Parental Socioeconomic Status as a determinant of breastfeeding : an analysis of the Korea National Health and Nutrition Examination Survey (2013 ~ 2017)

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Research article

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**Abstract**

**Background:** The importance of breastfeeding is well known. One of important factors affecting breastfeeding is socioeconomic status. We investigated the relationship between socioeconomic status and breastfeeding to promote future breastfeeding projects.

**Methods:** Data were collected from the 2013 - 2017 Korea National Health and Nutrition Examination Survey (KNHANES). We evaluated the demographic information and parents’ socioeconomic status of 1,220 children under 60 months.

**Results:** A total 1,220 children were included in this study. Some of the socioeconomic factors were associated with breastfeeding. Mothers’ education level (≥ 13 years: odd ratio [OR], 2.79; 95% confidence interval [CI], 1.21-6.42), middle high of mother’s income level (OR, 2.30; 95% CI, 1.18-2.84), no smoking status (OR, 3.07; 95% CI, 1.28-7.36), body mass index (BMI) (< 25 (kg/m²): OR, 1.82; 95% CI, 1.12-2.95) were associated with breastfeeding (p<0.05). Also, fathers’ age (30s: OR, 4.88; 95% CI, 1.82-13.04), education level (≥ 13 years: OR, 7.94; 95% CI, 3.12-20.18) were associated with breastfeeding (p<0.05). After controlling for the confounding factors, mothers’ BMI, fathers’ age and educational level were statistically significant.

**Conclusion:** This study demonstrated that socioeconomic factors were associated with breastfeeding in Korea. Keywords: Breastfeeding, Parental, Socioeconomic status, Korea

**Background**

The benefits of breastfeeding are well known. Breastfeeding reduces respiratory infections, gastrointestinal tract infections, necrotizing enterocolitis, sudden infant death syndrome, otitis media in children younger than 2 years of age, allergic disorders (asthma, atopic dermatitis), diabetes, obesity, acute leukemia, hypertension, and neurodevelopmental disorder. In addition, breastfeeding benefits mothers’ health, including reducing the risk of breast cancer, ovarian cancer, type 2 diabetes. The World Health Organization (WHO) and American Academy of Pediatrics recommend exclusive breastfeeding for the first six months, followed by continued breastfeeding for 1 year or longer as complementary foods are introduced.

Globally, 43% of infants aged younger than six months were exclusively breastfed in 2016, an increase from 36% in 2005. The prevalence of exclusive breastfeeding was highest in Southern Asia (59%) and Eastern Africa (57%). It is much lower in Latin America and the Caribbean (33%), Eastern Asia (28%), Western Africa (25%), and Western Asia (21%).

In 2006–2012, only an estimated 25% of infants in the WHO European Region were exclusively breastfed for the first 6 months. After birth, between 56% and 98% of infants in European countries (Ireland, 56%; the Netherlands, 80%; Italy, 86%; Sweden, 94%; Germany, 97%; and Norway, 98%) were breastfed. At 6 months age, the following breastfeeding rates were reported: Italy (38%), the Netherlands (51%),
Germany (57%), Sweden (61%), Norway (71%). Although early initiation of breastfeeding is very high in some countries, exclusive breastfeeding rates drop rapidly between 4 and 6 months of age and are very low at 6 months: Denmark, 13%; Germany, 19%; Norway, 17%; Sweden, 14%; the Netherlands, 39%. Among infants born in 2015 in the United States, 4 out of 5 (83.2%) were breastfed at birth, over half (57.6%) were breastfed at 6 months-old, and over one-third (35.9%) were breastfed at 12 months-old. However, despite the recommendation to breastfeed exclusively for about the first 6 months, less than 50% of infants were exclusively breastfed in the first 3 months, and 24.9% were exclusively breastfed in the first 6 months.

Between 1985 and 1995, the global rates of exclusive breastfeeding increased by 2.4% per year on average (increasing from 14% to 38% over 10 years). The Global Breastfeeding Collective, led by United Nations Children’s Fund and the WHO, set a target to increase the global rate of exclusive breastfeeding in the first 6 months of life: at least 50% by 2025 and at least 70% by 2030.

