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The Interrelationships Among Acculturation, Social Support, and Postpartum Depression Symptoms Among Marriage-Based Immigrant Women in Taiwan: A Cohort Study

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Abstract This cohort study assessed the structural relationships among social support, acculturation, and postpartum depressive symptoms experienced by marriage-based immigrant mothers in Taiwan. Data were collected at 1 and 6 months postpartum from 203 immigrant mothers married to Taiwanese men in Taipei, Taiwan. The structural equation modeling results showed that social support and postpartum depression were directly and negatively related. Higher social support and lower depression at 1 month postpartum were related to a positive social attitude (i.e., accepting attitude toward mainstream society). Social attitude was a moderator of the relationship between depression at 1 month and social support at 6 months postpartum, where a positive social attitude decreased the negative effect of depression at 1 month on social support at 6 months. Social support in the early postpartum period not only directly decreased postpartum depression, but also indirectly decreased postpartum depression through improving social attitude.

Keywords Postpartum depression · Acculturation · Social support · Structural equation modeling (SEM) · Moderation

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Background

In accordance with the trend of globalization, the number of marriage-based immigrant women who immigrate to countries other than their birth country due to international marriage is increasing around the world. During the past few decades, increasing numbers of foreign women have married and immigrated to Taiwan. Over 96 % of the marriage-based immigrant women in Taiwan are from South-East Asian countries, with the majority from China (roughly 67 %) and Vietnam (roughly 19 %) [1]. One-eleventh of all births in Taiwan in 2010 were attributable to immigrant mothers [2].

Acculturation is an important predictor of mental well-being among immigrants [3, 4]. The stress of acculturation results in a high rate of postpartum depression among immigrant mothers [5–9]. Immigrant women in Taiwan usually immigrate by themselves, without any family and friends from the mother country, and their marriages generally lack affection as the basis. Additionally, immigrant mothers often face birth soon after moving to Taiwan [10].

Lack of social support and high postpartum depression are important issues among marriage-based immigrant women giving birth in Taiwan. Most previous studies show a negative association between social support and postpartum depression [11–13]. Randomized controlled trials

demonstrated that social support intervention is effective in decreasing postpartum depression [14]. A previous study found that immigrant women in Taiwan had a higher prevalence of postpartum depression and a lower level of social support than did native women [15].

Acculturation is the level of adjusting to a new society and culture which are different from the person's original social and cultural background [16]. Researchers have measured acculturation with different indicators, including country of birth, duration of immigration, language ability, cultural participation (indicated by food and music preferences, media usage, and religious activities), ethnic interaction (e.g., interaction with people in mainstream society, social relationships, and social assimilation), and ethnic values and attitudes (e.g., social attitude) [17–19]. This concept is still developing and there is no consensus about the best way to measure it [18]. But it is increasingly recognized that acculturation should be a multidimensional concept [19].

A previous study showed that lack of social support and lower levels of acculturation were independent predictors of postpartum depression among immigrant women [7]. Nonetheless, the mechanism linking these three variables remained unclear. This study assessed the structural relationships among social support, acculturation, and postpartum depressive symptoms among marriage-based immigrant mothers in Taiwan. We first examined the relationship between social support and postpartum depressive symptoms at 1 and 6 month postpartum. Then we further examined the effects of acculturation on the relationship between social support and postpartum depression.

Methods

This prospective cohort study used a structured questionnaire completed at 1 and 6 months postpartum. The data collection period was from September 2008 through December 2009.

Participants

The study population was immigrant women from China or Vietnam who just gave birth to a child and lived in the five districts of Taipei City, including Bei-Tou, Shih-Lin, Nei-Hu, Nan-Kang, and Wan-Hua. Immigrant women were registered and monitored by the District Health Center after delivery. We cooperated with the five District Health Centers to recruit the study participants. Immigrant women who were registered at the five centers, older than 18 years of age, and who just gave birth to a child were contacted by a research assistant regarding the purpose of the study, and a brief description of the study, along with

assurances of confidentiality, and the right to refuse to participate in the study were given. Those women who agreed to participate in the study signed a consent form and provided their contact information. The study was approved by the institutional review board of National Yang-Ming University.

