# The Relationship between Social Support and Postpartum Depression in Migrant and Non-Migrant First-Time Mothers

## Abstract

**Aims and objectives.** This study examines the relationship between social status and postpartum depression by migrant generation, and determines whether social support moderates the relationship between migrant generations and postpartum depression. **Background.** Postpartum depression (PPD) afflicts more than 1 in 10 childbearing women worldwide; and this mental health problem may be higher among vulnerable populations of women such as migrants, an increasingly prevalent group in many countries. Social support and migrant generation (1st generation - mother and her parents born outside the host country; 2nd generation – mother born in the host country but not her parents; 2.5 generation – mother and one parent born in the host country) may contribute to the conflicting findings on migrant mothers and postpartum depression. **Design.** This study used a cross-sectional design. **Methods.** Sample recruitment of migrant and non-migrant first-time mothers (n=515) was implemented through an online platform. A STROBE checklist guided the reporting of this study. **Results.** PPD was lower among mothers with social support. While social support was negatively associated with PPD for all mothers, PPD was not associated with migrant generation nor was a moderation effect found. **Conclusion.** Social support is negatively associated with PPD for all mothers, but levels of PPD for migrant mothers may be linked to country-specific healthcare resources and immigration policies. Immigrant policies influence migrant mothers' healthcare access; thus, immigration policies may influence PPD among first-time migrant mothers and the manner in which nurses can provide formal support. This study finds that social support, including the formal social support provided by nurses, decreases the likelihood of PPD. Demands on nurses' technical and assessment skills are

high, but nurses also need to remember that their skills of providing social support are equally important, and for first-time mothers, may contribute to decreasing PPD.

**Keywords:** immigrants, migrant generations; mothers, social support, depression, nursing

## IMPACT STATEMENT

**What does this study add?**

- Migrant status, including 1st, 2nd and 2.5 migrant generations, is unrelated to levels of postpartum depression (PPD).
- A "healthy immigrant effect" indicating that migrant, compared to non-migrant, mothers demonstrated lower levels of PPD was found in this sample; but as noted by this and other studies, the effect may be due to country context and immigration policies (e.g., countries selecting only higher income, well-educated or employed migrants).
- Social support, including both the informal social support from friends and family and the formal social support provided by midwives, obstetrical nurses and nurses in well-child clinics, is related to lower levels of PPD; and therefore, nurses play a paramount role in reducing PPD.

## Introduction

Approximately 12% of childbearing women have postpartum depression (PPD) (Shorey et al., 2018), although estimates vary due to inconsistent definitions (i.e., antenatal, perinatal and postpartum depression versus solely postpartum depression) (Batt, Duffy, Novick, Metcalf, & Epperson, 2020; Postpartum Depression: Action Towards Causes Treatment Consortium, 2015), varied time-points of measurement in the postpartum period, and differences in PPD rates by geographical region (Shorey et al., 2018). PPD is defined as mental illness related to childbearing and is characterized by one or a combination of the following symptoms: depressed mood, anhedonia, problems with sleep and appetite, fatigue, feelings of worthlessness and suicidal thoughts (Stewart & Vigod, 2019). The precise etiology of postpartum depression (PPD) is unknown but appears to be linked to biological factors such as genetics and to psychosocial factors such as socioeconomics and lack of social support (Batt et al., 2020; Vaezi, Soojoodi, Banihashemi, & Nojomi, 2019).

For example, mothers who are migrants (i.e., individuals who change their country of usual residence and live in another country irrespective of the reason or legal status (United Nations, 2019)) may be more isolated and have less social support, thereby increasing their risk of PPD. This situation is particularly prevalent among mothers who are single, unemployed, less educated (Goyal, Gay, & Lee, 2010) and have a lower socioeconomic status (Goyal et al., 2010; Simhi, Sarid, & Cwikel, 2019). Poorer access to healthcare due to a lack of knowledge regarding healthcare resources may explain higher morbidity in migrants overall (Almeida, Caldas, Ayres-de-Campos, Salcedo-Barrientos, & Dias, 2013), including higher rates of PPD in migrant women compared to native-born mothers (Almeida, Costa-Santos, Caldas, Dias, & Ayres-de-Campos, 2016; Gavin et al., 2005). It may be that new mothers born from migrant parents may be less knowledgeable about available healthcare resources or less willing to use them. For this reason, several studies suggest that societal

integration can take up to three generations (El-Khoury et al., 2018; Munk-Olsen, Laursen, Mendelson, & Pedersen, 2010; Nakamura et al., 2020).