In Korea, the rates of breastfeeding at 6 months of age increased to 60.8% in 2010 and 62.3% in 2013; however, it decreased to 55.6% in 2016. The Korean Ministry of Health and Welfare's Fourth National Health Plan aims to increase to 66.8% by 2020.

Hence, exploring the socioeconomic factors which affect breastfeeding are crucial for increasing breastfeeding rate and maintaining breastfeeding. Although the socioeconomic factors associated with breastfeeding have been broadly reported, scant studies have examined these variables in Korea. Therefore, we explored the relationship between socioeconomic factors and breastfeeding in Korea using data from the Korean National Health and Nutrition Examination Survey (KNHANES).

**Methods**

*Data source*

This study was conducted using the raw data from the KNHANES of the sixth (2013 ~ 2015) and the seventh term (2016~2017). The KNHANES is a statutory survey on people's health behavior, prevalence of chronic diseases, and food and nutrition practices. KNHANES was conducted in a three-year period from the first (1998) to the third period (2005), and has since been reorganized into a year-round survey system, and has been conducted annually from the fourth term (2007-2009) to the present day. KNHANES consisted of a cross-sectional survey composed of a health interview survey and a health examination survey, and a nutrition survey. All survey protocols were approved by the Korea Centers for Disease Control & Prevention (KCDC) Institutional Review Board. Written informed consent was obtained from all participants before the survey commencement.

In this study, we included 1,726 children under 60 months in the sixth and seventh terms. Of these, we excluded 506 participants who were no information of breastfeeding, did not provide socio-economic data. We included the 1,220 participants who had complete health interview survey in the final analysis.
Study design

This study employed a cross-sectional design. All data are available from the KNHANES database (http://knhanes.cdc.go.kr/knhanes). We categorized data into two groups (non-breastfed, breastfed). The breastfeeding group was derived from the following questionnaires: “Have you been breastfeeding for at least a month?” These surveys included questions regarding sex, age, residence area, employment status, education level, incomes, parental smoking status, weight and height. Education level was divided into 3 categories: ≤ 9 years, 10~12 years, ≥ 13 years. Income was classified into quartiles to determine income level (1: low, 2: middle low, 3: middle high, 4: high). Body mass index (BMI) was calculated as the ratio of weight to height^2 (kg/m^2).

Data analysis

Statistical Package for the Social Sciences (SPSS) complex sample procedures were employed since KNHANES data were collected through a representative, stratified, and clustered sampling method. Participants’ characteristics are presented as an estimate and a 95% confidence interval. Differences between the breastfeeding and non-breastfeeding groups are reported using chi-square test. We conducted a logistic regression analysis to identify the relationships between factors and breastfeeding. We adjusted for mothers’ education, income, smoking status, BMI, fathers’ age, education level. Statistical analysis was conducted using SPSS version 21.0 (SPSS Inc. Chicago, IL, US). For all analyses, p-values were two-tailed, and a p value < 0.05 was considered significant.

Results

Participants’ demographics are shown on Table 1. A total of 1,220 children were included in the study. Mean birth weight was 3.21kg.

