

## Original Article

# Relationship between Breast Feeding during Childhood and Blood Pressure in Early Adulthood

Hossein Fallahzadeh<sup>1</sup>, Mahdieh Momayyezi<sup>1\*</sup>, Hamide Nasirzadeh<sup>2</sup>

1. Prevention and Epidemiology of Non-communicable Disease Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
2. Faculty of Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

**Received:** 2016/01/05

**Accepted:** 2016/05/14

### Abstract

**Introduction:** Breastfeeding produces an important effect on the physiology of the body, metabolism and human clinical status. Available evidence suggested that breastfeeding has a prophylactic effect on adiposity, blood pressure and other chronic diseases. Thus, this study was conducted to determine the association between infant breastfeeding and blood pressure status in early adulthood.

**Materials & Methods:** In this descriptive cross-sectional study, the sample size was determined to be 300, and the study data were collected through cluster sampling method in 2013. The data collection tool was a researcher-made questionnaire, which its reliability and validity have been confirmed. The statistical analyses were performed using SPSS Software (ver.16) applying independent t-test and ANOVA.

**Results:** The mean systolic pressure and diastolic pressure were  $113.6 \pm 13.1$  and  $72 \pm 11.6$  respectively. The mean systolic and diastolic pressure in males was higher than females. Moreover, increased BMI and age were associated with a significant growth in systolic and diastolic blood pressure. The present study demonstrated a significant positive correlation between systolic and diastolic blood pressure. However, the results did not show a significant relationship between duration or exclusivity of breastfeeding and systolic and diastolic blood pressure in adulthood.

**Conclusion:** The study findings revealed no association between the duration or exclusivity of breastfeeding and systolic and diastolic blood pressure in later life.

**Keywords:** Blood pressure, Bottle feeding, Breast feeding, Hypertension, Infant nutrition

---

\* **Corresponding author:** Tel: 035-38219100 email: mahdieh\_momayyezi@yahoo.com

## Introduction

It is generally accepted that infant breastfeeding has an important effect on the physiology of the body, metabolism and human clinical status<sup>[1]</sup>. As a matter of fact, it has beneficial effects against infections and allergic disorders and it can also promote neurodevelopment<sup>[2]</sup>.

Available evidence suggested that breastfeeding has a prophylactic effect on adiposity, stature, blood pressure and other chronic diseases<sup>[3]</sup>. The result of various studies demonstrated that blood pressure level in childhood and young adulthood is associated with several factors in the early life<sup>[4]</sup>. The effect of infant breastfeeding on cardiovascular disease and hypertension is recognized as an important public health issue<sup>[5]</sup>.

The effect of breastfeeding on blood pressure is a debatable issue, perhaps due to differences in the composition of breast milk and formula milk (particularly the sodium and fatty acid content). Low sodium intake in infancy can be related to lower blood pressure in adulthood<sup>[6]</sup>. Different studies demonstrated that People who were fed with breast milk had lower blood pressure and lower rates of obesity and type 2 diabetes than those who were fed only formula<sup>[7, 8, 9]</sup>. Whereas results of other studies showed no or little difference between blood pressure and infant breastfeeding<sup>[10, 11, 12]</sup>. The findings interpretation of different studies have revealed that the relationship between

breastfeeding and blood pressure demand to be examined carefully. The results of more systematic reviews and meta-analyses also indicated that inadequate control for confounding factors is an important limitation in many studies.

The small reduction in blood pressure associated with breastfeeding can demonstrate an important effect on public health at a population level<sup>[4]</sup>. Primary prevention efforts to reduce the risk of high blood pressure in later life could be started in the early life. Recognizing the benefit of breastfeeding on blood pressure levels may have an important impact for breastfeeding promotion policy<sup>[4]</sup>. Hence, this study was conducted to determine the association between infant breastfeeding and blood pressure status among early adulthood

## Materials and Methods

In this descriptive and cross-sectional study, the sample size was determined to be 300 students of ShahidSadoughi University of Medical Sciences in 2014. The study data were collected through cluster sampling method in 2014. Clusters were selected from five schools of Shahid Sadoughi University of Medical Sciences. Indeed, 15 clusters and 15 students from each cluster were selected. Academic disciplines based on entrance year were considered as clusters, which were randomly selected according to the number of students in each school. The participant's

inclusion criteria involved age of over 18 years as well as satisfaction to participate. In addition, participants who had not responded to all questions and non-native people were excluded from this study.