## Background

Besides psychiatric assessments, a common method of measuring PPD is via screening instruments such as the Edinburgh Postnatal Depression Scale (EPDS) (Almeida et al., 2016; Dennis, Merry, & Gagnon, 2017; El-Khoury et al., 2018). Using the EPDS, a Canadian study found higher levels of PPD in migrant mothers (including asylum seekers and migrants with regular status) compared to non-migrant mothers (Dennis et al., 2017). In Denmark, PPD (measured by psychiatrists) was not only higher in foreign-born mothers (1st generation migrants) but also was higher in native-born mothers with at least one foreign-born parent (Munk-Olsen et al., 2010). A study in France reported higher levels of PPD (measured by the EPDS) only in 1st generation migrant mothers without regular citizenship (not naturalized) when compared to 1st generation migrant mothers with regular citizenship, mothers who were native-born with one foreign-born parent (2.5 generation migrants), mothers who were native-born with both foreign-born parents (2nd generation migrants), and non-migrant mothers (El-Khoury et al., 2018).

Conversely, some studies found that migrant mothers had better outcomes than non-migrant mothers suggesting a "healthy immigrant effect" (Almeida et al., 2013; Anderson, Hatch, Comacchio, & Howard, 2017). A meta-analysis examining 53 studies on PPD using the EPDS found that migrants and non-migrant mothers did not differ in levels of PPD, but this finding may have resulted from the following reasons: inclusion of vulnerable groups of refugees and asylum seekers; differences arising from immigration policies of different countries; and exclusion of migrants who did not speak the host country's language (Anderson et al., 2017). Of course, when these studies compared the levels of PPD between

migrants and non-migrants, they controlled for demographic characteristics (e.g., mothers age, permanent partner/husband), risk factors (e.g., type of birth, breastfeeding) and types of social support (e.g., from spouse, regular healthcare provider) (Anderson et al., 2017; Dennis et al., 2017).

Social support, in particular, demonstrates a strong association with PPD; and differences in social support may add to the conflicting findings on levels of PPD among migrant and non-migrant mothers (Almeida et al., 2016; Batt et al., 2020; Dennis et al., 2017). Moreover, measuring social support is problematic as an accepted definition or conceptualization of social support for childbearing women is lacking (Leahy-Warren, 2016). This situation is evident as some authors examining PPD between migrant and non-migrant mothers have either not measured social support (Munk-Olsen et al., 2010) or used the structural social support variable of living with a supportive partner (El-Khoury et al., 2018).

In fact, we found no studies focusing on migrant generations and PPD that used a reliable instrument to measure functional social support in the care of the new infant (i.e., providing informational, instrumental, emotional, or appraisal support (Leahy-Warren, Mulcahy, & Lehane, 2019). Researchers studying populations of migrant mothers, however, have reported that compared to non-migrants, migrant mothers are at a grave disadvantage with regards to functional social support in the care of their new infant as they often report feelings of social isolation from family and friends, and may lack knowledge on available healthcare or welfare services (Cwikel, Segal-Engelchin, & Niego, 2018). Since contact with formal networks consisting of nurses, physicians and other healthcare professionals may assist with functional support, and therefore, be related to levels of PPD, basic information on the country's health system is essential.

Israel has a national health system that provides a basic basket of services to all citizens (Ministry of Health, 1994). Additionally, all pregnant mothers and mothers with

children under six years old living in Israel have access to Ministry of Health well-child clinics called Drop of Milk or Tipat Halav, regardless of citizenship (Madjar, Shachaf, & Zlotnick, 2019). Current estimates indicate that more than 90% of mothers living in Israel use these clinics (Zimmerman, Verbov, Edelstein, & Stein-Zamir, 2019). The primarily nurse-operated, Drop of Milk clinics provide health and developmental assessments of the mother and child, vaccinations, and referrals for developmental or healthcare issues (State of Israel - Ministry of Health, 2016). As part of their assessments, Drop of Milk clinics administer the EPDS to measure levels of PPD in all mothers; and a study examining these data found that migrant compared to non-migrant mothers living in Israel had higher levels of PPD (Simhi et al., 2019).

Thus, based on the conflicting literature, the question remains, whether levels of PPD are lower for different migrant generations with greater social support in the care of the new infant or whether there is a moderating effect between migrant status and social support on the level of PPD.

This study aims to examine the relationship between PPD by migrant status, and to determine whether social support moderates the relationship between migrant status and postpartum depression. Accordingly, we hypothesized that: (1) functional social support will be negatively related to levels of PPD for all first-time mothers, (2) migrant status will be related to levels of PPD, and (3) functional social support would operate as a moderator on the relationship between migrant status and levels of PPD such that 2.5 generation migrant mothers with social support would have the lowest levels of postnatal depression, followed by 2$^{nd}$ generation and 1$^{st}$ generation migrants compared to non-migrants.

## Methods

### Design

This quantitative study used a cross-sectional study design. STROBE guidelines for cross- sectional research were followed for the reporting of this study (see Supplementary File 1).

### Sample and data collection

The sample of first-time mothers, whose infants were less than 12 months old, was recruited through word-of-mouth and social media such as FACEBOOK and Whatsapp. Inclusion criteria were: (1) first-time mothers who gave birth less than 12 months ago; and (2) mother could read and write in Hebrew. Exclusion criteria were: (1) baby was born with a birth defect; (2) mother and baby were inpatients at time of recruitment; (3) the baby was not the result of a singleton pregnancy (i.e., twins or triplets); and (4) the baby was not a term birth at 37-41 weeks. Ethics approval was obtained from the university's ethics' committee (Ethics Committee Approval #038/21).