Table 1. Demographic Characteristics of Participants.
### Children’s Information

|                      | N   | Estimate (95% CI)     |
|----------------------|-----|----------------------|
| **Sex**              |     |                      |
| male                 | 625 | 51.93 (48.86-54.98)   |
| female               | 595 | 48.07 (45.02-51.14)   |
| **Age**              |     |                      |
| ≤                    | 396 | 31.51 (28.97-34.16)   |
| 13 ~ 24 months       | 397 | 32.82 (30.07-35.69)   |
| ≥ 25 months          | 427 | 35.67 (32.77-38.68)   |
| **Birth weight (kg)**| 1,220 | 3.21 (3.18-3.24)      |
| **Duration of Breastfeeding** |     |                      |
| ≥ 4weeks             | 334 | 30.43 (27.44-33.59)   |
| 5 ~ 8 weeks          | 203 | 18.96 (16.47-21.73)   |
| 9 ~ 12 weeks         | 271 | 24.75 (21.91-27.83)   |
| ≥ 13 weeks           | 290 | 25.86 (23.05-28.89)   |
| **Residence area**   |     |                      |
| Rural                | 202 | 15.91 (12.20-20.48)   |
| Urban                | 1,018 | 84.09 (79.52-87.80)  |
| **House income (quartile)** |     |                      |
| 1 (low)              | 68  | 5.43 (4.11-7.13)      |
| 2 (middle low)       | 403 | 34.00 (30.72-37.43)   |
| 3 (middle high)      | 427 | 34.28 (31.12-37.59)   |
| 4 (high)             | 322 | 26.29 (23.27-29.56)   |
| **Mother’s Information** |     |                      |
| **Age**              |     |                      |
| 20s                  | 149 | 12.73 (10.51-15.33)   |
| 30s                  | 907 | 74.68 (71.59-77.54)   |
| ≥ 40s                | 156 | 12.59 (10.60-14.90)   |
| **Marital status**   |     |                      |
| Never married        | 1   | 0.00 (0.00-0.38)      |
| Married              | 1,193 | 98.25 (96.81-99.05)  |
| Separated/divorced   | 18  | 1.69 (0.91-3.14)      |
| **Parity**           |     |                      |
| Primipara            | 182 | 16.91 (14.64-19.45)   |
| Multipara            | 938 | 83.09 (80.55-85.36)   |
| **Education level**  |     |                      |
| ≤ 9 years            | 70  | 6.16 (4.70-8.04)      |
| 10~12 years          | 320 | 28.32 (25.27-31.59)   |
| ≥ 13 years           | 732 | 65.51 (62.03-68.84)   |
| **Income (quartile)**|     |                      |
| 1 (low)              | 358 | 31.01 (27.74-34.49)   |
| 2 (middle low)       | 345 | 28.19 (25.32-31.26)   |
| 3 (middle high)      | 279 | 22.02 (19.32-24.99)   |
| 4 (high)             | 230 | 18.77 (16.21-21.64)   |
| **Employment**       |     |                      |
| No                   | 779 | 66.64 (63.23-69.89)   |
| Yes                  | 417 | 33.36 (30.11-36.77)   |
| **Current Smoking status** |     |                      |
| No                   | 1,101 | 95.44 (93.76-96.69)  |
| Yes                  | 52  | 4.56 (3.31-6.24)      |
| **Body mass index**  |     |                      |
| < 25 (kg/m²)         | 906 | 77.17 (74.23-79.86)   |
| ≥ 25 (kg/m²)         | 273 | 22.83 (20.14-25.77)   |
| **Father’s information** |   |                      |
| **Age**              |     |                      |
| 20s                  | 44  | 4.65 (3.16-6.81)      |
| 30s                  | 704 | 68.02 (64.16-71.65)   |
| ≥ 40s                | 279 | 27.33 (24.03-30.90)   |
| **Marital status**   |     |                      |
| Never married        | -   | -                    |
| Married              | 1,021 | 99.32 (98.05-99.76)  |
| Separated/divorced   | 6   | 0.68 (0.24-1.95)      |
Values are presented as estimate (95% confidence interval).

Breastfeeding group was 1,101 children. Factors related to breastfeeding were mothers’ education level and BMI, current smoking status (p < 0.05), fathers’ age, marital status and education level (p< 0.05) (Table 2).

