

ORIGINAL ARTICLE



The association between postpartum depression and early childhood caries

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ABSTRACT

Objective: To determine whether postnatal depression was associated with early childhood caries (ECC).

Methods: This cross-sectional study was nested in a large cohort study named Born in Guangzhou Cohort Study (BIGCS). Mothers were invited to answer the Chinese version of Edinburgh Postpartum Depression Scale (EPDS) at 11–14 months postpartum. Children's ECC experience was assessed at 24–37 months old. Socio-demographic factors were collected by a self-completed questionnaire. Chi-square test was used for bivariate analysis, and binary logistic regression was used for multivariable analysis.

Results: Totally 337 mother/children pairs were included into this study. Among them, 33 children had caries experience, accounting for 9.8% of the participants. Mothers with EPDS scores between 7 and 10 were associated with worse ECC experience of their children (adjusted OR = 2.948, 95% CI = 1.209–7.190), whereas mothers with EPDS scores higher than 10 were not associated with ECC experience of their children. Mother's education and the number of children living together were also associated with children's ECC experience (adjusted OR = 1.822, 95% CI = 1.013–3.275, and adjusted OR = 1.528, 95% CI = 1.086–2.150, respectively). Other factors such as maternal age at the time of conception, family income, mother's work status, duration of breastfeeding, and children's gender did not show effect on children's ECC experience.

Conclusion: Postnatal depression could be associated with children's ECC experience. In this study, mothers with slightly depression symptoms were more likely to have adverse effects on their children's ECC experience.

ARTICLE HISTORY

Received 7 June 2019

Revised 25 December 2019

Accepted 27 January 2020

KEYWORDS

Postpartum depression;
early childhood caries;
socio-demographic factors

Introduction

Postpartum depression (PPD) is a type of depression that affects some women after giving birth to an infant. Symptoms include sadness, changes in sleeping and eating patterns, low energy, anxiety, and irritability [1]. The results of a follow-up study showed that at least half of the depressed mothers had not recovered by the end of the first postpartum year; and that postnatal depression was usually recalled by the mothers three years later [2]. PPD is known to have adverse effects on child's physical and cognitive development [3–7]. For example, maternal depression has been linked to health-related behaviours that affect children's general health, including poorer patterns of feeding children, poorer child-rearing behaviours, and child abuse [8–10]. Studies have shown that children of such depressed mothers may develop behaviour disturbance at three years or cognitive defects at four years [11–13].

Since children are dependent upon the caregiver to provide, teach, and monitor appropriate preventive oral health behaviours, researchers were interested in whether maternal depression could lead to oral health problems of their children, especially early childhood caries (ECC) [14–23]. ECC is

defined as the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surface on any primary tooth in children up to 71 months of age [24]. To date, some studies confirmed the association between maternal depression and ECC [14,16–18,20,22,23], while other studies denied it [15,19]. In addition, to our knowledge, there is no research on the association between postnatal depression and ECC.

The aim of this study was to assess whether mother's postnatal depression could affect children's caries experience at 24–37 months old in a Chinese population.

Methods

This cross-sectional study is nested in the cohort study of Born in Guangzhou Cohort Study (BIGCS) [25,26]. BIGCS is a large-scale prospective study of mothers and their children from the prenatal period to adult life in the urban setting of Guangzhou, China. This cohort recruits women during early pregnancy at two campuses of the Guangzhou Women and Children's Medical Center (GWCMC). This centre is one of the largest tertiary hospitals in China, with 18,000–20,000 annual deliveries of 220,000 total births in the Guangzhou

municipality. Eligible women were those of Chinese nationality, living in Guangzhou who were at <20 weeks of gestation and who intended to deliver at one of the two GWCMC campuses. Further criteria included ability to complete questionnaires in Mandarin or Cantonese language and an intention to remain in Guangzhou for at least three years after delivery. Informed written consent was obtained from all participants and they can withdraw at any stage of the study. Children with birth defect or medical history of surgery were excluded from this study.

