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Social Determinants of Health Affect Postneonatal Infant Mortality: A Case–Control Field Study

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ABSTRACT

Objectives: Postneonatal infant deaths are mainly associated with environmental and socioeconomic causes that are preventable. The aim of this study was to identify the sociodemographic risk factors for postneonatal infant death.

Methods: This is a case–control study. The case group consisted of mothers residing in Bursa who lost their babies in the postneonatal period (n=113). The control group included mothers living in Bursa whose children were of age 12–24 months. The control group received health services from the same family physician as the case group and gave birth in the same month. No sample was selected from the case group, and all data were collected by a questionnaire using the face-to-face technique.

Results: This case–control study was conducted with 101 (34.1%) cases and 195 (65.9%) controls. The analyses of the model, which included all variables significant in binary analyses, showed that the infant mortality rate was higher in those residing in Bursa for less than 10 years (OR=4.211, 95%CI=2.202–8.023, p=0.001); was higher in those who were related to their spouses (OR=2.232, 95%CI=1.112–4.632, p=0.001); was higher in those who had 3 or more pregnancies (OR=3.814, 95%CI=2.001–7.275, p=0.001); was higher in male babies (OR=2.201, 95%CI=1.204–4.001, p=0.001), and was higher in those with a birth weight of ≤2.500 g (OR=6.881, 95%CI=2.811–16.901, p=0.001).

Conclusion: The medical history of the patients should be evaluated, and the patients with high risk should follow more closely and frequently to reduce postneonatal infant mortality.

Keywords: Infant mortality, newborn, risk factors

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INTRODUCTION

Infant mortality is defined as the death of an infant due to any reason within the 365 days after birth, and according to the time of death, it is divided basically into two periods: neonatal and postneonatal.[1] The neonatal period comprises the first four weeks after birth, and the postneonatal period comprises the period between the first month and one year. The causes of neonatal and postneonatal infant deaths and the mortality rates vary. In the neonatal age group, disorders such as prematurity, perinatal asphyxia, and congenital malformations arise and cause death, whereas in the postneonatal period, death is mainly caused by diarrhea,

lower respiratory infections, and infectious diseases such as measles. Moreover, postneonatal infant deaths are affected by socioeconomic, sociocultural, and environmental factors.[2] Because the cause of death was mainly related to social determinants and not medical causes, the number of doctor visits was also reduced. Because of these reasons, identification of the risk factor by classifying infant mortality according to the time of death would be one of the important steps toward reducing the infant mortality rate.

In Turkey, both neonatal and postneonatal infant mortality rates decreased significantly in the last 20 years. The infant mortality rate was 53 per thousand in 1993, whereas it was only 13 per thousand in 2013.[3] The postneonatal infant mortality rate has reduced to 6 per thousand in the last 20 years, and therefore it has been given less attention.[4] However, postneonatal infant mortality is still an important public health problem and should be addressed. The aim of this study was to identify the factors that affect postneonatal infant mortality.

METHOD

This is a case–control study. The case group consisted of mothers residing in Bursa who lost their babies in the postneonatal period (n=113). The control group included mothers living in Bursa and whose children were of age 12–24 months. The control group received health services from the same family physician as the case group and gave birth in the same month. No sample was selected from the case group, and it was aimed to reach all mothers. For each case, two controls were chosen (n=226). Finally, 101 (89.4%) mothers of the case group and 195 (86.3%) mothers of the control group were reached. The selection diagram of case and control groups is shown in Figure 1.

The data for the study was obtained using a questionnaire. They were collected after obtaining oral consent from the mothers through face-to-face interviews between January 1 and 31, 2012. The collected data were evaluated, and required corrections were made. Independent variables of the study were sociodemographic characteristics, health behavior, health characteristics, health services utilization, and birth characteristics.

The data were analyzed using SPSS version 21.0 software (IBM Corp. Armonk, NY, USA). Descriptive statistics were evaluated as frequency and percentage, and the Chi-squared test was used for categorical variables. Backward logistic regression (LR) analysis was used to identify factors that affect infant mortality, and the Chi-squared test was used to compare the census data. Three models were analyzed separately. Sociodemographic characteristics alone were included in model 1, and sociodemographic characteristics and maternal health characteristics were included in model 2. Model 3 included all variables that were significant in binary analyses, including the infant characteristics. All values of $p<0.05$ was considered statistically significant.

RESULTS

This case–control study was conducted with 101 (34.1%) case and 195 (65.9%) control. Sociodemographic features of mothers in the case and control groups are summarized in Table 1.

The presence of chronic disease was detected in 13 (12.9%) mothers in the case group and 19 (9.7%) mothers in the control group (p=0.411). Health behavior and health care use features of mothers in both groups are summarized in Table 2.