Table 2. Demographic characteristics according to the breastfeeding.
|                                | Non-Breastfeeding group | Breastfeeding group | P-value |
|--------------------------------|-------------------------|---------------------|---------|
| **Children’s information**     |                         |                     |         |
| **Sex**                        |                         |                     | 0.404   |
| Male                           | 47.95 (38.41-57.65)     | 52.33 (49.10-55.55) |         |
| Female                         | 52.05 (42.35-61.59)     | 47.67 (44.45-50.90) |         |
| **Age**                        |                         |                     | 0.139   |
| ≤ 12 months                    | 39.28 (29.66-49.81)     | 30.72 (28.14-33.42) |         |
| 13~24 months                   | 32.92 (24.25-42.94)     | 32.81 (29.95-35.80) |         |
| ≥ 25 months                    | 27.80 (20.10-37.07)     | 36.47 (33.43-39.63) |         |
| **Birth weight (kg)**          |                         |                     | 0.004   |
|                                | 3.03 (2.90-3.16)        | 3.23 (3.20-3.26)    |         |
| **Residence area**             |                         |                     | 0.540   |
| Rural                          | 18.13 (11.22-27.98)     | 15.68 (11.90-20.38) |         |
| Urban                          | 81.87 (72.02-88.78)     | 84.32 (79.62-88.10) |         |
| **House income**               |                         |                     | 0.513   |
| 1(Low)                         | 4.84 (2.09-10.79)       | 5.49 (4.09-7.33)    |         |
| 2(Middle low)                  | 41.06 (31.05-51.87)     | 33.28 (29.90-36.84) |         |
| 3(Middle high)                 | 31.69 (22.91-42.01)     | 34.55 (31.21-38.05) |         |
| 4(High)                        | 22.41 (14.51-32.95)     | 26.69 (23.51-30.13) |         |
| **Mother’s information**       |                         |                     |         |
| **Age**                        |                         |                     | 0.386   |
| 20s                            | 17.36 (10.50-27.32)     | 12.27 (9.97-15.01)  |         |
| 30s                            | 71.37 (60.60-80.16)     | 75.01 (71.74-78.02) |         |
| ≥ 40s                          | 11.27 (6.46-18.92)      | 12.72 (10.63-15.17) |         |
| **Marital status**             |                         |                     | 0.824   |
| Never married                  | 0.00 (0.00)             | 0.00 (0.00-0.42)    |         |
| Married                        | 98.90 (92.56-99.85)     | 98.19 (96.61-99.04) |         |
| Separated/divorced             | 1.11 (0.15-7.44)        | 1.75 (0.91-3.34)    |         |
| **Parity**                     |                         |                     | 0.741   |
| primipara                      | 18.37 (10.82-29.43)     | 16.78 (14.39-19.46) |         |
| multipara                      | 81.63 (70.57-89.18)     | 83.22 (80.54-85.61) |         |
| **Education**                  |                         |                     | <0.001  |
| ≤ 9 years                      | 10.32 (5.25-19.31)      | 5.77 (4.27-7.76)    |         |
| 10~12 years                    | 46.42 (34.73-58.52)     | 26.64 (23.56-29.96) |         |
| ≥ 13 years                     | 43.26 (32.14-55.10)     | 67.59 (64.03-70.96) |         |
| **Income (quartile)**          |                         |                     | 0.093   |
| 1(low)                         | 41.94 (31.69-52.94)     | 29.93 (26.53-33.56) |         |
| 2(middle low)                  | 25.94 (17.88-36.03)     | 28.42 (25.40-31.65) |         |
| 3(middle high)                 | 13.92 (8.32-22.36)      | 22.83 (19.92-26.03) |         |
| 4(high)                        | 18.20 (10.86-28.90)     | 18.83 (16.17-21.81) |         |
| **Employment**                 |                         |                     | 0.068   |
| No                             | 75.54 (65.43-83.44)     | 65.77 (62.18-69.20) |         |
| Yes                            | 24.46 (16.56-34.57)     | 34.23 (30.80-37.82) |         |
| **Current Smoking status**     |                         |                     | 0.008   |
| No                             | 88.84 (77.56-94.83)     | 96.07 (94.56-97.18) |         |
| Yes                            | 11.16 (5.17-22.44)      | 3.93 (2.82-5.44)    |         |
| **Body mass index**            |                         |                     | 0.014   |
| ≤ 25 (kg/m²)                   | 66.37 (55.65-75.64)     | 78.20 (75.15-80.97) |         |
| ≥ 25 (kg/m²)                   | 33.63 (24.36-44.35)     | 21.80 (19.03-24.85) |         |
| **Father’s information**       |                         |                     | 0.001   |
| **Age**                        |                         |                     |         |
| 20s                            | 13.78 (6.17-27.98)      | 3.84 (2.53-5.81)    |         |
| 30s                            | 51.10 (38.32-63.74)     | 69.52 (65.44-73.31) |         |
| ≥ 40s                          | 35.11 (24.11-47.97)     | 26.64 (23.20-30.39) |         |
| **Marital status**             |                         |                     | 0.015   |
| Never married                  | -                       | -                   |         |
| Married                        | 96.39 (85.81-99.16)     | 99.28 (98.15-99.91) |         |
To determine the association between breastfeeding and socioeconomic factors in all participants, logistic regression analysis was performed. The results are presented in Table 3. Mothers’ education level (≥13 years: odd ratio [OR], 2.79; 95% confidence interval [CI], 1.21-6.42), middle high of mother’s income (OR, 2.30; 95% CI, 1.18-2.84), no smoking status (OR, 3.07; 95% CI, 1.28-7.36), BMI (< 25(kg/m\(^2\)): OR, 1.82; 95% CI, 1.12-2.95) were associated with breastfeeding (p<0.05). Also, fathers’ age (30s: OR, 4.88; 95% CI, 1.82-13.04), education level (≥ 13 years: OR, 7.94; 95% CI, 3.12-20.18) were associated with breastfeeding (p<0.05). After adjusting for mothers’ education, income, smoking status, BMI, fathers’ age, education and income level, the OR showed that mother’s BMI (<25 (kg/m\(^2\)): OR, 2.14; 95% CI, 1.12-4.09), fathers’ age (30s: OR, 6.16; 95% CI, 1.63-23.31), (40s: OR, 3.94; 95% CI, 1.08-14.33), education level (≥13 years: OR, 4.48; 95% CI, 1.13-17.81) were statistically significant (p<0.05).

