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Association between unintended births and risk of postpartum depression: Evidence from Ethiopia, India, Peru and Vietnam

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ABSTRACT

Previous studies have shown that unintended births adversely affect birth outcomes, child health and cognitive development in developing countries. However, only a few studies have examined the association between unintended births and risk of postpartum depression (PPD) in these countries. The study uses data from the first wave of Young Lives Study (YLS) conducted in 2002 in Ethiopia, India, Peru and Vietnam to examine the association between birth intention and the risk of PPD. Bivariate and multivariable logistic regressions are used to examine the association. Bivariate result indicates that the risk of PPD was substantially higher among mothers who reported an unintended birth as compared to mothers who reported an intended birth in each country. Results from multivariable logistic regression models indicate that unintended births were associated with higher risk of PPD in pooled data (odds ratio: 1.46, 95%CI. 1.29, 1.66), Ethiopia (odds ratio: 1.99, 95% CI. 1.58, 2.50), and Peru (odds ratio: 1.29, 95% CI. 1.04, 1.59) compared with mothers having an intended birth. Results suggest that reducing unintended births might help in reducing the incidence of PPD among mothers in these countries. One of the most cost-effective interventions for reducing the incidence of unintended births is the availability of effective family planning programme.

1. Introduction

Global trends in unintended pregnancies indicate that, between 1995 and 2008, the unintended pregnancies dropped by 29% and 20% in the developed and the developing countries, respectively (Sedgh, Singh, & Hussain, 2014). Despite a drop in global rates of unintended pregnancy, the proportion of pregnancies that are unintended (especially in the developing world) remains high. In terms of numbers, about 86 million pregnancies worldwide were unintended; of these, 41 million ended in abortion, 33 million in unplanned births and 11 million in miscarriages (Sedgh et al., 2014). Recent estimates show that 5% and 7% of women age 15–44 in 2010–14 reported unintended pregnancies in developed and developing countries respectively (Bearak, Popinchalk, Alkema, & Sedgh, 2018).

Studies have shown that women's risk of developing depression, evident in the form of postpartum depression (PPD), is particularly high during childbearing years (Bohra et al., 2015). In a study by Fisher et al. (2013), prevalence of maternal depression varied between 15% and 57% in low and middle income countries. Although the birth of a baby is the time to celebrate, many women experience baby blues which

includes the symptoms such as mood swing, anxiety, crying episodes, and difficulty in sleeping. Experience of these symptoms for more than two weeks after childbirth leads to the PPD. Studies have also shown that PPD has potentially serious consequences for both mother and her new born. PPD is associated with a decrease in the time a mother spends with her infant; missed pediatric appointments; higher levels of disruptive behavior among children; and insecure attachment between the mother and the child (Bagner, Pettit, Lewinsohn, & Seeley, 2010; Bauer, Ofner, Pottenger, Carroll, & Downs, 2017; Stein et al., 1991). At its most, severe depression can lead to suicide (Ahmed et al., 2017). Despite credible evidence on the effect of PPD on maternal and child health outcomes, prevention and treatment of PPD is not an integral part of Maternal and Child Health Programs in developing countries. Recently, maternal mental health issue was described as the neglected 'm' in the Maternal and Child Health Programs especially in the context of developing countries (Rahman, Patel, Maselko, & Kirkwood, 2008). Mental health during postnatal period is also linked to achieving the target of Sustainable Development Goal of Improving Maternal Health (SDG-3), Promoting Gender Equality and Empowering Women (SDG-5), Reducing Child Mortality (SDG-3) and Poverty (SDG-1) in developing

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countries.