The data collection tool was a researcher-made checklist. The checklist started with questions regarding demographic variables such as sex, age, BMI, history of other chronic diseases and history of hypertension in family. Moreover, other questions were included infant feeding, duration of breastfeeding and the time of starting supplementary feeding. The answers to these questions were based on maternal recall of infant-feeding practices. Finally, systolic and diastolic blood pressures were measured by the interviewer. An automatic device was utilized to measure blood pressure (model: Omron mx3 plus (hem-742-e). At first, device accuracy was compared with a manual blood pressure. Then, blood pressure was measured in a sitting position, without moving in a quiet environment and after 5 minutes' rest; while participants' arms rested comfortably at heart level and their forearms were on the table.

Questions were read to participants by interviewers and responses were recorded. Face validity was examined using a panel of experts. It should be noted that a limitation of this study was reliance on maternal recall of infant-feeding practices.

Statistical analyses were performed using SPSS Software (ver.16) using independent

T-test and ANOVA for quantitative variables. The 5% level of statistical significance was considered.

## Results

The results showed that the students' mean age was  $23 \pm 1.1$  years, and mean body mass index (BMI) was  $21.91 \pm 0.4$  kg/m<sup>2</sup>. In addition, the mean systolic pressure and diastolic pressure were reported  $113.6 \pm 13.1$  and  $72 \pm 11.6$  respectively. The mean systolic and diastolic pressure in males was higher than females. This relationship was statistically significant between diastolic blood pressure and gender. ( $p=0.004$ ) A positive relationship was observed between age increase and prevalence of high systolic and diastolic blood pressure ( $p=0.000$ ). Also, increased BMI was associated with a significant growth in systolic and diastolic blood pressure ( $p=0.000$ ). The mean systolic and diastolic blood pressure was significantly higher in participants with family history of high blood pressure ( $p=0.000$ ).

As it is demonstrated in Table 1, approximately 96.4% of the participants had been breastfed. 88.9% of the participants were breastfed for more than 6 months. Also, introduction time of formula milk in most of them (51.7%) was after 6 months. The mean systolic and diastolic blood pressure has been summarized in Table 2 based on duration and exclusivity of breastfeeding.

**Table 1:** Demographic Characteristics of Study Participants

		N	%
<b>gender</b>	men	100	33.3
	women	200	66.7
<b>infant feeding</b>	Breast milk	182	60.7
	Formula milk	11	3.7
	Both	107	35.7
<b>duration of breastfeeding</b>	<3 month	17	5.9
	3-5 month	15	5.2
	6-12 month	48	16.7
	12-24 month	183	63.5
	>24 month	25	8.7
<b>timing of introduction of formula milk</b>	<3 month	32	27.1
	3-5 month	25	21.2
	6-12 month	49	41.5
	>12 month	12	10.2

**Table 2:** Means comparison of systolic and diastolic blood pressure according to infant nutrition variables

		systolic blood pressure	diastolic blood pressure
<b>gender</b>	men	126±9	81±6
	women	107±9	67±9
	p-value	0.2	0.004
<b>infant feeding</b>	Breast milk	112.2±13	71±12
	Formula milk	109.6±8	67±11
	Both	116.4±14	74±10
	p-value	0.06	0.2
<b>duration of breastfeeding</b>	<3 month	112±13	71±12
	3-5 month	110.9±11	72±7
	6-12 month	113.4±15	72±9
	12-24 month	115.2±13	73±12
	>24 month	107±12	68±9

		systolic blood pressure	diastolic blood pressure
	p-value	0.07	0.47
<b>timing of introduction of formula milk</b>	<3 month	111.7±12	71±12
	3-5 month	119±12	76±8
	6-12 month	116±16	74±9
	>12 month	115±15	72±13
	p-value	0.2	0.2

No association was detected between the duration or exclusivity of breastfeeding and systolic and diastolic blood pressure in later life. The study results illustrated that participants who were breastfed more than 2 years had the lowest systolic and diastolic blood pressure; though the study results did not support an association between systolic and diastolic blood pressure and total duration of breastfeeding.