Table 3. Unadjusted and adjusted Odds Ratio for breastfeeding and socioeconomic factors.

|                  | Unadjusted | Adjusted   |
|------------------|------------|------------|
| **Separated/divorced** | 3.61 (0.84-14.19) | 0.42 (0.00-1.85) |
| **Education level** |            | <0.001     |
| ≤ 9 years        | 16.88 (8.74-30.09) | 4.11 (2.77-6.06) |
| 10–12 years      | 46.30 (33.73-59.36) | 24.75 (21.40-28.43) |
| ≥ 13 years       | 36.83 (25.09-50.36) | 71.14 (67.34-74.68) |
| **Income (quartile)** |          | 0.348      |
| 1 (low)          | 39.03 (27.98-51.32) | 31.84 (28.09-35.85) |
| 2 (middle low)   | 23.22 (14.72-34.63) | 26.21 (22.90-29.82) |
| 3 (middle high)  | 16.21 (9.02-27.41) | 24.39 (20.99-28.14) |
| 4 (high)         | 21.54 (12.71-34.12) | 17.55 (14.92-20.53) |
| **Employment**   |            | 0.546      |
| No               | 18.30 (10.56-29.83) | 21.54 (18.56-24.84) |
| Yes              | 81.70 (70.17-89.44) | 78.46 (75.16-81.44) |
| **Current Smoking status** |        | 0.142      |
| No               | 44.01 (31.84-56.95) | 54.15 (50.13-58.12) |
| Yes              | 55.99 (43.05-68.16) | 45.85 (41.88-49.87) |
| **Body mass index** |             | 0.902      |
| < 25 (kg/m\(^2\)) | 54.56 (41.49-67.04) | 53.70 (49.79-57.56) |
| ≥ 25 (kg/m\(^2\)) | 45.44 (32.96-58.51) | 46.30 (42.44-50.21) |