Data collection

Mothers reported their depressive symptoms using the Chinese version of Edinburgh Postpartum Depression Scale (EPDS) at 11–14 months postpartum. EPDS questionnaire has been validated in Chinese population [27]. The questionnaire is a 10-item scale and answers are on a 4-point Likert scale from 0 to 3. The total score range is from 0 to 30; a higher score indicates a higher level of depressive symptoms. The questionnaire can be completed in about 5 min. It has been validated and used widely in many populations [28,29].

In China, it is the routine to receive physical examination before kindergarten recruitment. Therefore, in this cohort children came back for oral examination at GWCMC's child health care clinics at 24–37 months old. Caries experience was recorded as positive if there was detectable decayed cavity, missing or filled tooth surface due to caries on any tooth. A trained member of the research team performed the oral examination. First parents and children were asked whether children had received treatment of dental caries. If there were missing teeth, the information about the reason of missing was collected. Then the examiner performed oral examination with a disposable oral mirror and probe. Only those caries cavity that could be detected by probe were recorded as caries positive. Intra-examiner's reliability was tested before the study by reassessing caries experience of 43 colleagues after 2 weeks of the first assessment. The reliability was calculated by intra-class correlation coefficient and the result was 0.996.

Socio-demographic information was collected from a self-completed questionnaire. The information included maternal age at the time of conception, mother's education (primary school and below, junior school, technical secondary school, high school, college, bachelor, master, PhD, and above), family income (no income, <1500RMB, 1501–4500RMB, 4501–9000RMB, 9001–35,000RMB, 35,001–55,000RMB, 55,001–80,000RMB, refuse to answer, unknown), mother's work status (no, yes), duration of breastfeeding (months), children's gender, and the number of people under age 18 living together. The questionnaire was first distributed to colleagues to test whether it is easy to understand. Then the refined questionnaire was distributed to mothers in this study.

Statistical methods

There was no previous study about the effect of postnatal depression on children's oral health in China. Therefore, the

caries prevalence of general population was used for crude sample size estimation in this study. In China, the caries prevalence of children at 2–3 years old was varied from 20% to 40% [30,31]. In a meta-analysis, the pooled ECC prevalence of children at 2 and 3 years old was 17.3% and 40.2%, respectively [32]. In this study, the caries prevalence for the controlled group was estimated as 20%. With odds ratio (OR) of approximately 2 [18], $\alpha = 0.05$, $\beta = 0.2$, the sample size of mother/children pairs should be 249.

Data were analysed with SPSS (version 22, SPSS Inc., Chicago, IL). First, the percentage of caries-positive children within each variable category was compared using chi-square test. Second, all variables were modelled using binary logistic regression (backward stepwise: likelihood ratio). The dependent variable was caries experience (positive or not), while the independent variables were EPDS scores (classified into three groups with tertile values as cut-off points), and the potential confounding variables were maternal age at the time of conception (<=25 years, 26–30 years, 31–35 years, >=36 years), mother's education (below college, college, bachelor, above bachelor), family income (<=4500RMB, 4501–9000RMB, 9001–35,000RMB, >35,000RMB), mother's work status (no, yes), the duration of breastfeeding (<=12 months, 13–18 months, 19–24 months, >24 months), children's gender (male, female), and the number of people under age 18 living together.

Results

Totally 476 children participated the oral examination from June 2018 to December 2018. Among them, 4 children had birth defect, 3 children had a medical history of surgery before 11–14 months old, 19 more children had a medical history of surgery before 24–37 months old, and 114 subjects had not filled out the EPDS questionnaire at 11–14 months postpartum. Finally 337 mother/children pairs were included into this study. Among them, 13 subjects had missing data in family income, and 9 had missing data in EPDS questionnaire. The missing data were filled with the mode of the data in the corresponding category.

