A global study of the association of cesarean rate and the role of socioeconomic status in neonatal mortality rate in the current century

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Introduction

Caesarean section (C/S) rates have significantly increased across the world over the past decades. In the present population-based study, we sought to evaluate the association between C/S rate and neonatal mortality rates.

Materials and methods

This retrospective ecological study included longitudinal data of 166 countries from 2000 to 2015. We evaluated the association between C/S rates and neonatal mortality rate (NMR), adjusting for total fertility rate, human development index (HDI), gross domestic product (GDP) percentage, and maternal age at first childbearing. The examinations were also performed considering different geographical regions as well as regions with different income levels.

Results

Table 1 The relationship between NMR and each variable after adjusting for all other variables

Variables	Regression coefficient (95% CI)	Standard error	p-value*
C/S rate	-1.1 (-1.47, -0.73)	0.19	<0.001
TFR	1.88 (1.28, 2.47)	0.3	<0.001
HDI	-7.31 (-8.32, -6.3)	0.52	<0.001
GDP percentage	0.5 (0.02, 0.98)	0.25	0.04
Maternal age at first childbearing	-0.24 (-0.46, -0.021)	0.11	0.03
The interaction between C/S rate and HDI	0.97 (0.37, 1.57)	0.31	0.002
The interaction between C/S rate and GDP	0.38 (-0.16, 0.92)	0.28	0.17

CI Confidence Interval, C/S Cesarean Section, TFR Total Fertility Rate, HDI Human Development Index, GDP Gross Domestic Products
* Refers to the relationship between NMR and each variable after adjusting for all other variables
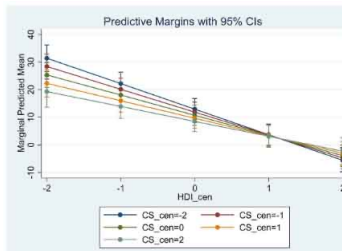
Fig. 1 Correlation between C/S rate and NMR according to HDI

Table 2 The relationship between NMR and C/S rate in the six WHO regions

Regions	Regression coefficient (95% CI)	Standard error	p-value*
AFR	-0.75 (-1.28, -0.23)	0.26	0.005
AMR	0.06 (0.004, 0.13)	0.03	0.04
EMR	0.01 (-0.18, 0.21)	0.1	0.88
EUR	-0.12 (-0.16, -0.09)	0.02	<0.001
SEAR	-0.41 (-0.72, -0.11)	0.15	0.01
WPR	-0.13 (-0.24, -0.02)	0.06	0.02

CI Confidence Interval, AFR Africa, AMR Americas, EMR Eastern Mediterranean, EUR Europe, SEAR South-East Asia, WPR Western Pacific
* Refers to the relationship between NMR and C/S rate after adjusting for all other variables

Table 3 The median of each variable according to four different levels of income groups

Income level, Median (Q25-Q75)	C/S rate	NMR	MMR	TFR	Age of first childbearing	HDI	GDP percentage	Health expenditure per capita
Group 1 (n=540)	22.14 (17.4-28.77)	2.8 (2.2-3.6)	8 (5.5-13)	1.61 (1.39-1.9)	29.51 (28.46-30.23)	0.87 (0.83-0.9)	8 (6.8-9.29)	2280 (1040.11-4192.9)
Group 2 (n=300)	21.39 (14.64-29.61)	9.65 (6.8-15.48)	35 (17.75-47.25)	1.88 (1.54-2.36)	27.3 (26.46-28.17)	0.73 (0.7-0.76)	5.89 (4.91-7.4)	277.67 (148.15-430.13)
Group 3 (n=177)	8.85 (4.6-15.18)	18.1 (12.55-25.95)	71.5 (29.75-122.5)	2.6 (1.69-3.5)	28.12 (26.83-29.04)	0.63 (0.56-0.68)	5.66 (4.47-6.71)	67.4 (35.06-121.62)
Group 4 (n=62)	2.95 (1.68-4.5)	31.65 (27.93-38.8)	450 (350.75-698.5)	5.31 (4.62-6.05)	29.21 (28.56-29.87)	0.44 (0.39-0.47)	5.45 (4.36-8.25)	25.12 (15.38-36.39)

C/S Cesarean Section, NMR Neonatal Mortality Rate, MMR Maternal Mortality Rate, TFR Total Fertility Rate, HDI Human Development Index, GDP Gross Domestic Products

Conclusion

This study indicated that NMR associated with C/S is dependent on various socioeconomic factors such as total fertility rate, HDI, GDP percentage, and maternal age at first childbearing. Further attentions to the socio-economic status are warranted to minimize the NMR by modifying the C/S rate to the optimum cut-off.

Key words

Caesarean section rate, Human development index, Neonatal mortality