## Discussion

The present study was conducted to determine the association between infant breastfeeding and blood pressure status among students. The study results showed that the mean blood pressure was normal within the participants, which was consistent with findings of other studies [13, 14]. In addition, a significant positive correlation was observed between systolic and diastolic blood pressure that confirmed the results of Rahmati's study. [14]

In the current study, mean systolic and diastolic blood pressure was higher in males than females, and blood pressure was also higher within males in Rahmati's study

being confirmed in [14] other studies, [15] as men are at a greater risk for cardiovascular compared to age-matched, premenopausal women. Recent studies have revealed that blood pressure is higher in men than in women at similar ages, using the technique of 24-hour ambulatory blood pressure monitoring,, though after menopause, blood pressure increases in women to levels even higher than in men [16], which may be due to changes in the hormone level of women. Furthermore, in the present study, mean systolic and diastolic blood pressure was significantly higher in participants with family history of high blood pressure, which these results are consistent with those of Safari et al. [17].

In the current study, there was a positive relationship between age increase and prevalence of high systolic and diastolic blood pressure. Some conducted studies in this field reported a significant relationship between age increase and high systolic blood pressure. [14, 17] This may be due to increased vascular resistance resulting in thickened blood vessel walls by increasing age.

Body fat distribution is regarded as a main factor in hypertension.<sup>[18]</sup> According to the results of the present study, an increase in BMI is associated with a significant growth in systolic and diastolic blood pressure. Salem and Rezaeian demonstrated that the students with higher rates of overweight /obesity were reported to have higher systolic and diastolic blood pressure.<sup>[13]</sup> Rahmati et al. represented that body mass index is a significant predictor of hypertension.<sup>[14]</sup> Moreover, Mohammadi and Mirzaei indicated that most population attributable fraction of hypertension was associated with obesity in Yazd.<sup>[19]</sup> In another study, 14.06% (of 21.8%) of the hypertension prevalence in men and 20.3% (of 33.9%) in women was due to obesity.<sup>[20]</sup> Investigating epidemiology of obesity and hypertension in Uzbekistan showed that obese men and women were more likely to get high blood pressure than men and women with normal BMI.<sup>[21]</sup> The results of other studies also confirmed the present study findings<sup>[18, 22]</sup>.

Moreover, the study results showed no significant relationship between breastfeeding and systolic and diastolic blood pressure in later life, which was consistent with those of some other studies.<sup>[1, 10, 24]</sup>, though in some studies, breastfeeding decreased systolic blood pressure.<sup>[24]</sup> Forsyth et al. represented that breastfeeding for at least 3 months decreased systolic and diastolic blood pressure in childhood and adulthood.<sup>[7]</sup>

Martin et al. investigated the relationship between breast feeding in infancy and blood pressure in later life in a systematic review. In their study, Mean systolic blood pressure was lower in breastfed infants compared with bottle-fed infants according in eight studies. Also, six studies showed no or little difference in systolic blood pressure among breastfed versus formula-fed infants.<sup>[4]</sup>

Owen et al. proposed that the results of small studies showing large differences in blood pressure should be cautiously treated. Indeed, they indicated a possibility of confounding, particularly by social factors, current body size, and diet in later life.<sup>[6]</sup> Fall et al. represented that the differences in methods of data collection, postnatal factors, demographic and socio-economic factors such as income can affect the results of different studies.<sup>[25]</sup>