The descriptive data of the participants and the comparison of the included group and the non-responder group are presented in Table 1. There were no background differences between the two groups, except that mothers in the non-responder group were younger than the included group. For the included group, mother's age at the time of conception was from 23 to 41 years old, with mean age (SD) as 29.98 (3.70) years old. About 76 per cent mothers had a bachelor level or higher education, and about 78 per cent mothers had to work to support their family. About 86 per cent mothers kept the breastfeeding duration less than 18 months. Approximately 66 per cent of the participants had only 1 child in their family.

The EPDS scores ranged from 1 to 26, with mean (SD) as 8.12 (4.63) and tertile values as 7 and 10. The mean age (SD) of children participating in oral examination was 32.36 (2.47) months old. Totally 33 children had caries experience, accounting for 9.8% of the participants.

Table 1. The comparison between included group and non-responder group.

	Responder group		Non-responder group		<i>p</i> Value
	<i>n</i>	Percentage	<i>n</i>	Percentage	
Maternal age at the time of conception					
< =25	28	8.30%	4	3.50%	.032*
26–30	177	52.50%	66	57.90%	
31–35	86	25.50%	37	32.50%	
> =36	46	13.60%	7	6.10%	
Mother's education					
Below college	11	3.30%	5	4.40%	.953
College	70	20.80%	23	20.20%	
Bachelor	207	61.40%	69	60.50%	
Above bachelor	49	14.50%	17	14.90%	
Family income					
< =4500RMB	39	11.60%	19	16.70%	.505
4501–9000RMB	157	46.60%	47	41.20%	
9001–35,000RMB	131	38.90%	44	38.60%	
>35,000RMB	10	3.00%	4	3.50%	
Mother's work status					
No	75	22.30%	21	18.40%	.387
Yes	262	77.70%	93	81.60%	
Duration of breastfeeding					
< =12	206	61.10%	80	70.20%	.171
13–18	85	25.20%	18	15.80%	
19–24	28	8.30%	8	7.00%	
>24	18	5.30%	8	7.00%	
Gender					
Male	174	51.60%	59	51.80%	.982
Female	163	48.40%	55	48.20%	
The number of people under age 18 living together					
0	223	66.20%	72	63.20%	.368
1	96	28.50%	38	33.30%	
2	9	2.70%	2	1.80%	
3	2	0.60%	1	0.90%	
4	5	1.50%	0	0.00%	
5	0	0.00%	1	0.90%	
6	2	0.60%	0	0.00%	

Bivariate analysis showed a significant association between ECC experience and EPDS scores, mother's education, and the number of people under age 18 living together (Table 2). Binary logistic regression presented the same results with bivariate analysis (Table 3). EPDS scores were associated with children's ECC experience. However, when comparing the three EPDS groups, the difference was only shown between the middle EPDS score group and the lower EPDS score group. Compared to children with mother's EPDS scores lower or equal to 6, children with mother's EPDS scores between 7 and 10 had significantly higher possibility of having ECC (adjusted OR = 2.948, 95% CI = 1.209–7.190).

Mother's education was linked to children's ECC experience. Higher education level was associated with higher possibility of ECC experience (adjusted OR = 1.822, 95% CI = 1.013–3.275). The number of people under age 18 living together also affected children's ECC experience. A higher number was associated with a higher likelihood of children's ECC experience (adjusted OR = 1.528, 95% CI = 1.086–2.150).

Discussion

This cross-sectional study aimed to determine whether postnatal depression was associated with children's ECC experience. Mothers were invited to fill out EPDS questionnaire at 11–14 months postpartum, and their children received oral examination at 24–37 months old. The result showed that

although EPDS scores was a risk factor of ECC experience, the effect was only shown in EPDS scores between 7 and 10. EPDS scores higher than 10 did not show effects on ECC experience. Higher mother's education and living with more people under age 18 were also associated with children's ECC experience.