Of the 338 eligible women, 317 women (93.8 %) were successfully contacted and 226 women (71.3 %) completed the first interview at 1 month postpartum. Of the 226 women, 203 women (89.8 %; 137 from China and 66 from Vietnam) completed the follow-up interview at 6 months postpartum and were the study subjects. We compared those who completed the second interview and those who were lost to follow-up and found there were no significant differences in age, educational level, or duration of immigration between the two groups. The lost-to-follow-up group had lower mean scores for social support (26.52 vs. 29.76, $p = 0.14$) and postpartum depression (6.67 vs. 9.74, $p = 0.08$) at 1 month postpartum, but the differences were not statistically significant.

Measures

A structured questionnaire was completed through face-to-face or telephone interviews at 1 and 6 month postpartum at the women's convenience. A phone call was made to set up time and place for the follow-up interview 7–10 days before the indicated time for the follow-up. To examine the potential mode effect, we compared characteristics between women who were interviewed in person and those interviewed on the telephone. There were no significant differences between the two groups in the mean scores for social support (face to face: 29.71, telephone: 29.94, $p = 0.89$) and postpartum depression (face to face: 6.79, telephone: 6.30, $p = 0.61$).

The study variables at 1 month postpartum included background variables such as immigrant women's age, immigrant women's educational level, immigrant women's work status, family socio-economic status, and parity, as well as acculturation variables such as duration of living in Taiwan (month), local language ability, social assimilation, and social attitude. Social support and postpartum depressive symptoms were also assessed. Social support and postpartum depression symptoms were assessed again at 6 months postpartum.

Family socio-economic status was measured using the Hollingshead's Two-Factor Index of Social Position, which is composed of occupational and educational level of spouses [20]. Family socio-economic status was divided into low (11–29 points), middle (30–40 points), and high (41–55 points) based on the index scores.

The duration of living in Taiwan was reported as the number of months living in Taiwan. The ability to use the

local language (Chinese) was measured using a 4-item, 5-point Likert scale from 1 (very poor) to 5 (very good) for listening, speaking, reading, and writing ability. Social assimilation was defined as integration into mainstream society. Social attitude was defined as accepting attitudes toward mainstream society. Social assimilation and social attitude were measured using 2-item and 6-item 4-point Likert-scale, respectively. Higher scores indicated higher levels of social assimilation and better social attitude (greater acceptance of mainstream society). This scale has been used previously among immigrant women in Taiwan [15]. The internal consistency, as assessed using Cronbach's alpha, was 0.75 for social assimilation and 0.71 for social attitude in this study.

Social support was measured by a 12-item, 5-point Likert scale with a possible range from 12 to 60. Higher scores indicated better social support. This scale demonstrated acceptable reliability and validity in a previous study of marriage-based immigrant women in Taiwan [15]. The internal consistency of this scale, as assessed using Cronbach's alpha in this study, was 0.84 at 1 month postpartum and 0.83 at 6 months postpartum.

Depression was measured using the Chinese version of the Edinburgh Postnatal Depression Scale (EPDS). The EPDS includes 10 Likert-scale items with scores ranging from 0 to 30 points, with higher scores indicating higher depressive symptoms. The EPDS is used extensively to measure depression among postpartum women of different cultural backgrounds [9, 21–24]. The reliability and validity of the Chinese-version EPDS was previously demonstrated among marriage-based immigrant women in Taiwan [24]. The internal consistency of the EPDS, as assessed by Cronbach's alpha in this study, was 0.85 at 1 month postpartum and 0.82 at 6 months postpartum.

Data Analysis

The study variables were described using percentages, means and standard deviations (SD). Differences in the mean scores of social support and postpartum depression at 1 and 6 months postpartum were assessed using paired t tests. Bivariate correlation among acculturation, social support and depression at 1 and 6 months postpartum were assessed using Pearson's correlation.

The interrelationships among acculturation, social support and depression were examined using structural equation modeling (SEM). We examined the interrelationships between social support and depression at 1 and 6 months postpartum using the cross-lag approach (Fig. 1; path ①) [25]) and obtained the cross-lag model. Then we added in the paths linking social support and acculturation as well as depression and acculturation and examined moderating (Fig. 1; path ②) and mediating (Fig. 1; paths ③ and ④)
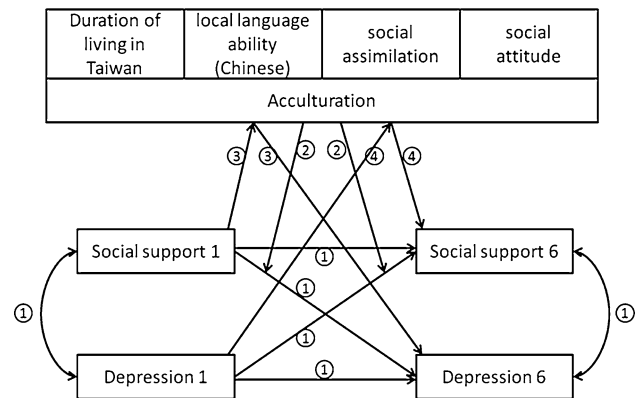