The results demonstrated that people who were breastfed more than 2 years had the lowest systolic and diastolic blood pressure, though no association was observed between systolic and diastolic blood pressure and total duration of breastfeeding. Although the results were consistent with Miladi et al's findings<sup>[1]</sup> some studies showed that people who were breastfed longer, have a lower risk of hypertension and type 2diabetes in adulthood.<sup>[26, 27]</sup> Moreover, Fall et al. showed a U-shaped relationship between the duration of breastfeeding and blood pressure in adulthood.<sup>[25]</sup> On the contrary, some studies did not show any significant correlations between the duration of breastfeeding and

blood pressure.<sup>[28, 29]</sup> For example, Izadi et al. did not report any significant relationships between the duration of breastfeeding and risk factors of cardiovascular disease in the regression model after controlling for confounding factors.<sup>[30]</sup> According to findings of Brion et al.'s study, previous reports revealed a relationship between breast feeding and blood pressure, which are likely to be influenced by confounding factors.<sup>[31]</sup> It is worth mentioning reliance on maternal recall of infant-feeding practices can be mentioned as the limitation of the study.

## Conclusion

The findings of the present study revealed no significant correlation between the duration or exclusivity of breastfeeding and systolic and diastolic blood pressure in later life. The factors not measured in the current study are likely to affect the relationship between breastfeeding and blood pressure in adulthood such as genetics, culture, environmental factors and socio-economic factors.

## Reference

- 1- Miladi Gorji H , Ghorbani R, Ebrahimian A.A. Relationship between breast feeding in infancy with blood pressure in early. *HMJ* 2007; 11 (1):51-55. [Persian]
- 2- Ravelli ACJ, Meulen JHP, Osmand c, et al. Infant feeding and adult glucose tolerance, lipid profile, blood pressure, and obesity. *Arch Dis child.* 2000; 82; 248-52.
- 3- Kramer MS, Matush L, Vanilovich I, et al. Effects of prolonged and exclusive breastfeeding on child height, weight, adiposity, and blood pressure at age 6.5 y: evidence from a large randomized trial. *Am J Clin Nutr.* 2007; 86(6):1717-21.
- 4- Martin RM, Gunell D, smith GD. Breast feeding in infancy and blood pressure in later life: systematic review and meta analysis. *Am J Epidemiology.* 2005; 161(1): 15-26.
- 5- Singhal A, Cole TJ, lucas A. Early nutrition in preterm infants and later blood pressure: two cohorts after randomized trials. *The Lancet.* 2001; 357: 413-419.
- 6- Owen CG, whincup PH, Gilg JA, et al. Effect of breast feeding in infancy on blood pressure in later life: systemmatic review and meta-analysis *BMJ.* 2003; 327: 1189-1195.
- 7- Forsyth Js, Willatts p, Agostoni c, et al. long chain polyunsaturated fatty acid supplementation in infant formula and blood pressure in later childhood: follow up of a randomized controlled trial. *BMJ* 2003; 326: 953.
- 8- Martin RM, Ness AR, Gunnell D, et al. Does breastfeeding in infancy protect against obesity in childhood? The Avon Longitudinal Study of Parents and Children. *Circulation* 2004; 109: 1259–66.
- 9- Lawlor DA, Najman JM, Sterne J, et al. Associations of parental, birth, and early life characteristics with systolic blood pressure at 5 years of age: findings from the Mater-University study of pregnancy and its outcomes. *Circulation* 2004; 110:2417–23.