The association between maternal depression and children's cognitive development, emotional/social functioning, behaviour problems, and psychiatric disorders has been confirmed by many studies [5,7,13,33,34]. In Cambridge, a community sample of children of mothers who had had postnatal depression were found to perform significantly less well on cognitive tasks at 18 months than did children of well mothers [12,35]. Two London studies of more socio-economically disadvantaged populations found that this effect still obtained when the children were 4–5 years old [11,12]. Based on these studies, the possible explanations for the association between maternal depression and children's ECC experience may be as follows. First, oral health practices for infants and toddlers are the responsibility of the caregivers before the child masters his or her own oral self-care skills. A higher perceived level of depression might lead to less frequent and/or less effective oral health behaviours for their children [15]. Second, a study showed that depressive symptoms were significantly associated with abundant lactobacillus growth [36]. It is possible that children with depressed mothers were more likely to get caries bacteria because oral organisms in children can be transmitted from

Table 2. Association between variables and ECC experience.

	<i>n</i>	Caries positive (%)	<i>p</i> Value
EPDS scores			
< =6	132	6.1	.018*
7–10	110	16.4	
> 10	95	7.4	
Maternal age at the time of conception			
< =25	28	3.6	.607 [†]
26–30	177	10.7	
31–35	86	11.6	
> =36	46	6.5	
Mother's education			
Below college	11	0.0	.034 ^{†*}
College	70	4.3	
Bachelor	207	11.6	
Above bachelor	49	12.2	
Family income			
< =4500RMB	39	2.6	.363 [†]
4501–9000RMB	157	11.5	
9001–35,000RMB	131	9.9	
> 35,000RMB	10	10.0	
Mother's work status			
No	75	10.7	.773
Yes	262	9.5	
Duration of breastfeeding			
< =12	206	9.7	.491 [†]
13–18	85	8.2	
19–24	28	17.9	
> 24	18	5.6	
Gender			
Male	174	9.8	.989
Female	163	9.8	
The number of people under age 18 living together			
0	223	8.5	.044 ^{†*}
1	96	11.5	
2	9	11.1	
3	2	0.0	
4	5	0.0	
6	2	100.0	

[†]Fisher's exact test; ^{*}Linear-by-linear association (one-sided, exact); others used Pearson chi-square test.

**p* < .05.

Table 3. Final model of logistic regression for ECC experience.

	Adjusted OR	95% CI	<i>p</i> Value
EPDS scores			
< =6 ^a			
7–10	2.948	1.209, 7.190	.017*
> 10	1.206	0.416, 3.495	.731
Mother's education	1.822	1.013, 3.275	.045*
The number of people under age 18 living together	1.528	1.086, 2.150	.015*

Statistical method: binary logistic regression (backward stepwise: likelihood ratio), probability for stepwise: entry: 0.05, removal: 0.10.

^aReference group.

**p* < .05.

mothers [37–39]. Third, maternal depression may have negative influence on their children's dental fear and dental attendance [21,40], which could affect their children's oral health as well.

The EPDS is a questionnaire that was sensitive to the severity of depression. Higher score represents higher possibility of post-natal depression. It was reported that an EPDS score of 9/10 could be used as the optimal cut-off for the Chinese population [27]. When a low false negative rate is desired, a cut-off score of 6/7 could be used [27]. In this study, EPDS scores were divided into three groups with tertile values of 7 and 10 as cut-off scores. Therefore, the upper tertile group, i.e. mothers with

scores higher than 10, could be defined as mothers with depression, while the middle tertile group, i.e. mothers with scores between 7 and 10, could be defined as mothers nearly with depression. One interesting result is that compared with the non-depression group, it was the nearly depression group, but not the depression group, that was associated with children's ECC experience. There may be three possible explanations for this situation. First, mothers with depression may exhibit symptoms that draw outside attention of their life partner or relatives and could get more help for childcare, while mothers with nearly depression have not shown much depression symptoms and hence have more pressure to take care of their children. Second, it is also possible that the sample size of this study was not enough to detect the difference between depression group and non-depression group. Because there is no previous research about the prevalence of ECC in children with depressed mothers in China, this study took the caries prevalence of general population, which is 20%, as caries prevalence of non-depression group. In addition, the test power was set to be 80%, which means the probability of rejecting a false H_0 is 80% [41]. The sample size should be larger if the test power was set to be 90%. Third, children in this study were still young and the pathological process of caries had not been fully shown out yet, i.e. the hazard factors had not fully exhibit their effect yet. The BIGCS started to recruit subjects in 2012 and now started to follow-up children at six years of age. The result of six years may give more substantial evidences.