The online sites provided a link with a description of the study, consenting procedure, the questionnaire, and upon completion of the questionnaire, a link to obtain an 80-shekel gift certificate (equivalent to approximately $24.50). Data collection was conducted between December 2020 and February 2021, which was during the COVID-19 pandemic. Our goal was to collect a sample size of at least 250 to ensure at least 95% power, given an effect size of 0.15, a 0.05 probability of a Type I error, and 18 potential predictors.

### Analysis

Data were analyzed using SPSS® Version 25. The primary independent variable was the four-group migrant status. All covariates, the potential moderator and the dependent variable were compared by the four-group migrant status variable using chi-square test for categorical variables and One-Way Analysis of Variance (ANOVA) with Tukey’s post-hoc

analysis for continuous variables. Pearson's correlation coefficient was used to examine associations between continuous variables.

A series of linear regression models with the continuous dependent variable of PPD showed the association between the categorical variable of migrant status (1st generation migrants, 2nd generation migrants, 2.5 generation migrants to the referent group of non-migrants) and tested the potential moderating effect of social support (total score and two subscale scores) on the relationship between migrant status and PPD. Specifically, Hayes SPSS PROCESS macro for Model 1 was used to examine the interactions of the moderating effects of social support (total score and two subscale scores of practical support and supportive presence) on the relationship between migrant status and PPD while controlling for all covariates (Hayes, 2015; Hayes & Scharkow, 2013). Tables provide beta estimates, 95% lower and upper level confidence intervals (CI), F-values, and adjusted r-squared. Significance was declared at $p<0.05$.

**Measures**

The questionnaire required approximately 20 minutes to complete. Based on variables found in the existing literature, the questionnaire included demographic characteristics, risk factors, types of social support and PPD. Demographic characteristics included: month and year of birth; place of birth of mother; place of birth of mother's mother; place of birth of mother's father; mother's birthdate; baby's birthdate; the mother's education level; family status (including single, married or having a partner in the household); employment; guaranteed employment post-maternity leave; socioeconomic status. Risk factors included: type of pregnancy (including use of fertility treatment); type of delivery; and breast feeding. Types of social support included: use of the well-child care (Tipat Halav or Drop of Milk clinics) and functional social support (including its two subscales) measured

by the Perinatal Infant Care Social Support Scale (Leahy-Warren et al., 2019). Additionally, the questionnaire measured PPD by the EPDS (Cox, Holden, & Sagovsky, 1987).

The independent variable of this study is migrant status, a four-category variable based on the birthplace of mothers and the mothers' parents. Mothers were categorized as *non-migrants* if both the mothers and their parents were native-born, this category was the referent group. Mothers were categorized as *2.5 generation migrants* if the mother was native-born and only one of the mother's parents was native-born. Mothers were categorized as *2nd generation migrants* if the mother was native-born and both her parents were foreign-born; and the mothers were categorized as *1st generation migrants* if the mother and both her parents were foreign-born.

The variable suspected of being a moderator is social support, which in this study was measured using the 19-item PICSS instrument comprising a total score and two subscales measuring *'Practical Support'* with 10 items and '*Supportive Presence'* with nine items (Leahy-Warren, McCarthy, & Corcoran, 2011; Leahy-Warren et al., 2019). Respondents rated each item on a 4-point scale containing the values of 'strongly disagree' to strongly agree'. Higher scores indicated more social support. For this relatively new English-language instrument, a certified translation and back-translation process was used to obtain a valid Hebrew-language version; and exploratory factor analysis was conducted to examine the two-factor structure. Internal consistency for the total scale and the two subscales of practical support and supportive presence resulted in Cronbach's alphas of 0.934, 0.908, and 0.909, respectively.

The dependent variable is PPD, which was measured by the EPDS, a 10-item, 4-point Likert Scale (Glasser & Barell, 1999) that was validated with Hebrew-speakers (Cox et al., 1987). Internal consistency for the EPDS in this study's sample was Cronbach's alpha=0.869.

## RESULTS

Respondent first-time mothers (n=515) were categorized based on their birth country and their parents' birth country into a four-group migrant status variable: non-migrants (59%, n=306) comprising mothers who were native-born to native-born parents; 2.5 generation migrants (17%, n=86) comprising mothers who were native-born and who had one native-born parent; 2nd generation migrants (14%, n=70) comprising mothers who were native-born but both parents were not native-born; and 1st generation migrants (10%, n=53) comprising mothers who were not native-born with parents who were not native-born. This four-group migrant status variable, as the primary independent variable of interest variable, was used in comparisons with demographic and other characteristics.

Comparisons by migrant status revealed no differences for the following: babies' age, mothers' education level, family status, employment, guaranteed employment post-maternity leave, type of pregnancy, type of delivery, breast feeding status, or well-child care (see Table 1). Significant differences by migrant status were found by mothers' age ($p<0.05$), socioeconomic status ($p<0.05$), total social support ($p<0.05$), supportive presence ($p<0.05$), and PPD ($p<0.05$). Based on Tukey's post-hoc analyses, non-migrant mothers compared to 2nd generation mothers were the youngest, had the lowest level of total social support, the least supportive presence, and had the highest levels of PPD.

