The relationship between bioenvironmental characteristics of mothers and infant's birth weight in Khuzestan province

Hamid Haroon Rashidi[1*], Ahmad Ahmadi Arjmandniya[2], Ghazanfari Afrooz[2], Kazem Beshlideh[2]

1. Department of Psychology and Exceptional Children, Sciences and Research Branch, Islamic Azad University, Tehran, Iran
2. Faculty of Educational Sciences and Psychology, Tehran University, Tehran, Iran

[*] **Corresponding author:** Tel: +98 2144865165; fax: +98 2144865165
Address: Department of Psychology and Exceptional Children, Health Engineering, Sciences and Research Branch, Islamic Azad University, Tehran, Iran
E-mail: haroon_rashidi2003@yahoo.com
Received 3/1/2014; revised 29/1/214; accepted 1/2/214

Abstract

Introduction: Birth weight is one of the important sanitary indices for evaluating prenatal care all over the world. The purpose of this research was to determine the relationship between the bioenvironmental characteristics of mothers and infant's birth weight.
Materials and methods: First, in a correlational study, all newborn babies in hospitals and maternity centers of Khuzestan were selected from May 2012 to March 2013. Then, 925 babies were randomly selected and their parents answered the bioenvironmental questionnaire. The data was analyzed using correlation coefficient and multiple regression analysis.
Results: There was a significant relationship between the bioenvironmental characteristics of mothers and infant's birth weight ($p<0.001$). Also, results showed that mother's environmental features could explain the regression of birth weight for 9%.
Conclusion: The result showed that bioenvironmental characteristics influence birth weight during pregnancy.

Keywords: Bioenvironmental characteristics, birth weight

Introduction

Low Birth Weight (LBW) is the main cause of death among neonates and infants. In different countries, LBW has a direct relationship with infant mortality. Different factors are attributed to LBW, such as biological, psychological, social, and environmental factors. From a biological point of view, LBW can result from preterm delivery, intrauterine growth restriction, maternal anemia, low gestational age, short birth intervals, and mother's weight (1).

Regarding the role of psychological factors, one of the important consequences of mothers' psychological problems and stresses during pregnancy is the neonate's prematurity and LBW. Other factors such as parents' education, poor social-economical status, and environmental pollutions (air and noise pollution) affect neonates' birth weight (2). Air pollution can negatively affect the fetal health and growth either directly through the mother's placenta or

[Downloaded from demo.medilam.ac.ir on 2026-11-14]

indirectly via its impacts on the mother's health, leading to the preterm separation of the fetus from the uterus. Inhaling smoke can disrupt the endocrine and the nervous system, and reduce the amount of the oxygen that reaches the fetus (3). Studies showed that air pollution has a negative impact on the fetal growth. Mothers living in more air-polluted areas give birth to lower weight neonates than those living in less polluted areas. Poor air quality from coal pollution has a direct relationship with neonates' low weight, height, and growth (4).

Noise pollution is psychologically defined as undesirable, unpleasant, or unwanted noise (5). Exposure to over-the-limit noise is counted as an environmental pollution since it damages health and negatively affects all living things (6). The physiological and psychological impacts of noise on human beings often appear gradually and affect their nervous system directly, revealing its negative consequences (7). Studies showed that there is a significant relationship between environmental pollutants, particularly the polluted air caused by solid fuels in developing courtiers, and neonatal low weight and stillbirths (8-9). Studies in California point to a relationship between environmental pollutants, such as carbon monoxide, dioxide nitrogen, and fine suspended particles with LBW (10). Another study in Brazil on 2529 singleton babies showed that there was a significant relationship between environmental pollutants such as sulfur dioxide and neonatal low birth weight (11). In addition, studies conducted in Massachusetts, U.S.A; Sidney, Australia and Iran found a relationship between air pollution and neonatal low birth weight (12-14). Also, a study in Japan showed that mother's exposure to noise pollution during pregnancy was related to neonatal low birth weight and the shortness of pregnancy period (15). In the same vein, another study revealed that mother's exposure to noise pollution during pregnancy was related to neonatal low birth weight, and had negative consequences on mother's health. It could involve hearing loss and high blood pressure for mothers which might cause negative consequences during pregnancy (16). Due to the relatively high prevalence of low weightiness in Asia, including Iran and its role as a main cause of many biological, cognitive, and psychological injuries, exploring this issue is totally essential. Studying LBW is a key health index for evaluating prenatal care and a determinant for neonatal health in the society. It is possible to prevent the incidence of low weight neonates by identifying, adjusting, and controlling risk factors related to LBW. Identification of LBW underlying and related factors is extremely essential because of the importance of neonatal birth weight as a key health index of any country for evaluating prenatal care. They are also a determinant for neonatal health in ~~the~~ society because their identification significantly assists us in preventing and reducing preterm delivery and low birth weight, prenatal diagnosis, early control of congenital abnormalities, and timely and effective treatment of pregnancy and delivery diseases. In order to set up a national comprehensive and practical data bank on neonatal birth weight-related factors, particularly neonatal LBW, further studies are required due to the country's geographical diversity and expansion. Therefore, this study examined the relationship between biological-environmental factors and neonatal weight to identify factors related to neonatal birth weight, take an important measure in preventing low birth weight as the most