Living in a family with few children has been reported to be associated with less caries in children [42–44]. This result was supported by this study. A conflicting result of this study with other studies was that mother's education had negative influence on children's ECC experience, i.e. the higher the mother's education, the higher the possibility of their children having ECC experience. Possible explanations were that in this urban population, mothers shoulder responsibilities to contribute to their family income. In this study, about 78 per cent of mothers had to work to support their family. In China, a higher education leads to a higher work burden or pressure and less attention to childcare [45,46]. Therefore, mothers with higher education level may spend less time on the management of their children's oral health. On the other hand, the fact that ECC rate did not decrease with mother's education level illustrated that there is still a lack of knowledge about ECC in China. Thus, there is a need to generalize the knowledge of caries prevention.

When looking at the limitation of this study, the following aspects should be considered. First, the sample was selected from mothers who intended to deliver at one of the two GWCMC campuses. Although this centre is one of the largest tertiary hospitals in China, subjects in this study could not be recognized as a representative sample of the population. Second, only mothers who had ability to complete questionnaires in Mandarin or Cantonese language were recruited into this study. This may have a potential to exclude mothers with lower literacy. Third, this study did not identify whether mothers were the main caregivers of their children. Mother's medical condition and oral health status were not collected as well. Forth, children's oral hygiene status and oral health

practices were not assessed in this study. These factors should be included in future study. Fifth, the ECC prevalence in this study was 9.8%, lower than 20–40% in other studies [30–32]. This may be because the different criteria of caries examination. Another possible explanation was that literature reports the prevalence of ECC is between 1% and 12% in developed nations [47]. Guangzhou is one of the first ports in China to initiate global trading and is developing into a cosmopolitan city. Furthermore, mothers receiving antenatal care at the GWCMC are likely to be more affluent and older and have higher education than the contemporary pregnant women in Guangzhou [25]. The economic and social developments in these families may have an impact on their children's ECC prevalence. Despite these possible explanations, further studies with larger sample size should provide more evidence on the association between postnatal depression and ECC experience.

Conclusion

The association between postnatal depression and ECC experience was studied in an urban population. Postnatal depression could be associated with ECC experience, but the significant result was only shown in mothers with nearly depression. Subjects will be further followed-up at six years old. The longitudinal data should generate more evidence on the association between maternal depression and children's ECC experience.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

BIGCS study is supported by the National Natural Science Foundation of China (81673181), the Guangzhou Science Technology and Innovation Commission (201508030037, 2014A020213022), and the Guangdong Provincial Department of Science and Technology (2012J5100038).