[Put Table 1 about here]

Pearson's correlation coefficient was used to examine the associations among babies' age, mothers' age, social support and PPD. Findings showed a single significant and negative correlation between total social support and PPD ($r=-0.517$, $p<0.01$) (not shown in tables).

A series of multivariable linear regression models were used to examine the presence of a moderating effect. Each model contained the dependent variable of PPD, the

independent categorical variable of migrant status, the interaction term containing the full scale of total social support (or one of the two subscales) and migrant status, and selected covariates (see Table 2). The first model tested the presence of a moderating effect of the practical support subscale and migrant status on the dependent variable of PPD. Findings indicated that among first-time mothers, PPD levels were lower among 2nd generation migrants (compared to non-migrants) (B=-1.40, CI=-2.65, -0.14, $p<0.05$), higher by mother's age (B=0.11, CI=0.001, 0.22, $p<0.05$), lower for those with guaranteed employment post-maternity leave (B=-1.27, CI=-2.17, -0.37, $p<0.05$), and lower for those with practical support (B=-3.80, CI=-4.72, -4.89, $p<0.0001$). This model explained about 24% of the total variance ($p<0.0001$).

The second model tested the moderating effect of supportive presence subscale and migrant status on the dependent variable of PPD. Findings indicated that among first-time mothers, PPD levels were lower among those with guaranteed employment post-maternity leave (B=-1.12, CI=-1.98, -0.26, $p<0.05$), and lower for those with supportive presence (B=-4.82, CI=-5.71, -3.92, $p<0.0001$). The second model explained about 31% of the total variance ($p<0.0001$).

The final model tested the moderating effect of the full scale of total social support and migrant status on the dependent variable of PPD. Findings indicated that among first-time mothers, PPD was less common among those with guaranteed employment post-maternity leave (B=-0.98, CI=-1.83, -0.13, $p<0.05$), and those with higher levels of total social support (B=-5.29, CI=-6.25, -4.32, $p<0.0001$). The final model explained about 30% of the total variance ($p<0.0001$). All three models showed that for first-time mothers, regardless of migrant status, social support was negatively associated with postnatal depression; and the interaction term was not significant. Figure 1 shows a plot of the final model (See Figure 1).

[Put Table 2 about here]

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## DISCUSSION

This study examined whether: (1) there was an association between functional social support and PPD for all first-time mothers, (2) migrant status was related to levels of PPD; and (3) functional social support had a moderating effect on the relationship between migrant status and levels of PPD. While findings showed that total social support (and the subscales of practical support and supportive presence) was negatively associated with levels of PPD for migrant and non-migrant mothers (first hypothesis), no evidence was found that migrant status was related to levels of PPD (second hypothesis) nor was evidence found supporting the existence of a moderating relationship of total social support (or the subscales) on the relationship between migrant status and levels of PPD (third hypothesis). Only in the regression model that included the practical support subscale were 2nd generation migrant mothers compared to non-migrants found to exhibit lower levels of PPD, and older compared to younger mothers found to exhibit higher levels of PPD. For all regressions, higher levels of PPD was associated with the covariate of not having guaranteed employment post-maternity leave.

### Migrant Status and PPD

Studies on the relationship between migrant status and levels of PPD present conflicting findings with some researchers reporting that migrants demonstrated higher levels of PPD than non-migrants (Almeida et al., 2016), others showed no difference in levels of PPD or that migrants had lower levels of PPD than non-migrants (Anderson et al., 2017). Our multivariable analysis indicated levels of PPD did not differ by migrant status, although bivariate analyses suggested that non-migrants had the highest level of PPD. That is, if this

study had not conducted multivariable analyses that controlled for social support, the bivariate results would suggest "a healthy immigrant effect." Moreover, the regression model that controlled for practical support indicated that 2nd generation migrant mothers, compared to non-migrants, exhibited lower levels of PPD. Such findings suggest the need measuring functional social support and specifying the type of functional social support.

Results from studies on different migrant generations of mothers have been inconsistent, particularly with regard to 2nd generation migrant mothers who are native-born and may be straddling the culture of their host country and the culture of their foreign-born parents. We found that in the regression analyses controlling for practical support, 2nd generation migrant mothers had lower levels of PPD compared to non-migrant mothers. This finding differs from a France-based study on migrant generations that found no significant differences in PPD by migrant generation after adjusting for having a supportive partner (El-Khoury et al., 2018). Adding to these conflicting findings is a U.S.-based study that found 2nd generation Latina adolescent mothers had the highest amount of risk factors (including depression) (Martinez et al., 2018) and a Danish study noted that 1st and 2nd generation migrant mothers had higher levels of mental health problems postpartum compared to non-migrants (Munk-Olsen et al., 2010). This long list of ambivalent findings suggests that either measurement of variables (including using a reliable instrument and specifying the type of social support) is not sufficiently precise or that pivotal variables differentiating the effects of the 2nd generation migrant mothers have not yet been uncovered.