[Downloaded from demo.medilam.ac.ir on 2026-11-14]

important cause of disabilities, and increase neonates' birth weights.

Materials and methods

This correlation study was conducted as a field research. The sample (population) consisted of all the neonates born in the north part of Khuzestan province from March 21, 2012 to March 20, 2013 and their mothers. In order to determine the research sample, the researchers selected all the neonates born in the province's hospitals or maternity wards registered in the delivery profiles in the noted period. Then, 925 neonates were selected in a simple random way (drawing lots) because of the availability of the neonates' list and the delivery profiles so that their mothers could be studied for the research variables. The bioenvironmental data of the mothers were collected using a questionnaire designed for this purpose based on the results of various studies. This questionnaire assessed the four biological, cognitive, emotional, and environmental factors. The environmental factors included noise and air pollution. The validity of the questionnaire was approved by relevant experts. It was calculated by Cronbach's alpha at 0.85 (4). The obtained reliability of the questionnaire was 0.84. A P-value < 0·05 was considered to be statistically significant.

Results

As Table 1 shows, there is a significant negative relationship between air pollution or noise pollution and the neonates' birth weight ($p<0.001$). In other words, mothers who were exposed to air and noise pollution gave birth to lower weight neonates.

Table1. The correlation coefficients between the mothers' environmental variables and birth weight

Environmental variable	Birth weight	
	Correlation coefficient (r)	P value
Noise pollution	-0.186	0.001
Air pollution	-0.297	0.001

The results of Table 2 show that mother's environmental variables can explain 9% of the regression of the birth weight.

.Table2. The prediction model and coefficients of the birth weight based on mother's environmental variables

		Statistical indices					
	Environmental variables	R	R^2	F	β	T	P value
Birth weight	Air pollution	0.299	0.089	45.26	-0.290	9.11	0.001
	Noise pollution				-0.138	3.20	0.001

Discussion

The results indicate that there is a significant negative relationship between air and noise pollution and the neonates' birth weight ($p<0.001$). These findings are compatible with the results of Zarbakhsh, Sham et al., Jalalol Aldin, Nas Simento et al., Toshi Hito, Wiler, Bobak and Hal (4, 5, 12, 9, 16-18). Wiler attributed the fetal poisoning-

[Downloaded from demo.medilam.ac.ir on 2026-11-14]

related injuries to time length and density of exposure to carbon monoxide (16). In another research, Bobak showed that environment's carbon monoxide significantly decreases the fetal weight along with other pollutants (17). Also, Hal's study revealed that neonates who were subject to polluted air during their third trimester had a lower birth weight than others (18). Toshi Hito showed that mother's exposure to noise pollution during pregnancy was related to low birth weight (4). Air pollution can negatively affect the fetal health and growth either directly through mother's placenta or indirectly via its impacts on mother's health, leading to the preterm separation of the fetus from the uterus. Inhaling smoke can disrupt the endocrine and nervous system, and reduce the amount of the oxygen that reaches the fetus; therefore, the existence of carbon monoxide, soot particles and other pollutants in the air reduces birth weight while it increases preterm birth.

A noisy environment disrupts speaking and comprehension, reduces brain activity, causes disharmony in physical activities, diminishes learning ability and increases mistakes. The consequences of unwanted noises on human beings are as follows: nervous sensitivity, intense irritability, muscular cramps, physical and psychological fatigue, stress and anxiety, dizziness, headaches and migraines, anger, loss of physical balance, homicide and suicide inclination, bad temper, violence and lack of concentration, adrenalin secretion, poor vision, midriasis, lack of libido, metabolic and digestive system disorders, gastritis and peptic ulcer, constipation, maldigestion, colitis, sudden wake up, reduced skin resistance response, dyspnea due to reduced and ruptured blood vessels, changes in electroencephalography activity and blood vessel constriction, increased blood and intravascular pressure, neonates' preterm birth, academic failure, reduced productivity, and temporary or even permanent deafness (7).