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Data availability statement

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

References

- Wisner KL, Parry BL, Piontek CM. Postpartum depression. *N Engl J Med*. 2002;347(3):194–199.
- Cox JL, Rooney A, Thomas P, et al. How accurately do mothers recall postnatal depression? Further data from a 3 year follow-up study. *J Psychosom Obstet Gynecol*. 1984;3(3-4):185–189.
- Quevedo LA, Silva RA, Godoy R, et al. The impact of maternal post-partum depression on the language development of children at 12 months. *Child Care Health Dev*. 2012;38(3):420–424.
- Netsi E, Pearson RM, Murray L, et al. Association of persistent and severe postnatal depression with child outcomes. *JAMA Psychiat*. 2018;75(3):247–253.
- Murray L, Cooper PJ. Postpartum depression and child development. *Psychol Med*. 1997;27(2):253–260.
- Ismail AI. Determinants of health in children and the problem of early childhood caries. *Pediatr Dent*. 2003;25(4):328–333.
- Mirhosseini H, Moosavipoor SA, Nazari MA, et al. Cognitive behavioral development in children following maternal postpartum depression: a review article. *Electron Physician*. 2015;7(8):1673–1679.
- Cadzow SP, Armstrong KL, Fraser JA. Stressed parents with infants: reassessing physical abuse risk factors. *Child Abuse Negl*. 1999;23(9):845–853.
- Carson DK, Schauer RW. Mothers of children with asthma: perceptions of parenting stress and the mother-child relationship. *Psychol Rep*. 1992;71(3_suppl):1139–1148.
- Masterson EE, Sabbah W. Maternal allostatic load, caretaking behaviors, and child dental caries experience: a cross-sectional evaluation of linked mother-child data from the third National Health and nutrition examination survey. *Am J Public Health*. 2015;105(11):2306–2311.
- Cogill S, Caplan H, Alexandra H, et al. Impact of maternal postnatal depression on cognitive development of young children. *Br Med J (Clin Res Ed)*. 1986;292(6529):1165–1167.
- Cooper PJ, Murray L. Postnatal depression. *BMJ*. 1998;316(7148):1884–1886.
- Wrate R, Rooney A, Thomas P, et al. Postnatal depression and child development: a three-year follow-up study. *Br J Psychiatry*. 1985;146(6):622–627.
- Wendt L-K, Svedin C-G, Hallonsten A-L, et al. Infants and toddlers with caries. Mental health, family interaction, and life events in infants and toddlers with caries. *Swed Dent J*. 1995;19(1-2):17–27.
- Quinonez RB, Keels M, Vann W, Jr., et al. Early childhood caries: analysis of psychosocial and biological factors in a high-risk population. *Caries Res*. 2001;35(5):376–383.
- Al-Jewair TS, Leake JL. The prevalence and risks of early childhood caries (ECC) in Toronto, Canada. *J Contemp Dent Pract*. 2010;11(5):1–8.
- Finlayson TL, Siefert K, Ismail AI, et al. Psychosocial factors and early childhood caries among low-income African-American children in Detroit. *Commun Dent Oral Epidemiol*. 2007;35(6):439–448.
- Bonanato K, Paiva SM, Pordeus IA, et al. Relationship between mothers' sense of coherence and oral health status of preschool children. *Caries Res*. 2009;43(2):103–109.
- Tang C, Quinonez RB, Hallett K, et al. Examining the association between parenting stress and the development of early childhood caries. *Community Dent Oral Epidemiol*. 2005;33(6):454–460.
- Dos Santos Pinto G, de Avila Quevedo L, Britto Correa M, et al. Maternal depression increases childhood dental caries: a cohort study in Brazil. *Caries Res*. 2017;51(1):17–25.
- Freire M, Hardy R, Sheiham A. Mothers' sense of coherence and their adolescent children's oral health status and behaviours. *Community Dent Health*. 2002;19(1):24–31.
- Seow W, Clifford H, Battistutta D, et al. Case-control study of early childhood caries in Australia. *Caries Res*. 2009;43(1):25–35.
- Menon I, Nagarajappa R, Ramesh G, et al. Parental stress as a predictor of early childhood caries among preschool children in India. *Int J Paediatr Dent*. 2013;23(3):160–165.
- Drury TF, Horowitz AM, Ismail AI, et al. Diagnosing and reporting early childhood caries for research purposes: a report of a workshop sponsored by the National Institute of Dental and Craniofacial Research, the Health Resources and Services Administration, and the Health Care Financing Administration. *J Public Health Dent*. 1999;59(3):192–197.
- Qiu X, Lu J-H, He J-R, et al. The born in Guangzhou cohort study (BIGCS). *Eur J Epidemiol*. 2017;32(4):337–346.