One possible explanation for the confusing finding on 2nd generation migrant mothers may be the country context. For example, special programs targeting new migrant mothers also are aim to help mothers with the support of services such as well-child clinic (Cwikel et al., 2018). Moreover, all new mothers, regardless of citizenship, ethnicity or socioeconomic status, have access to the nurse-operated well-child clinic (Drop of Milk clinics) (State of

Israel - Ministry of Health, 2016). It may be due to these supports that Israel's migrant mothers, compared to non-migrant mothers, demonstrate lower levels of PPD.

**Migrant Status and Social Support on PPD**

Social support is important for all mothers but particularly for migrant mothers as lack of knowledge on healthcare access, miscommunication, and cultural differences can lead to misunderstanding about treatment needs or options (Almeida et al., 2013). The two subscales of functional social support were specific for infant care and measured a supportive presence and practical support (Leahy Warren, 2005). A supportive presence indicates that encouragement was offered to new mothers; and practical support includes giving information or performing helpful tasks that aid the new mother. Both a supportive presence and practical support can be informal (such as a spouse) or formal (such as a nurse in a well-child clinic). Many studies have noted that having a supportive spouse reduces PPD among new mothers, however, the type of support offered by the spouse is frequently unspecified (El-Khoury et al., 2018). Yet, when this study tested for moderating effects between migrant generation status and total social support (and each subscale) on levels of PPD, none were found. Thus, although social support is indeed negatively associated to levels of PPD for both migrant and non-migrant mothers, there is no evidence of a combined migrant generation-social support interactive or moderating effect on levels of PPD.

Still, this study found that after controlling for practical support, 2nd generation migrant mothers had lower levels of PPD and older mothers had higher levels of PPD; these relationships were not found when controlling for supportive presence or for total social support. A possible explanation for this finding may be that 2nd generation migrant mothers have the advantage of drawing from two cultures, the culture from their host country where they were born and the culture of their parents. Acculturation theory suggests that an individual who can successfully live and thrive in two cultures exhibits integration (Berry,

2005), which has been linked to higher self-esteem and well-being in adolescents and young adults (Cavdar, McKeown, & Rose, 2021). Therefore, it maybe that 2nd generation migrant mothers, compared to non-migrant mothers, reap the benefits from both the culture of their foreign-born parents and the culture of their host country. No significant findings were found for 2.5 generation mothers; perhaps, the cultural benefits from a single foreign-born parent were less strong.

Another type of support is financial support. Since this study was conducted during the COVID-19 pandemic when many individuals had reduced hours or were laid off completely due to government restrictions (Kol-Zchut, 2021), we added a variable about guaranteed employment post-maternity leave and found that mothers with that guarantee had lower levels of PPD. This finding was not unexpected and was in line with other researchers' findings that higher occupational levels and more secure employment are related to lower levels of PPD (El-Khoury et al., 2018).

## LIMITATIONS

As with all studies, this study has limitations and so generalizability must be taken with caution. First, this study used a convenience sample, which although large, may not represent all migrant and non-migrant mothers. Second, due to the cross-sectional study design, all first-time mother only provided information at a single point in time, and no efforts were made to verify responses. Third, an online questionnaire was used so mothers unwilling or unable to gain access to online platforms were not included. Fourth, measurement of formal and informal structural networks was not made. Fifth, all questionnaires were in Hebrew, and therefore, migrants who could not read Hebrew, the language of the host country, were unable to participate. Lastly, this study was undertaken

during the COVID-19 pandemic, and the restrictions and tension associated with the pandemic also may have influenced the results.

## CONCLUSIONS

Total social support was negatively associated with levels of PPD, but migrant status was unrelated to levels of PPD. Despite findings from other studies hinting at a moderating effect between migrant generations and social support on PPD, this study's findings showed none. Moreover, if this study had not controlled for social support, we would have incorrectly suspected a "healthy immigrant effect." This and other studies' findings suggest at least three reasons that the country context may influence the association between social support and PPD for migrant generations: (1) Migrant samples may or may not include vulnerable groups such as refugees and asylum seekers based on the country's immigration policies; (2) The country's health system may restrict service use for some migrant subpopulations; and (3) Some countries may provide supplemental or additional services to all or some subpopulations of migrants and their children. Consequently, future studies are needed to tease out the impact of country context on the associations among migrant generations, social support and PPD.

### Relevance to Clinical Practice and/or Policy

Social support, including the formal social support of nurses, is associated with lower rates of PPD for first-time mothers regardless of migrant generation. Nurses have many skills including assessment and detecting signs and symptoms that threaten health. These skills are instilled via nursing education and reinforced in clinical practice, while the formal social support that nurses provide via the caring role often is valued less. Educators teaching nursing students need to emphasize the importance of the caring role that facilitates patient

trust, increasing patients' attention and adherence to nursing guidance. Through the caring role, nurses assist first-time mothers to build confidence in their abilities to care for their new infants. Thus, in clinical practice, we need to educate nurses on the importance of their caring role and reinforce its practice, as the formal social support provided through the caring role can help prevent PPD for all first-time mothers.