The results of the present study confirm that air and noise pollutions are associated with neonates' low birth weight. Therefore, relevant authorities are recommended to take air and noise pollutions seriously and find a solution for this major social problem in order to facilitate a healthy life and normal growth for neonates. Besides health care centers, this study suggests establishing consultation and psychological centers for pregnant mothers for their access to accurate and comprehensive information about biological, psychological, cognitive, social, emotional, and environmental features of parents and their impact on neonates' birth weight and health. The researchers also suggest conducting research on other parents' traits such as biological, psychological, social, emotional, cognitive and environmental traits instead of retrospective studies.

Reference

1. Alexander GR, Wingate MS, Mor J, Boulet S. Birth outcomes of Asian-Indian Americans. Int J Gynaecol Obstet. 2007;97(3):215-20.
2. Shmueli A, Cullen MR. Birth weight, maternal age, and education: new observations from Connecticut and Virginia. Yale J Biol Med. 1999; 72(4): 245-58.
3. Kitsantas P, Hollander M, Li L. Using Classification Trees to Assess Low Birth Weight Outcomes. Artif Intell Med. 2006; 38(3): 275-89.
4. Bhari Z, Hoseinian S, Afrooz GH, Hooman HA. [Prevalence of low birth weight and comparison of many biological characteristics of low birth weight – newborns, mothers with those

[Downloaded from demo.medilam.ac.ir on 2026-11-14]

of normal weight- newborns counterparts]. J Guilan Uni Med Sci. 2012;21(81):37-44.(Persian)
5. Shum D, Neulinger K, O'Callaghan M, Mohay H. Attentional problems in children born very preterm or with extremely low birth weight at 7-9 years. Arch Clin Neuropsychol. 2008; 23(1): 103-12.
6. Pritchard VE, Clark CA, Liberty K, Champion PR, Wilson K, Woodward LJ. Early school-based learning difficulties in children born very preterm. Early Hum Develop. 2009; 85(4): 215-24.
7. Evensen KA, Akarnes J, Brubakk AM, Vik T. Predictive value of early motor evaluation in preterm very low birth weight and term small for gestational age children. Early Hum Dev. 2009; 85(8): 511-8.
8. Pope DP1, Mishra V, Thompson L, Siddiqui AR, Rehfuess EA, Weber M, et al. Risk of Low birth weith and stillbirth associated with lndoor air pollution from solid fuel use in developing countrices. Epidenuiol Rev. 2010; 32(1):70-81.
9. Nascimento LF, Moreira DA. Are enriromental pollutante risk factors for low birth weight? Cad Saude Publica. 2009; 25(8):1791-6.
10. Bell ML, Ebisu K, Belanger K. Ambiet air pollution and low birth weight in connectiut and Massachusetts. Envirom Health Perspect. 2007; 115(7):1118-24.
11. Woodruff TJ, Parker JD, Adams K, Bell ML, Gehring U, Glinianaia S, et al. Interaational collaboration on air pollution and pregnancy outcomes (ICAPPO). Int J Envirom Res Pub Health. 2010; 7: 2638-52.
12. Jalaludin B, Mannes T, Morgan G, Lincoln D, Sheppeard V, Corbett S. Impact of ambient air pollution on gestational age is modified by season in Sydney, Australia. Envirom Health. 2007; 7(6):16-22.
13. Maina G, Saracco P, Giolito MR, Danelon D, Bogetto F, Todros T. Impact of maternal psychological distress on fetal weight, prematurity and intrauterine growth retardation. J Affect Disord. 2008; 111(2-3): 214-20.
14. Patel V, Prince M. Maternal psychological morbidity and low birth weight in India. Bir J Psychiatry. 2006; 188: 284-5.
15. van Baar AL, van Wassenaer AG, Briët JM, Dekker FW, Kok JH. Very preterm birth is associated with disabilities in multiple developmental domains. J Pediatr Psychol. 2005; 30(3): 247-55.
16. Weiler G, Risse M, Klöppel A. [Assessment of damage to the child in acute CO poisoning in pregnancy]. Geburtshilfe Frauenheilkd. 1994; 44(11): 744-8.(German)
17. Bobak M. Outdoor air pollution, low birth weight, and prematurity. Environ Health Perspect. 2000; 108(2): 173-6.
18. Hall J, Gilligan A, Schimmel T, Cecchi M, Cohen J. The origin effects and control of air pollution in laboratories used for human embryo culture. Hum Reprod. 1998; 4: 146-55.

[Downloaded from demo.medilam.ac.ir on 2026-11-14]