- 10- Martin RM, Ben-Shlomo Y, Gunnell D, et al. Breast feeding and cardiovascular disease risk factors, incidence, and mortality: the Caerphilly study. *J Epidemiol Community Health*. 2005; 59(2):121-9.
- 11- Leeson CP, Kattenhorn M, Deanfield JE, et al. Duration of breast feeding and arterial distensibility in early adult life: population based study. *BMJ* 2001; 322:643–7.
- 12- Ravelli ACJ, Van Der Meulen JH, Osmond C, et al. Infant feeding and adult glucose tolerance, lipid profile, blood pressure, and obesity. *Arch Dis Child* 2000; 82:248–52.
- 13- Salem Z, Rezaeian M. Blood pressure status and its association with obesity and abdominal obesity in students of Rafsanjan University of Medical Sciences in 2007. *Journal of Rafsanjan University of Medical Sciences*. 2008; 7 (3):157-164.[Persian]
- 14- Rahmati F, Moghadass Tabrizi Y, Shidfar M, et al. Prevalence of obesity and hypertension among Tehran university students. *PAYESH*. 2004; 3(2): 123-130. [Persian]
- 15- Gholipour M, Tabrizi A. Prevalence of cardiovascular disease risk factors among the Sharif University of Technology students. *Cardiovascular Nursing Journal*. 2012; 1 (2):48-56. (Persian)
- 16- Reckelhoff JF. Gender Differences in the Regulation of Blood Pressure. *Hypertension*. 2001; 37(5):1199-208.
- 17- Safari Moradabadi A, Ghanbarnejad A, Nikparvar M, et al. Prevalence of hypertension and respective risk factors in adults in Bandar Abbas, Iran. *HMJ*. 2014; 18 (3):219-27.[Persian]
- 18- Alfonso S, Francesco P, Cappuccino O, et al. The relationship of waist circumference of blood pressure: the olivetti heart study. *Am aj ahyper*. 2002; 15:180-6.
- 19- Mohammadi M, Mirzaei M. Population attributable fraction of hypertension associated with obesity in Yazd province in 2009: A Short Report. *Journal of Rafsanjan University of Medical Sciences*. 2015; 13 (12):1179-186. [Persian]
- 20- Karami M, Soori H, Bahadori Monfared A. Estimating the contribution of selected risk factors in attributable burden to stroke in Iran. *Iranian J Publ Health*. 2012; 41(5): 91-6. [Persian]
- 21- Mishra V, Arnold F, Semenov G, et al. Epidemiology of obesity and hypertension and related risk factors in Uzbekistan. *Eur J Clin Nutr*. 2006; 60:1355-66.
- 22- Azizi F, Esmaelzadeh A, Mirmiran P. Obesity is associated with heart disease risk factor – disease: an epidemiological study in Tehran. *Iranian J Endocrinol Metabolism*. 2003; 5(4): 389-97. [Persian]
- 23- Marmot MG, Page CM, Atkins E, et al. Effect of breast feeding on plasma cholesterol and weight in young adults. *J Epidemiol Community Health*. 1980; 34:164–71.
- 24- Das UN. Breast-feeding has little effect on blood pressure in later life: Evidence-based Healthcare. 2004; 8(3):145-47.
- 25- Fall CH, Borja JB, Osmond C, et al. Infant-feeding patterns and cardiovascular risk factors in young adulthood. *International Journal of Epidemiology*. 2011; 40:47-62.
- 26- Mayer-Davis EJ, Dabelea D, Lamichhane AP, et al. Breastfeeding and type 2 diabetes in the youth of three ethnic groups: the search for diabetes in youth case-control study. *Diabetes Care*. 2008; 31:470–75.
- 27- Lawlor DA, Riddoch CJ, Page AS, et al. Infant feeding and components of the metabolic syndrome: findings from the European Youth Heart Study. *Arch Dis Child*. 2005; 90:582–88.



- 28- Davis JN, Weigensberg MJ, Shaibi GQ, et al. Influence of breastfeeding on obesity and type 2 diabetes risk factors in Latino youth with a family history of type 2 diabetes. *Diabetes Care*. 2007; 30:784–89.
- 29- Baranowski T, Bryan GT, Harrison JA, et al. Height, infant feeding practices and cardiovascular functioning among 3 or 4 year old children in three ethnic groups. *J Clin Epidemiol*. 1992; 45:513–18.
- 30- Izadi V, Kelishadi R, Qorbani M, et al. Duration of breastfeeding and cardiovascular risk factors among Iranian children and adolescents: The CASPIAN III study. *Nutrition*. 2013; 29(5):744-51. (Persian)
- 31- Brion MA, lawlor DA, Matigasvich AM, et al. What are the causal effects of breast feeding on IQ, obesity and blood pressure. *International Journal of Epidemiology*. 2011; 40: 670-680.