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**Table 1. Comparisons of First-Time Mothers' Characteristics by Migrant Generation with frequencies for categorical variables, and means (M) and standard deviations (sd) for continuous variables (n=515)**

| | **Non-migrants and migrant generation based on the birthplace of the mother and mother's parents** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Non-migrants:** Mother and her parents native-born **(n=306)** | | **2.5th Generation:** Mother native-born and one native-born parent **(n=86)** | | **2nd Generation:** Mother native-born but both parents were not native-born **(n=70)** | | **1st Generation:** Mother and parents were not native-born **(n=53)** | |
| | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| Baby's age (months) (M/sd) | 4.4 | 2.78 | 4.0 | 2.45 | 4.3 | 2.56 | 4.5 | 2.47 4.03 |
| Mother's age (year) (M/sd)*[1] | 31.0 | 3.91 | 31.2 | 4.31 | 32.6 | 5.58 | 31.7 | |
| 18-22 | 4 | 1.3% | 0 | 0.0% | 3 | 4.4% | 1 | 1.9% |
| 23-26 | 27 | 9.0% | 10 | 11.8% | 2 | 2.9% | 3 | 5.7% |
| 27-30 | 103 | 34.2% | 27 | 31.8% | 27 | 39.7% | 16 | 30.2% |
| 31-35 | 132 | 43.9% | 39 | 45.9% | 17 | 25.0% | 22 | 41.5% |
| 36-40 | 26 | 8.6% | 6 | 7.1% | 11 | 16.2% | 10 | 18.9% |
| ≥ 40 | 9 | 3.0% | 3 | 3.5% | 8 | 11.8% | 1 | 1.9% |
| Education level | | | | | | | | |
| Less than 12 years | 2 | 0.7% | 0 | 0.0% | 0 | 0.0% | 1 | 1.9% |
| Secondary education | 49 | 16% | 11 | 12.8% | 11 | 15.7% | 5 | 9.4% |
| Post-secondary education | 26 | 8.5% | 6 | 7.0% | 3 | 4.3% | 3 | 5.7% |
| Bachelor's degree | 147 | 48.0% | 46 | 53.5% | 32 | 45.7% | 28 | 52.8% |

| | | | | | | | Postpartum depression 2 | |
|---|---|---|---|---|---|---|---|---|
| Master's degree | 79 | 25.8% | 21 | 24.4% | 23 | 32.9% | 15 | 28.3% |
| PhD | 3 | 1.0% | 2 | 2.3% | 1 | 1.4% | 1 | 1.9% |
| Family status | | | | | | | | |
| Living with permanent spouse | 289 | 94.4% | 80 | 93.0% | 66 | 94.3% | 51 | 96.2% |
| Separate from baby's father | 11 | 3.6% | 1 | 1.2% | 2 | 2.9% | 1 | 1.9% |
| Single mother | 6 | 2.0% | 5 | 5.8% | 2 | 2.9% | 1 | 1.9% |
| Employment | | | | | | | | |
| Full-time | 180 | 58.8% | 56 | 65.1% | 50 | 71.4% | 36 | 67.9% |
| Part-time | 58 | 19.0% | 13 | 15.1% | 5 | 7.1% | 8 | 15.1% |
| Self-employed | 14 | 4.6% | 8 | 9.3% | 5 | 7.1% | 3 | 5.7% |
| Unemployed | 49 | 16.0% | 8 | 9.3% | 9 | 12.9% | 5 | 9.4% |
| Homemaker | 5 | 1.6% | 1 | 1.2% | 1 | 1.4% | 1 | 1.9% |
| Guaranteed employment post-maternity leave | 180 | 58.8% | 56 | 65.1% | 50 | 71.4% | 36 | 67.9% |
| Socioeconomic status-above average* | 78 | 25.5% | 21 | 24.4% | 28 | 40.0% | 25 | 47.2% |
| Type of pregnancy | | | | | | | | |
| Spontaneous and planned | 208 | 68.0% | 61 | 70.9% | 54 | 77.1% | 36 | 67.9% |
| Spontaneous and unplanned | 66 | 21.6% | 15 | 17.4% | 6 | 8.6% | 13 | 24.5% |
| Used fertility treatments | 32 | 10.5% | 10 | 11.6% | 10 | 14.3% | 4 | 7.5% |
| Type of delivery | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Vaginal | 206 | 67.5% | 53 | 61.6% | 49 | 70.0% | 31 | 58.5% |
| Instrumental | 35 | 11.5% | 14 | 16.3% | 7 | 10.0% | 9 | 17.0% |
| Planned Caesarean section | 32 | 10.5% | 7 | 8.1% | 5 | 7.1% | 5 | 9.4% |
| Emergency Caesarean section | 32 | 10.5% | 12 | 14.0% | 9 | 12.9% | 8 | 15.1% |
| Breast-feeding status | | | | | | | | |
| Still breast feeding | 200 | 65.4% | 66 | 76.7% | 43 | 61.4% | 34 | 64.2% |
| Stopped breast feeding | 37 | 12.1% | 8 | 9.3% | 12 | 17.1% | 11 | 20.8% |
| Never breast fed | 69 | 22.5% | 12 | 14.0% | 15 | 21.4% | 8 | 15.1% |
| Well-child care (Drop of Milk clinics) | 283 | 92.8% | 84 | 97.7% | 69 | 98.6% | 49 | 94.2% |
| Total Social support (M/sd)*[1] | 3.03 | 0.55 | 3.22 | 0.48 | 3.15 | 0.48 | 3.13 | 0.42 |
| • Practical support | 2.99 | 0.60 | 3.17 | 0.55 | 3.07 | 0.54 | 3.08 | 0.47 |
| • Supportive presence*[2] | 3.09 | 0.61 | 3.28 | 0.52 | 3.23 | 0.55 | 3.18 | 0.50 |
| Postnatal depression (M/sd)*[3] | 7.95 | 5.49 | 6.64 | 4.82 | 6.19 | 4.99 | 6.88 | 4.67 |