Multiple pregnancies were found in 6 (5.9%) mothers in the case group and 8 (4.1%) in the control group (p=0.480). Pregnancy-, birth-, and baby-associated features in the case and control groups are summarized in Table 3.

The characteristics that were statistically significant in the binary analysis were included in the LR analysis. As a result, the infant mortality rate was 4.211 [2.202–8.023] times

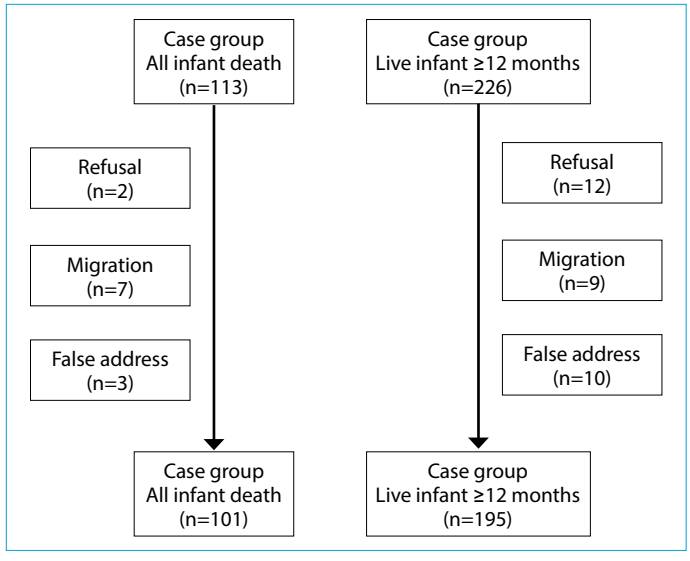

Figure 1. Selection diagram of case and control groups.

Table 1. Sociodemographic features of mothers in the case and control groups

	Case Group (n=101)	Control Group (n=195)	p
Age groups			
≤19 years	2 (2.0)	10 (5.1)	0.313
20–34 years	81 (80.2)	158 (81.0)	
≥35 years	18 (17.8)	27 (13.9)	
Education (years)			
≤5 years	54 (53.5)	90 (46.2)	0.233
≥6 years	47 (46.5)	105 (53.8)	
Partner's education (years)			
≤5 years	38 (37.6)	62 (31.8)	0.315
≥6 years	63 (62.4)	133 (68.2)	
Family type			
Extended family	26 (25.7)	57 (29.2)	0.526
Core family	75 (74.3)	138 (70.8)	
Consanguineous marriage			
Yes	27 (26.7)	26 (13.3)	0.004
No	74 (73.3)	169 (86.7)	
Number of household			
≤4 persons	80 (79.2)	157 (80.8)	0.790
≥5 persons	21 (20.8)	38 (19.2)	
Working status			
Unemployed	62 (61.4)	132 (67.7)	0.279
Employed	39 (38.6)	63 (32.3)	
Partner's working status			
Unemployed	10 (9.9)	28 (14.4)	0.467
Public/private sectors	70 (69.3)	123 (63.1)	
For own	21 (20.8)	44 (22.5)	
Income adequacy			
More	25 (24.7)	55 (28.2)	0.559
Equal	54 (53.5)	107 (54.9)	
Less	22 (21.8)	33 (16.9)	
Health insurance			
No	10 (9.9)	14 (7.2)	0.416
Yes	91 (90.1)	181 (92.8)	
Residence time (years)			
≤9 years	51 (50.5)	45 (23.1)	0.001
≥10 years	50 (49.5)	150 (76.9)	

Data are presented as n (%).
Chi-squared test.

higher in those residing in Bursa for less than 10 years (p=0.001), was 2.232 [1.112–4.632] times higher in those who were related to their spouses (p=0.001), was 3.814 [2.001–7.275] times higher in those who had 3 or more pregnancies (p=0.001), was 2.201 [1.204–4.001] times higher in male babies (p=0.001), and was 6.881 [2.811–16.901] times higher in those with a birth weight of ≤2.500 g (p=0.001). The evaluation of factors affecting infant mortality is summarized in Table 4.

DISCUSSION

In this study, many independent variables that may affect postneonatal infant death were analyzed. Multiple analyses have put forward that five of these (residing time, consanguineous marriage, pregnancy count, gender of infant, and birth weight) have caused an independent risk of postneonatal death. Of these, birth weight and residing time were observed to cause the highest risk.