Values are presented as estimate (95% confidence interval).
|                                | Unadjusted OR (95% CI) | OR p-value | Adjusted OR a (95% CI) | p-value |
|--------------------------------|------------------------|------------|------------------------|---------|
| **Children’s information**     |                        |            |                        |         |
| **Sex**                        |                        |            |                        |         |
| Male                           | 1.19 (0.79-1.80)       | 0.404      | 0.90 (0.44-1.87)       | 0.782   |
| Female                         | Reference              |            | 0.96 (0.45-2.07)       | 0.917   |
| **Age**                        |                        |            |                        |         |
| ≤ 12 months                    | Reference              |            | Reference              |         |
| 13~24 months                   | 1.27 (0.76-2.13)       | 0.353      | 0.90 (0.44-1.87)       | 0.782   |
| ≥ 25 months                    | 1.68 (1.01-2.80)       | 0.048      | 0.96 (0.45-2.07)       | 0.917   |
| **Residence area**             |                        |            |                        |         |
| Rural                          | Reference              |            | Reference              |         |
| Urban                          | 1.19 (0.68-2.09)       | 0.540      |                        |         |
| **House income**               |                        |            |                        |         |
| Low                            | Reference              |            | Reference              |         |
| Middle low                     | 0.71 (0.27-1.87)       | 0.494      |                        |         |
| Middle high                    | 0.96 (0.36-2.54)       | 0.936      |                        |         |
| High                           | 1.05 (0.38-2.91)       | 0.926      |                        |         |
| **Mother’s information**       |                        |            |                        |         |
| **Age**                        |                        |            |                        |         |
| 20s                            | Reference              |            | Reference              |         |
| 30s                            | 1.49 (0.78-2.83)       | 0.225      |                        |         |
| ≥ 40s                          | 1.60 (0.72-3.57)       | 0.252      |                        |         |
| **Parity**                     |                        |            |                        |         |
| primipara                      | Reference              |            | Reference              |         |
| multipara                      | 1.12 (0.58-2.14)       | 0.741      |                        |         |
| **Education level**            |                        |            |                        |         |
| ≤ 9 years                      | Reference              |            | Reference              |         |
| 10~12 years                    | 1.03 (0.43-2.44)       | 0.954      | 0.53 (0.15-1.88)       | 0.328   |
| ≥ 13 years                     | 2.79 (1.21-6.42)       | 0.016      | 0.89 (0.24-3.35)       | 0.864   |
| **Income(quartile)**           |                        |            |                        |         |
| 1(low)                         | Reference              |            | Reference              |         |
| 2(middle low)                  | 1.54 (0.88-2.68)       | 0.132      | 1.15 (0.51-2.61)       | 0.740   |
| 3(middle high)                 | 2.30 (1.18-4.49)       | 0.015      | 1.56 (0.65-3.72)       | 0.316   |
| 4(high)                        | 1.45 (0.74-2.84)       | 0.278      | 0.70 (0.29-1.67)       | 0.420   |
| **Employment**                 |                        |            |                        |         |
| No                             | Reference              |            | Reference              |         |
| Yes                            | 1.61 (0.96-2.68)       | 0.070      |                        |         |
| **Current Smoking status**     |                        |            |                        |         |
| No                             | 3.07 (1.28-7.36)       | 0.012      | 0.45 (0.09-2.27)       | 0.335   |
| Yes                            | Reference              |            | Reference              |         |
| **Body mass index**            |                        |            |                        |         |
| < 25 (kg/m²)                   | 1.82 (1.12-2.95)       | 0.016      | 2.14 (1.12-4.09)       | 0.021   |
| ≥25 (kg/m²)                    | Reference              |            | Reference              |         |
| **Father’s information**       |                        |            |                        |         |
| **Age**                        |                        |            |                        |         |
| 20s                            | Reference              |            | Reference              |         |
| 30s                            | 4.88 (1.82-13.04)      | 0.002      | 6.16 (1.63-23.31)      | 0.008   |
| ≥40s                           | 2.72 (0.99-7.42)       | 0.051      | 3.94 (1.08-14.33)      | 0.037   |
| **Education level**            |                        |            |                        |         |
| ≤ 9 years                      | Reference              |            | Reference              |         |
| 10~12 years                    | 2.20 (0.89-5.39)       | 0.086      | 1.42 (0.42-4.84)       | 0.571   |
| ≥ 13 years                     | 7.94 (3.12-20.18)      | <0.001     | 4.48 (1.13-17.81)      | 0.033   |
| **Income(quartile)**           |                        |            |                        |         |
| Reference | 1(low) | 2(middle low) | 3(middle high) | 4 (high) |
|-----------|--------|---------------|----------------|---------|
| Reference | 1.38 (0.72-2.64) | 1.84 (0.86-3.94) | 0.99 (0.49-2.05) | **Employment** |
| No        | Reference | 1.23 (0.63-2.38) | 0.547 |
| Yes       | 1.50 (0.87-2.60) | 0.114 |
| Current Smoking status | Body mass index | 0.97 (0.56-1.68) | 1.15 (0.58-2.25) | 0.688 |
| No        | Reference | Reference | Reference | < 25(kg/m²) |
| Yes       | Reference | Reference | Reference | ≥25 (kg/m²) |