[1]Tukey's post-hoc analysis revealed significant differences between non-migrants and both the 2nd and 2.5th generation migrants.

[2]Tukey's post-hoc analysis revealed a significant difference between non-migrants and the 2.5th generation migrants.

[3]Although One-Way ANOVA revealed significant differences by migrant status, Tukey's post-hoc analysis revealed only a trend (p=0.054) of difference between non-migrants and the 2nd generation migrants

Legend: * $p<0.05$, ** $p<0.01$, *** $p<0.001$

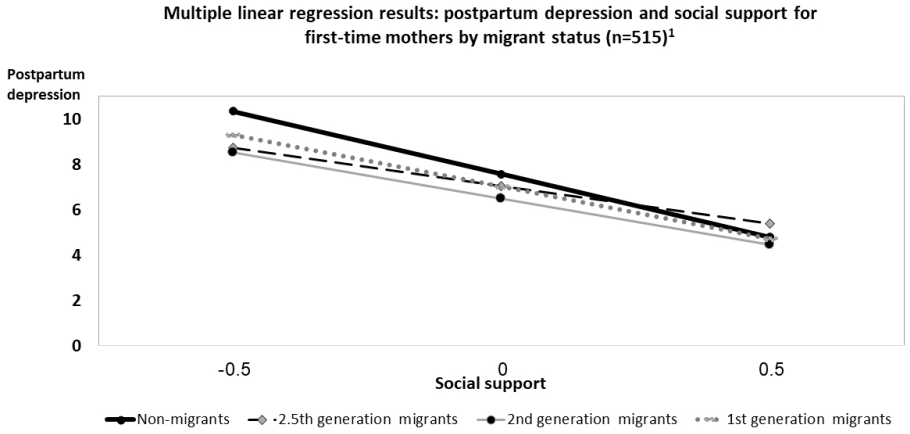
**Table 2. Multiple linear regression models predicting postpartum depression among first-time mothers who delivered less than 10 months ago (B, and lower and upper 95% confidence intervals (n=515)**

