancy. These three indicators describe the status of the mother and can determine the bargaining position of women.

Knowledge or cognition is one domain of behavior; generally obtained from learning through the process of sensing and observation (Notoatmojo 2014). The source of knowledge can be obtained by empiricism, namely through the process of sensing and observing, or by rationalism that relies on reason (Keraf & Dua 2001). Mothers with higher education have their own income will be easier to access information that is currently facilitated by the digital era. The mother can also be easier to attend pregnancy classes or seminars related to the care of her pregnancy. From the path analysis, it was found that the maternal characteristics influence maternal knowledge of pregnancy with a path coefficient of 0.489 and a p value of 0.000.

### Effect of pregnancy knowledge on perceived behavioral control (PBC)

Mothers with sufficient knowledge of pregnancy tend to have good PBC. The results of path analysis found that maternal knowledge about pregnancy had an effect on PBC with a path coefficient of 0.425 and a p value of 0.000. The results of this study are in line with the research of Maichum et al (2016) in Thailand related to the development of the theory of planned behavior, which resulted in a positive and significant effect of knowledge about environmentally friendly products on the perception of controlling consumer behavior to buy these products (Maichum et al 2016). One indicator of PBC is self-efficacy. Then it can be concluded that maternal knowledge will strengthen self-efficacy, further strengthening perceptions of controlling behavior.

### Effect of perceived behavioral control on maternal health status, then to LBW infants-birth

Perceived behavior control is a person's belief about his ability to do an action, about ease or difficulty in performing a behavior, or it can be said also as a

person's readiness to take an action (Wolfe & Higgins 2008). Perceived behavioral control can predict intentions (behavioral intention) and then arrive at actions or behaviors, but PBC can also be a direct antecedent of actions (Ajzen 1991, Ajzen 2002, Wolfe & Higgins 2008). Among mothers who gave birth to LBW and not LBW, there were no significant differences in perceptions of controlling behavior. It can be concluded that, a person's perception of their ease and ability to take action does not necessarily manifest in real action. This is influenced by various factors that can be included in self-efficacy and controllability.

Gender issues and the position of women in the social hierarchy are the causes of perceived behavioral control that are not in line with actions (Pratto et al 2006), and both of these are still strong in East Nusa Tenggara. This has an impact on the poor health of pregnant women because of the neglected workload and nutrition fulfillment (Ashmad et al. 2012). Women are generally the most blamed if something happens in pregnancy and childbirth so that pregnant women will do whatever is recommended as long as their pregnancy and childbirth are safe. This situation should be overcome by providing knowledge and understanding for parents, parents in-law, and husbands of pregnant women. Pregnancy is not a condition that is appropriate to be considered ordinary and just nature.

#### **Effect of perceived behavioral control on obedience to traditional pregnancy care, then to LBW infants-birth**

Despite the PBC, for the respondents in this study the reasons for not carrying out the standard ANC and still working hard during pregnancy were also caused more by cultural reasons. According to traditional belief, keep working hard has a philosophy to facilitate the smooth delivery. With a low average socio-economic condition, the hope for a smooth delivery is something that very meaningful. Concern about increasing costs if you have to experience childbirth with complications, including being a reason for mothers to obey the advice of parents or elderly people. From the data on the family pattern of respondents who gave birth to LBW, it proved to be more in the form of an extended family pattern. The extended family pattern influences obedience to traditional care that is recommended by parents or parents in-laws who live together. Obedience can also be explained by the obedience theory from Milgram (1974) which describes the factors that influence the obedience are: distance/physical closeness, emotional distance/closeness to authority figures, legitimacy of authority figures, and the effect of non-obey (David 2012).

The activities of mothers who are pregnant in their daily lives are generally not reduced, plus if they have to undergo various dietary restrictions, it will affect the health status of pregnant women and can interfere with the growth and development of the fetus they contain. From in-depth interviews with respondents, more pregnant women who work hard are in the form of domestic work, namely washing clothes, mopping the floor, carrying water and some mothers carrying firewood. This work is intentionally related to cultural values that say that pregnant women should not be lazy, and a stronger reason is that hard work can facilitate the delivery process. This is in line with the results of a study by Kranz and Chang (2012) who found that worries about labor were difficult to motivate pregnant women to continue working hard (Krans & Chang 2012).

Fortier et al (1995) found that the risk for small gestational age LBW birth increased in pregnant women who worked at least 6 hours a day and with a standing position continuously (Fortier et al 1995). Mothers with severe physical work, in this case as farmers, are at risk of giving birth to LBW (Viengsakhone et al 2010). Research by Rizvi et al (2007) found the proportion of mothers who could take a nap was greater in the group of mothers who gave birth to babies with normal birth weights.

#### **CONCLUSION**

Maternal characteristics, pregnancy knowledge, perceived behavioral control, maternal health status, and obedience to traditional pregnancy care are key points that might be used as a structural model to prevent LBW-infants birth. The limitations of this study regarding research locations in urban areas, in the provincial capital where access to information and knowledge is good enough.

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