Fig. 1 The hypothesized structural equation model for the effects of acculturation, social support at 1 and 6 months postpartum, and depression at 1 and 6 months postpartum. Social support 1 and social support 6 are social support scores at 1 and 6 months postpartum, respectively. Depression 1 and Depression 6 are depression scores at 1 and 6 months postpartum, respectively. ① indicates by the path between social support and depression at 1 and 6 months postpartum; ② indicates by the path of moderating; ③ and ④ indicates by the path of mediating

effects of acculturation on the relationship between social support and postpartum depression based on the cross-lag model. Moderating effects of acculturation were that the temporal relationship between social support and depression differed by level of acculturation. Mediating effects of acculturation were that the temporal relationship between social support and depression were exerted through level of acculturation. The hypothesized model is presented in Fig. 1. We centralized each variable in the model to mitigate multicollinearity when the moderating effect of acculturation was tested. A moderating effect was supported if the path coefficients of invariance were significant. The paths that were not statistically significant were removed from the hypothesized model to obtain a modified model. Lastly, to obtain the final model, we added background variables as covariates to the modified model. Therefore the final model presents the structural relationship between acculturation, social support, and postpartum depression symptoms with adjustment for background variables.

Descriptive analyses were performed using SPSS 18.0 software (SPSS Inc., Chicago, IL, USA). The LISREL 8.80 software was used to examine the SEM model which applied maximum-likelihood estimations (Scientific Software International Inc, Lincolnwood, IL, USA). The SEM produced parameter estimates for each path coefficients. Each path coefficient is estimated using standardized solution and is deemed as statistically significant ($p < 0.05$) using a t test (Wald's test). A value ≥0.9 for the goodness of fit index (GFI) and the comparative fit index (CFI), as well as a value ≤0.08 for the

Table 1 Characteristics of the study participants (n = 203)

Characteristic	n	Percentage (%)
Educational level		
Elementary school or lower	26	12.8
Junior high school	48	23.7
Senior high school	78	38.4
University or higher	51	25.1
Work status		
Not employed	187	92.1
Employed	16	7.9
Family socio-economic status[a]		
Low	37	18.5
Middle	64	32.0
High	99	49.5
Parity		
1	126	62.1
>1	77	37.9

[a] Data missing for three subjects and were excluded (n = 200)

root-mean-square error approximation (RMSEA) signaled good model fit.

To obtain parameter estimates with standard errors small enough for the SEM model, a sample size of 150 or more is suggested [26]. The study sample size was 203, which is large enough to produce valid parameter estimates in the SEM.

Results

Characteristics of the Study Participants

The characteristics of the study participants are summarized in Table 1. More than 60 % of the study participants immigrated to Taiwan <36 months previously. The mean age of the study participants was 27 years (SD = 4.2; range, 20–42 years). About 74.9 % of women had an educational level of senior high school or lower. Most of the study participants (92.1 %) did not work outside the home at 1 month postpartum. About 50.5 % of the study women had low to middle family socio-economic status. More than 60 % of the study participants were primiparas.

Acculturation, Social Support, and Postpartum Depression

The prevalence of depression as determined by an EPDS score ≥10 was 24.1 % at 1 month postpartum and 12.3 % at 6 months postpartum. There was a significant decrease in the mean score of depression at 6 months compared to

that at 1 month postpartum (1 month: 6.67; 6 months: 4.02; paired $t = 6.93$, $p < 0.001$). Mean social support scores did not differ between the two time points (1 month, 29.76; 6 months, 28.91; paired $t = -1.07$, $p = 0.286$).

All correlation coefficients were significant between social support and depression, except for the correlation between depression at 1 month and social support at 6 months postpartum. Among the acculturation factors and depression, the correlations between local language ability and depression at 1 month postpartum, social attitude and depression at 1 month postpartum, and social attitude and depression at 6 months postpartum were significant. The correlation between social assimilation and social support at 1 month postpartum and between social attitude and social support at 1 month postpartum were also significant (Table 2).