*Adjusted for mother's education, income, smoking status, body mass index and father's age, education.

**Discussion**

Using data from the KNHANES, this study demonstrated that socioeconomic factors affect breastfeeding. Children whose mothers have a higher education level, middle high income, no smoking and obese status were associated with breastfeeding, as were children whose fathers had high education level and 30s age.

Multiple factors influence breastfeeding. These factors were classified into four groups: demographic, biological, social, and psychological. Demographic factors that affect the breastfeeding rate include race, maternal age, marital status, socioeconomic status, and education level. In this study, we examined socioeconomic factors that affect breastfeeding.

Some studies showed that parental age did not affect breastfeeding. However, several previous reports showed that the older the mothers were more likely to breastfeed than were younger mothers. Oakely et al reported that the younger the mother was, the less likely she was to breastfeed or to stop breastfeeding within 6 weeks. We posit that younger mothers lack knowledge and awareness of breastfeeding. In this study, most parents were in their 30s and most breastfed their infants; mothers' age did not affect breastfeeding.

Banu et al stated that the higher the parents’ education level, the higher the exclusive breastfeeding rate and longer duration of the exclusive breastfeeding. In this study, parents’ education level was also related to breastfeeding. The higher the parents’ education level, the more it affected breastfeeding. It is believed that the higher education level coincides with increased opportunities to access information about the benefits of breastfeeding. In high-income countries, mother’s education level is positively associated with higher breastfeeding rate. Even for mothers with a job, breastfeeding rate is estimated to be high, because the higher the level of education, the higher the occupational status, the better the working environment and the better knowing the benefits of breastfeeding. In middle- and low-income countries,
the relationship between breastfeeding and mothers’ education level varies. Some studies have reported a negative relationship between mothers’ education level and the breastfeeding rate owing to quick return to work. Another study showed a higher parental education level was associated with a higher breastfeeding rate and exclusive breastfeeding. We found a positive association between father's education level and breastfeeding. Similar finding has been reported by Flacking et al, who found that the lower the fathers’ education level, the lower the breastfeeding rate. We posit that this is related to family income. Because higher education often results in a better income, mothers may not need to work and can focus on parenting. However, other study showed that mothers—but not fathers—education level was related breastfeeding, or that parental education level was not related to breastfeeding.

Wallby et al reported that higher breastfeeding rate in low-income households. This is believed to be due to the fact that there are no economic condition to choose a different formula besides breast milk and no easy finding a job for mother. Victoria et al stated that high-income, better-educated women breastfeed more commonly in high-income countries. Due to economic benefits, the lower the household’s gross income, the higher the breastfeeding in low-income and middle-income countries. However, in other studies, household income did not affect breastfeeding. In this study, there was no relationship between house income, the parental income and breastfeeding, however, the mothers of middle high income was related to breastfeeding.