| | | 95% CI | | | 95% CI | | | 95% CI | |
|---|---|---|---|---|---|---|---|---|---|
| | **B** | **Lower** | **Upper** | **B** | **Lower** | **Upper** | **B** | **Lower** | **Upper** |
| **Independent Variable** | | | | | | | | | |
| Migrant status and Generation (Gen) (referent: non-migrant) | | | | | | | | | |
| • 2.5th Generation (native-born mother from one native-born parent) | -0.78 | -1.94 | 0.39 | -0.50 | -1.62 | 0.61 | -0.52 | -1.63 | 0.58 |
| • 2nd Generation (native-born mother from two non-native-born parents) | -1.40* | -2.65 | -0.14 | -1.14 | -2.35 | 0.07 | -1.09 | -2.27 | 0.10 |
| • 1st Generation (non-native born mother) | -0.44 | -1.85 | 0.96 | -0.44 | -1.79 | 0.89 | -0.55 | -1.85 | 0.75 |
| **Covariates** | | | | | | | | | |
| Baby's age (months) | -0.14 | -0.30 | 0.02 | -0.07 | -0.22 | 0.09 | -0.11 | -0.26 | 0.04 |
| Mother's age (years) | 0.11* | 0.001 | 0.22 | 0.06 | -0.05 | 0.16 | 0.07 | -0.04 | 0.17 |
| Education level– > high school | 0.07 | -1.17 | 1.30 | 0.22 | -0.95 | 1.39 | 0.12 | -1.04 | 1.28 |
| Family status – with permanent spouse | -1.87 | -3.84 | 0.09 | -1.50 | -3.38 | 0.38 | -1.65 | -3.52 | 0.22 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Guaranteed employment post-maternity leave | -1.27* | -2.17 | -.37 | -1.12* | -1.98 | -0.26 | -0.98* | -1.83 | -0.13 |
| Socioeconomic status – > average | -0.76 | -1.75 | 0.22 | -0.46 | -1.40 | 0.49 | -0.59 | -2.37 | 1.20 |
| Type of pregnancy – spontaneous and planned | 0.26 | -1.16 | 1.68 | 0.15 | -1.21 | 1.51 | 0.16 | -1.20 | 1.51 |
| Type of delivery – vaginal | -0.40 | -1.31 | 0.52 | -0.15 | -1.03 | 0.72 | -0.39 | -1.25 | 0.47 |
| Breast-feeding status – ever breastfed | -0.01 | -0.94 | 0.91 | 0.24 | -0.66 | 1.12 | 0.13 | -0.75 | 1.01 |
| Well-child care (Drop of Milk clinics) | -1.78 | -3.62 | 0.06 | -1.01 | -2.79 | 0.78 | -1.08 | -2.82 | 0.66 |
| | | | | | | | | | |
| **Moderator (one per model)** | | | | | | | | | |
| Practical support (Practical) | -3.80**** | -4.72 | -2.89 | | | | | | |
| • Interaction 2.5th Gen x Practical | 1.91 | -0.14 | 3.96 | | | | | | |
| • Interaction 2nd Gen x Practical | 0.73 | -1.59 | 3.05 | | | | | | |
| • Interaction 1st Gen x Practical | 0.74 | -2.14 | 3.62 | | | | | | |
| Supporting Presence (Presence) | | | | -4.82**** | -5.71 | -3.92 | | | |
| • Interaction 2.5th Gen x Presence | | | | 1.30 | -0.76 | 3.35 | | | |
| • Interaction 2nd Gen x Presence | | | | 1.69 | -0.45 | 3.83 | | | |
| • Interaction 1st Gen x Presence | | | | 1.99 | -0.66 | 4.64 | | | |
| Total Social support | | | | | | | -5.29**** | -6.25 | -4.32 |
| • Interaction 2.5th Gen x Social support | | | | | | | 2.10 | -0.10 | 4.29 |
| • Interaction 2nd Gen x Social support | | | | | | | 1.40 | -1.02 | 3.82 |

| | | | |
|---|---|---|---|
| • Interaction 1st Gen x Social support | | | 0.92 -2.10 3.95 |
| **R-squared, F-Value** | **0.24, 9.230 (17, 487)****** | **0.31, 12.883 (17,487)****** | **0.30, 12.734 (17, 487)****** |

* p<0.05, ** p<0.01, *** p<0.001 ****p<0.0001




[1]Regression model covariates included: baby's age (months), mother's age (years), more than high school education, living with a permanent spouse, full-time work with employee benefits, above average socioeconomic status, spontaneous/planned pregnancy, regular vaginal delivery, ever breastfed, used well-child clinics. No significant differences found among groups.

Figure 1

338x190mm (96 x 96 DPI)

STROBE Statement—checklist of items that should be included in reports of observational studies

| | Item No | Recommendation | |
|---|---|---|---|
| **Title and abstract** | 1 | (*a*) Indicate the study's design with a commonly used term in the title or the abstract | X |
| | | (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found | X |
| **Introduction** | | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported | X |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses | X |
| **Methods** | | | |
| Study design | 4 | Present key elements of study design early in the paper | X |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | X |
| Participants | 6 | (*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up<br>*Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls<br>***Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants** | X |
| | | (*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed<br>*Case-control study*—For matched studies, give matching criteria and the number of controls per case | |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | X |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | *X* |
| Bias | 9 | Describe any efforts to address potential sources of bias | X |
| Study size | 10 | Explain how the study size was arrived at | X |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | X |
| Statistical methods | 12 | (*a*) Describe all statistical methods, including those used to control for confounding | X |
| | | (*b*) Describe any methods used to examine subgroups and interactions | X |
| | | (*c*) Explain how missing data were addressed | |
| | | (*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed<br>*Case-control study*—If applicable, explain how matching of cases and controls was addressed<br>*Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy | |
| | | (*e*) Describe any sensitivity analyses | |

Continued on next page

| | | | |
|---|---|---|---|
| **Results** | | | |
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed | X |
| | | (b) Give reasons for non-participation at each stage | |
| | | (c) Consider use of a flow diagram | |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | X |
| | | (b) Indicate number of participants with missing data for each variable of interest | |
| | | (c) *Cohort study*—Summarise follow-up time (eg, average and total amount) | |
| Outcome data | 15* | *Cohort study*—Report numbers of outcome events or summary measures over time | |
| | | *Case-control study*—Report numbers in each exposure category, or summary measures of exposure | |
| | | *Cross-sectional study*—Report numbers of outcome events or summary measures | *X* |
| Main results | 16 | (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included | X |
| | | (*b*) Report category boundaries when continuous variables were categorized | |
| | | (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses | X |
| **Discussion** | | | |
| Key results | 18 | Summarise key results with reference to study objectives | X |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias | X |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | X |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | X |
| **Other information** | | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | X |