In this study, the postneonatal infant mortality rate was found to be 4.3 times higher in mothers living for 10 years or less in the city of Bursa. In a study representing Turkey and investigating the effects of migration, it was found that the duration of residence is a risk for postneonatal infant mortality.[5] Duration of residence at the place of immigration affects postneonatal infant mortality through the state of the mother to use public institutions such as health institutions and services. The main determinant of the parameter is the control mechanism that dissociates on the "gender" basis.[6] The main reason behind this control mechanism is "the fear of gossip" in terms of "honor." A field study conducted in a neighborhood of immigrants to Istanbul found that women's daily relationships and use of public spaces were subjected to their spouse's permission.[7] In this regard, it can be said that as long as a woman establishes a secure position in terms of her honor in public, her spouse allows her to use public spaces such as health institutions, and the duration of establishing this position can take more than 10 years.[6,7]

In this study, the postneonatal infant mortality rate was 2.2 times higher in consanguineous marriage. In a national study on the causes of infant mortality, it was reported that the infant mortality rate was 1.9 times higher in consanguineous marriage.[8] In another study, it was reported that consanguineous marriage increased infant mortality by 2.4-fold.[9] It was demonstrated that the infant mortality rate was higher in the babies of mothers in first-degree consanguineous marriages.[10] The increased rate of infant mortality in consanguineous marriages is probably due to congenital malformations and chromosomal diseases.

Table 2. Health behavior and health care use features of mothers in both groups

	Case Group (n=101)	Control Group (n=195)	p
Number of pregnancy			
≤2 pregnancies	48 (47.5)	130 (66.7)	0.001
>3 pregnancies	53 (52.5)	65 (33.3)	
Smoking			
Smokers/passive smoker	55 (54.5)	82 (42.1)	0.042
Non-smokers	46 (45.5)	113 (57.9)	
Unintended pregnancy (mother)			
No	79 (78.2)	161 (82.6)	0.365
Yes	22 (21.8)	34 (17.4)	
Unintended pregnancy (partner)			
Planned	84 (83.2)	172 (88.2)	0.229
Unplanned	17 (16.8)	23 (11.8)	
Accessing time to any health institution			
≤30 min	91 (90.1)	173 (88.7)	0.717
30–60 min	10 (9.9)	22 (11.3)	
Using prenatal care services from the family physician			
No	7 (6.9)	10 (5.1)	0.270
1-3 times	21 (20.8)	28 (14.4)	
> 4 times	73 (72.3)	157 (80.5)	
Using prenatal care services from the obstetricians			
No	6 (5.9)	7 (3.6)	0.618
1-3 times	10 (9.9)	22 (11.3)	
> 4 times	85 (84.2)	166 (85.1)	
Using postnatal care service from the family physician	49 (49.5)	114 (58.5)	0.103
Using postnatal care services from the obstetrician	42 (41.6)	80 (41.0)	0.926
Present of violence			
Physical violence	4 (4.0)	12 (6.2)	0.429
Psychological violence	11 (10.9)	19 (9.7)	0.756
Sexual violence	9 (8.9)	21 (10.8)	0.606
Economic violence	15 (14.9)	11 (5.6)	0.008

Data are presented as n (%).
Chi-squared test.

Therefore, based on the data from the Ministry of Health, the second most common cause of infant mortality in Turkey is congenital anomalies and chromosomal diseases.[11] Thus, it is required to prevent consanguineous marriages and work on providing information to couples on possible risks.

In our study, the postneonatal infant mortality rate was 3.5 times higher in mothers who had 3 or more pregnancies. Similarly, it was found that the infant mortality rate was 2.4 times higher in mothers who had 4 or more pregnancies.[8] In a study in New Zealand, the postneonatal infant mortality rate was 2.1 times higher in mothers with 3 or more pregnancies than in mothers in their first pregnancy.[12] In other studies, it was also found that the infant mortality rate was higher in women who gave many births.[13,14] In a meta-analysis, it was found that prematurity and neonatal and postneonatal infant

Table 3. Pregnancy-, birth-, and baby-associated features in the case and control groups

	Case Group (n=101)	Control Group (n=195)	p
Pregnancy			
Assisted	7 (6.9)	8 (4.1)	0.293
Spontaneous	94 (93.1)	187 (95.9)	
Delivery place*			
State Hospital	80 (79.2)	135 (69.9)	0.089
Private Hospital	21 (20.8)	58 (30.1)	
Delivery type			
Cesarean	48 (47.5)	97 (49.7)	0.717
Normal	53 (52.5)	98 (50.3)	
Gender			
Male	63 (58.1)	90 (46.2)	0.008
Female	38 (41.9)	105 (53.8)	
Birth week			
≤ 37 weeks	49 (48.5)	38 (19.5)	0.001
> 38 weeks	52 (51.5)	157 (80.5)	
Weight (gr)			
≤ 2500 gr	42 (41.6)	18 (9.2)	0.001
> 2500 gr	59 (58.4)	177 (90.8)	

Data are presented as n (%).
Chi-squared test.
*Home births (n=2) were not included.

mortality rates increase in women aged 18–35 years who had 3 or more pregnancies.[15] The increase in the postneonatal infant mortality rate with an increased number of pregnancies suggests that it can be related to physiological processes.