Maternal job status is variable that has been associated with breastfeeding. Previous studies revealed that full-time houseswives have higher breastfeeding rates than mothers with work and the shorter the time to return to work after childbirth, the shorter the breastfeeding period. It is estimated that they stop breastfeeding because they have less time to care for the child while working. However, we did not find a significant association between breastfeeding and parental job status.

A consistent negative association between breastfeeding and maternal smoking has been well known in present study. Weiser et al showed that smoking during the postpartum period were associated with failure to initiate breastfeeding, also associated with weaning sooner. Nicotine increases dopamine secretion in the hypothalamus, thereby reducing prolactin levels. For this reason, helping mothers quit smoking is beneficial to the health of infants and children as it helps prolong breastfeeding duration. In our study, significant negative association with breastfeeding was observed for maternal smoking.

Baker et al suggested that maternal obesity can be considered as a risk factor to adverse breastfeeding outcome. There were some hypotheses trying to explain possible reasons why obese women are less likely to breastfeed; (1) large breast in obese women have been associated with breastfeeding practical difficulties; (2) excessive maternal adiposity may interfere with the development of the mammary glands; (3) delayed lactogenesis and lower prolactin response to suckling in obese women. Our result showed that obesity is associated with breastfeeding. But we were not clear on the possible reasons.
Importantly, our results shed light on some socioeconomic factors associated with breastfeeding; however, this study has some limitations. The utilized data were collected through self-report, and this is a source of recall bias which may have either underestimated or overestimated the relationship between the breastfeeding and socio-economic status. This study was conducted by breastfeeding status, it was not possible to investigate the effects of breastfeeding duration and type. Further, causal relationships cannot be confirmed owing to the cross-sectional design of the KNHANES. In addition to the factors used in this study, it is considered that studies on various social factors such as breastfeeding education, use of postpartum care center, parental leave, and establishment of a breastfeeding room in the workplace are necessary.

**Conclusion**

This population-based study demonstrated that socioeconomic factors (parental education level, mothers’ income, smoking and obese status and fathers’ age) affect breastfeeding. To increase the breastfeeding rate and exclusive breastfeeding, further research should explore the reasons why parents stop breastfeeding.

**Abbreviations**

KNHANES: Korea National Health and Nutrition Examination Survey

WHO: World Health Organization

OR: odd ratio

CI: confidence interval

BMI: Body mass index

**Declaration**

**Ethics approval and consent to participate**

All of the participants in the KNHANES were informed that they had been randomly chosen to participate in the survey with the right to participate in the further analyses, and signed an informed consent form. As this was a cross-sectional study that used and analyzed data from KNHANES (http://knhanes.cdc.go.kr/knhanes/), ethical approval was not required.

**Consent for publication**: Not applicable

**Availability of data and materials**
The datasets generated and/or analyzed during the current study are available from the Korea National Health and Nutrition Examination Survey (http://knhanes.cdc.go.kr/knhanes).

**Competing interests:** The authors declare that they have no competing interests

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**Authors’ contributions**

All authors have read and approved the manuscript

Conceptualization: THK. Data curation: THK, JSL. Formal analysis: THK, JSL. Investigation: THK, JSL. Methodology: THK, JSL. Writing-original draft: THK. Writing-review & editing: THK, JSL

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**Figures**

Participants (n=31,098) from the Korean National Health and Nutrition Examination Survey (KNHANES), 2013 ~ 2017

- **Inclusion**
  - Aged ≥12 months to <60 months: 1,534 participants

- **Exclusion** (if at least one of the following criteria were present):
  - No information regarding breastfeeding: 365 participants
  - No information regarding socioeconomics: 41 participants
  - Single parents: 314 participants

**Final study population:** N = 814

**Figure 1**

Flow chart of the sample selection process of the study population