Structural Equation Modeling on Acculturation, Social Support and Postpartum Depression

We first examined the interrelationships between social support and depression at 1 and 6 months postpartum (Fig. 2). The SEM showed that social support at 1 month postpartum and depression at 1 month postpartum were negatively correlated (-0.20, $p < 0.05$). Social support at 6 months postpartum and depression at 6 months postpartum were negatively correlated (-0.22, $p < 0.05$). Social support at 1 month postpartum was directly associated with social support at 6 months postpartum (0.31, $p < 0.05$). Depression at 1 month postpartum was directly associated with depression at 6 months postpartum (0.46, $p < 0.05$). The cross-lag paths from social support at 1 month to depression at 6 months postpartum and from depression at 1 month to social support at 6 months postpartum were not significant.

We added acculturation to the SEM and statistically insignificant paths were removed. Then background variables were added and adjusted for in the model. The final model is presented in Fig. 3. The interrelationships between social support and depression were similar to those in Fig. 2. Figure 3 additionally showed social support at 1 month postpartum was directly and positively associated with social attitude (0.19, $p < 0.05$); depression at 1 month postpartum was directly and negatively associated with social attitude (-0.18, $p < 0.05$); social attitude moderated the relationship between depression at 1 month and social support at 6 months postpartum, where a positive social attitude decreased the negative effect of depression at 1 month postpartum on social support at 6 months postpartum (-0.17, $p < 0.05$). The fit indices suggested a good fit for the model (GFI = 0.99, CFI = 0.99, RMSEA = 0.074).

Table 2 Correlation coefficients among social support, depression, and acculturation in the postpartum period

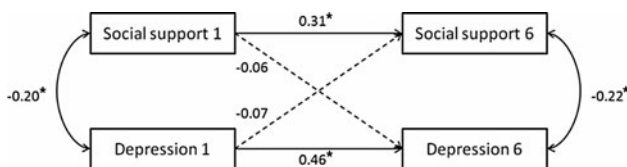|	Social support at 1 month postpartum	Social support at 6 months postpartum	Depression at 1 month postpartum	Depression at 6 months postpartum	Acculturation			
					Duration of living in Taiwan (month)	Local language ability (Chinese)	Social assimilation	Social attitude
Social support at 1 month postpartum	1	0.32**	−0.20**	−0.15*	−0.06	−0.08	0.16*	0.22**
Social support at 6 months postpartum		1	−0.13	−0.30**	−0.05	−0.10	0.05	0.13
Depression at 1 month postpartum			1	0.47**	−0.12	−0.14*	0.05	−0.22**
Depression at 6 months postpartum				1	0.00	−0.10	−0.04	−0.19**
Duration of living in Taiwan (month)					1	−0.06	0.07	0.13
Local language ability (Chinese)						1	0.16*	0.19**
Social assimilation							1	0.36**
Social attitude								1
Mean	29.76	28.91	6.67	4.02	33.80	11.63	2.39	10.10
Standard deviation	9.61	9.90	5.80	4.64	30.32	3.86	2.12	3.70

* $p < 0.05$; ** $p < 0.01$

Fig. 2 The structural equation model for social support at 1 and 6 months postpartum, and depression at 1 and 6 months postpartum. Social support 1 and social support 6 are social support scores at 1 and 6 months postpartum, respectively. Depression 1 and Depression 6 are depression scores at 1 and 6 months postpartum, respectively. Data presented were path coefficients. A *dashed line* shows that the indicated path is not statistically significant. * $p < 0.05$

Discussion

This study confirmed a negative and significant relationship between social support and postpartum depression among immigrant women as demonstrated in previous studies [11–13]. Different from previous studies, we took time into consideration in the current study. Though the cross-lag relationships linking social support and depression at the two different time points were not significant, yet social support exerted its effect on postpartum depression through direct association with postpartum depression symptoms at the two time points, respectively, and indirectly through the continuity of social support at 1–6 months postpartum, then on depression symptoms at 6 months postpartum.