The postneonatal infant mortality rate was 6.8 times higher in babies with a birth weight of less than 2.500 g. It was shown that postneonatal infant death was 16 times higher in infants less than 2500 g.[8] In a study in the USA, the infant mortality rate was 2.3 per thousand in babies weighing ≥2.500 g, whereas it was 5.7 per thousand under 2.500 g.[16] In another study in the USA, the postneonatal infant mortality rate was 3.97 times higher in those with low birth weight (1500–2499 g) than in those with normal birth weight (2500–4000 g) and was 13.69 times higher in those with very low birth weight (<1500 gr).[17] In a study in Brazil, the risk was found to be higher as the birth weight decreases, based on the observation made on babies with a birth weight of 3000–3500 g.[18] It was found that babies weighing under 2.500 g are at an increased risk of health-related problems in the short and long term, such as chronic pulmonary diseases, intracranial hemorrhage, and central nervous system disorders, and have an increased risk of death.[19,20]

The postneonatal infant mortality rate was 2.2 times higher in male babies. In many studies conducted in countries other than Turkey, it was observed that postneonatal infant mortality risk was higher in male babies than in female babies.[12,16,18] The reason behind this difference is that the XY chromosome pair in males is more sensitive to recessively inherited diseases, and the effect of sex hormones on the immune system as the sex hormones in males inhibit the maturation of B and T lymphocytes.[21]

The strength of the study is that it has studied an entire province. On the other hand, its limitation is that there are other factors that may affect infant mortality and that these are not questioned in the study.

CONCLUSION

Of the individuals residing in Bursa for 10 or more years, mothers with consanguineous marriage, mothers with 3 or more pregnancies, babies with a birth weight of less than 2500 g, and male babies are at more risk for postneonatal infant mortality. To prevent postneonatal infant mortality, family physicians and gynecologists should question the patients in detail about the social determinants of health and follow patients at risk more closely and frequently.

Disclosures

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Conflict of Interest: None declared.

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Ethics Committee Approval: This study was performed with the approval of the Istanbul Bilim University Clinical Research Ethic Committee (Approval date: January 14, 2014, and Approval number: 16-105).

Authorship Contributions: Concept – B.C., C.O.; Design – B.C.; Supervision – B.C.; Materials – B.C.; Data collection and/or processing – B.C., C.O.; Analysis and/or interpretation – B.C., C.O., H.B.; Literature search – B.C., C.O., H.B.; Writing – B.C., C.O., H.B.; Critical review – B.C., C.O., H.B.

Table 4. Evaluation of factors affecting infant mortality

		Model 1	Model 2	Model 3
Sociodemographic features				
Residence (years)	β	0.385	0.789	0.795
≤9 years	SE	1.109	1.282	1.301
≥10 years (ref)	OR	3.209	4.117	4.211
	95% CI	1.915–5.337	2.418–7.001	2.202–8.023
	p	0.001	0.001	0.001
Consanguineous marriages	β	0.212	0.682	0.788
Yes	SE	0.989	0.735	1.001
No (ref)	OR	1.915	1.101	2.232
	95% CI	1.101–3.701	0.101–3.705	1.112–4.632
	p	0.003	0.115	0.001
Mother health-associated features				
Pregnancy count	β		1.907	1.109
3 and above	SE		0.397	0.385
2 and below (ref)	OR		2.802	3.814
	95% CI		1.662–4.778	2.001–7.275
	p		0.001	0.001
Smoker/passive smoker	β		0.779	0.612
Yes	SE		1.145	1.841
No (ref)	OR		1.978	1.019
	95% CI		0.345–5.378	0.945–3.784
	p		0.173	0.201
Economic violence	β		0.565	0.112
Yes	SE		1.001	0.956
No (ref)	OR		2.101	1.899
	95% CI		0.014–7.458	0.112–5.458
	p		0.247	0.312
Baby-associated features				
Gender	β			0.145
Boy	SE			1.007
Girl (ref)	OR			2.201
	95% CI			1.204–4.001
	p			0.001
Birth weight	β			1.398
≤2500 g	SE			0.397
>2500 g (ref)	OR			6.881
	95% CI			2.811–16.901
	p			0.001
Birth week	β			0.278
≤37 weeks	SE			0.554
≥38 weeks (ref)	OR			1.005
	95% CI			0.886–16.901
	p			0.401

CI: Confidence interval; OR: Odd's ratio; SE: Standard error.
Logistic regression test.

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