- [26] Cyranoski D. Gigantic study of Chinese babies yields slew of health data. *Nature*. 2018;559(7712):13–14.
- [27] Lee DTS, Yip SK, Chiu HFK, et al. Detecting postnatal depression in Chinese women: validation of the Chinese version of the Edinburgh Postnatal Depression Scale. *Br J Psychiatry*. 1998; 172(5):433–437.
- [28] Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry*. 1987;150(6):782–786.
- [29] Cox J, Holden J. Perinatal mental health: a guide to the Edinburgh Postnatal Depression Scale (EPDS). London: Royal College of Psychiatrists; 2003.
- [30] People's Government of Beijing Municipality. The report of hygiene and population health condition of Beijing in 2010 (In Chinese). People's Medical Publishing House. 2010;25–26 (69 Chinese).
- [31] Zhou Y, Lin HC, Lo EC, et al. Risk indicators for early childhood caries in 2-year-old children in southern China. *Aust Dent J*. 2011; 56(1):33–39.
- [32] Zhang X, Yang S, Liao Z, et al. Prevalence and care index of early childhood caries in mainland China: evidence from epidemiological surveys during 1987–2013. *Sci Rep*. 2016;6(1):18897.
- [33] Ali NS, Mahmud S, Khan A, et al. Impact of postpartum anxiety and depression on child's mental development from two peri-urban communities of Karachi, Pakistan: a quasi-experimental study. *BMC Psychiatry*. 2013;13(1):274.
- [34] Turkcapar AF, Kadioğlu N, Aslan E, et al. Sociodemographic and clinical features of postpartum depression among Turkish women: a prospective study. *BMC Pregnancy Childbirth*. 2015; 15(1):108.
- [35] Murray L, Fiori-Cowley A, Hooper R, et al. The impact of postnatal depression and associated adversity on early mother-infant interactions and later infant outcome. *Child Dev*. 1996;67(5): 2512–2526.
- [36] Anttila SS, Knuuttila MLE, Sakki TK. Depressive symptoms favor abundant growth of salivary lactobacilli. *Psychosom Med*. 1999; 61(4):508–512.
- [37] Wakaguri S, Aida J, Osaka K, et al. Association between caregiver behaviours to prevent vertical transmission and dental caries in their 3-year-old children. *Caries Res*. 2011;45(3):281–286.
- [38] Dzidic M, Collado MC, Abrahamsson T, et al. Oral microbiome development during childhood: an ecological succession influenced by postnatal factors and associated with tooth decay. *ISME J*. 2018;12(9):2292–2306.
- [39] Chaffee BW, Gansky SA, Weintraub JA, et al. Maternal oral bacterial levels predict early childhood caries development. *J Dent Res*. 2014;93(3):238–244.
- [40] Costa VPP, Correa MB, Goettems ML, et al. Maternal depression and anxiety associated with dental fear in children: a cohort of adolescent mothers in Southern Brazil. *Braz Oral Res*. 2017;31:e85.
- [41] Cohen J. A power primer. *Psychol Bull*. 1992;112(1):155–159.
- [42] Christensen LB, Twetman S, Sundby A. Oral health in children and adolescents with different socio-cultural and socio-economic backgrounds. *Acta Odontol Scand*. 2010;68(1):34–42.
- [43] Harris R, Nicoll AD, Adair PM, et al. Risk factors for dental caries in young children: a systematic review of the literature. *Community Dent Health*. 2004;21(1 Suppl):71–85.
- [44] Neves ÉTB, Perazzo MF, Gomes MC, et al. Association between sense of coherence and untreated dental caries in preschoolers: a cross-sectional study. *Int Dent J*. 2019;69(2):141–149.
- [45] Du F, Dong X-y. Women's employment and child care choices in urban China during the economic transition. *Economic Develop Cultural Change*. 2013;62(1):131–155.
- [46] Ma X, Zhang J. The Timing of Childbearing and Female Labor Supply in China. Institute of Economic Research, Hitotsubashi University; 2018. (Technical Report. CEI Working Paper Series, No. 2018-9).
- [47] Rai NK, Tiwari T. Parental factors influencing the development of early childhood caries in developing nations: a systematic review. *Front Public Health*. 2018;6:64.