Of the acculturation indicators, social attitude was the only significant factor affecting the relationship between social support and postpartum depression symptoms in the SEM model. Immigrant women who had greater social support and fewer depression symptoms at 1 month postpartum also had better social attitudes. We further found that social attitude moderated the relationship between depression at 1 month and social support at 6 months postpartum, where a positive social attitude decreased the negative effect of depression at 1 month on social support at 6 months postpartum. The results suggest that a positive, accepting attitude toward mainstream society decreased the negative effect of depression on social support among immigrant women.
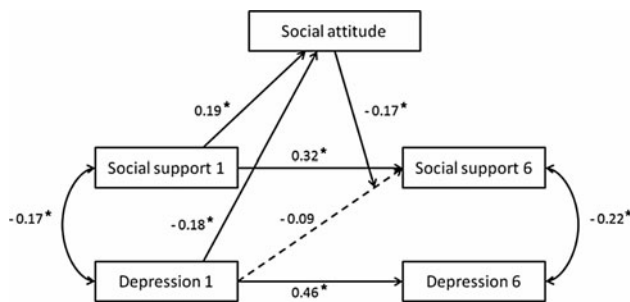
Fig. 3 The final structural equation model for acculturation (social attitude only), social support at 1 and 6 months postpartum, and depression at 1 and 6 months postpartum after adjusting for immigrant women's age, educational level, work status, family socioeconomic status, and parity. Social support 1 and social support 6 are social support scores at 1 and 6 months postpartum, respectively. Depression 1 and Depression 6 are depression scores at 1 and 6 months postpartum, respectively. Model fit: GFI = 0.99, CFI = 0.99, RMSEA = 0.074. Data presented were path coefficients. A *dashed line* shows that the indicated path is not statistically significant. * $p < 0.05$

Although local language ability was negatively correlated with depression at 1 month postpartum, and social assimilation was positively correlated with social support at 1 month postpartum in the bivariate analysis, local language ability and social assimilation were not significantly related to depression and social support in the SEM model. Those could be due to the fact that local language ability and social assimilation were significantly correlated with social attitude. Thus social attitude took up the significance of the other two variables in the SEM model. Of the indicators for acculturation proposed in the literature [17–19], cultural participation (e.g., participation in food, music, media, and religious activities) was not included in the study. Future study could include different acculturative indicators to better understand the relationship between acculturation, social support, and postpartum depression symptoms among immigrant mothers.

Since marriage-based immigrant women in Taiwan usually immigrated alone, had low social support, and gave birth shortly after immigration, we believe that enhanced social support in the early postpartum period is needed for this population. Based on our results, increased social support may decrease postpartum depression, and increase immigrant women's positive attitudes toward the mainstream society. Additionally, among mothers who were depressed at 1 month postpartum, those who had higher acculturation level tended to have higher social support at 6 months postpartum, thus decreasing depression at 6 months postpartum. Altogether social support and acculturation could mitigate the consequences of early postpartum depression symptoms on later social support (6 months postpartum), and thus decrease depression symptoms at

6 months postpartum for immigrant women who were depressed in the early postpartum period.

The prevalence of postpartum depression symptoms as determined by an EPDS score ≥10 were 24.1 % at 1 month and 12.4 % at 6 months postpartum. The rates of postpartum depression in the early postpartum period ranged from 24 to 42 % among migrant women in a previous review [5]. Our prevalence estimates at 1 month postpartum were within this range. The mean depression score decreased significantly from 1 to 6 months postpartum in our study. Another study also showed similar decreases in depression symptoms between 1 and 5 months postpartum [27].

The limitations of this study should be noted. We obtained the population list of immigrant women in only five districts of Taipei City and about 60 % of the immigrant women in the population list completed the study. We did not have information about women who did not participate and generalizability could be a concern. Of those women who participated in the study, there were no significant differences between the women who completed the study and those who did not. However, we noted that women who did not complete the study seemed to have higher depression scores and lower social support at 1 month postpartum, although the differences were not statistically significant. Additionally, we included immigrant women from China and Vietnam only because the two groups composed 90 % of immigrant women in Taiwan. Additional studies are needed with immigrant women from other cultural backgrounds. We used both face-to-face and telephone interviews to collect data for practical reasons. Although there were no significant differences in the mean social support and depression scores by mode of data collection, a mode effect cannot be ruled out completely. Though our study results suggest that our final model characterizes the relationships among acculturation, social support, and postpartum depression, we cannot rule out the possibility that an alternative model could exist. Further study is warranted to confirm our results.

Conclusions

Social support and social attitude were negatively related to postpartum depression symptoms among immigrant women. Social support in the early postpartum period not only directly decreased postpartum depression but also indirectly decreased postpartum depression through improving social attitudes. To decrease postpartum depression, we suggest enhanced social support in the early postpartum period is needed to improve social attitudes and decrease postpartum depression among immigrant mothers. Policies should target immigrant mothers and aim at

increasing their acculturation and social support in the early postpartum period. For example, policies that treat immigrant women equally with native people in legal and social aspects and social support programs in the early postpartum period could be provided for immigrant mothers. Randomized controlled trials are needed to validate the effect of social support on social attitude and postpartum depression.

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