Clinicians have mainly attributed PPD to biological conditions such as hormonal and emotional causes. However, these hormonal changes and emotional factors are experienced universally by all mothers, but not all mothers develop PPD (Arora & Bhan, 2018). Taking this fact into account, few studies have investigated the role that other socio-demographic and cultural factors, in addition to the biological factors, may play in explaining PPD. Such studies have identified women's health during pregnancy, premature births, intimate partner violence during pregnancy, difficulty in labour, sex of child, health of the child, stressful life events, economic status, etc. as the other risk factors for PPD (Shivalli & Gururaj, 2015; Ludermir, Lewis, Valongueiro, de Araújo, & Araya, 2010; Gupta, Kishore, Mala, Ramji, & Aggarwal, 2013; Patel, Rodrigues, & DeSouza, 2002). A key factor that may also lead to PPD is women's birth intention. The association between unintended births and postpartum depression is really complex, and the pathways through which birth intention may affect maternal well-being has not been systematically analyzed. Mental health of women may be influenced by her own characteristics (education, age, socioeconomic status) as well as her experience of pregnancy and birth (such as pregnancy complication or preterm birth) (Bener, Gerber, & Sheikh, 2012; Treyvaud, 2014). Also, adverse health behaviors such as smoking and alcohol are more prevalent among mothers having an unintended birth. Mothers having an unintended birth may also experience poor quality relationship with their husbands/partners and may receive lower level of social support as compared to those who have intended birth (Wellings et al., 2013). Earlier studies have reported a strong association between low level of support from husband/partner and risk of depression. Furthermore, lack of support from family and friends has been shown to act as a link between stressful life and depression/anxiety during postpartum period (Glazier, Elgar, Goel, & Holzapfel, 2004).

Few studies from the developed world have reported positive association between unintended birth and PPD (Abbasi, Chuang, Dagher, Zhu, & Kjerulff, 2013; Brito, Alves, Ludermir, & Araújo, 2015; Gauthreaux et al., 2017; Mercier, Garrett, Thorp, & Siega-Riz, 2013). To date, in low and middle income countries, unintended births have been linked to multiple types of undesirable outcomes including but not limited to childhood mortality, high-risk pregnancy behavior (such as smoking, alcohol consumption during pregnancy), low birth weight, malnutrition and cognitive underdevelopment of children, poor antenatal care, and premature births (Dott, Rasmussen, Hogue, & Reefhuis, 2010; Han, Nava-Ocampo, & Koren, 2005; McCrory & McNally, 2013; Shah et al., 2011; Singh et al., 2012, 2013, 2017; Upadhyay & Srivastava, 2016). Although the association between birth intention and child outcomes has been extensively studied, the effect of unintended birth on PPD particularly in developing countries remains severely under-researched. Moreover, understanding the effect of unintended birth on PPD is important because maternal depression has been recognized as a serious global public health issue (Hanlon, 2012), and the developing countries are not an exception.

Considering the potentially serious consequences of PPD and the non-availability of systematic studies investigating the association between unintended births and PPD in developing countries, our study examines the association between unintended births and the risk of PPD in four developing countries, namely, Ethiopia, India, Peru and Vietnam. The selection of these countries is guided by the availability of Young Lives Study (YLS), where information on birth intention and PPD is collected.

2. Data and methods

2.1. Data

We used data from the first wave of the YLS, which was conducted in Ethiopia, India, Peru and Vietnam in 2002. Young Lives is an international longitudinal study investigating the changing nature of childhood

poverty. About 12000 children are being followed in the aforementioned four countries. Each country has two cohorts: a younger cohort and an older cohort. The younger cohort consists of about 2000 children born during 2001–2002 and the older cohort consists of about 1000 children born during 1994–1995 to be followed over a period of 15 years. The YLS is conducted every three/four years to collect data on a range of indicators related to the growth and development of children. The YLS collects information on maternal health, child welfare outcomes including nutritional status, growth, physical health, cognitive development, social and emotional well-being and educational development (Galab et al., 2003).

Data in YLS were collected using a sentinel site sampling approach. For each country, 20 sentinel sites were selected by a team of local experts to represent a range of geographic regions and living conditions. From each selected sentinel site, a village or census tract was selected randomly. Since no up-to-date lists were available, the fieldworkers carried out door-to-door listings to identify households with children age 6–18 months. Using these lists, 100 households with eligible children were then selected randomly from each sampled village or tract. The exact procedures used for data collection varied between sites because of topographical and administrative differences within and between countries. The details about YLS sampling strategy can be found elsewhere (Escobal & Flores, 2008a; Kumra, 2008a; Nguyen, 2008; Outes-Leon & Sanchez, 2008b). Non-response rates among selected households were low in each country (less than 2%).

The survey interviewed about 2000 women from Ethiopia, 2011 from India, 2052 women from Peru and 1999 women from Vietnam. Individuals with missing data on any of the variable included in the models were excluded based on the following criteria: if the women were unsure about their pregnancy intention or information on PPD could not be collected. Of the interviewed women about 105 (5.3%) women from Ethiopia, 41 (2.0%) women from India, 20 (1.0%) women from Peru and 22 (1.1%) women from Vietnam were not sure about their pregnancy intention. Similarly, information on the PPD could not be collected from 28 (1.4%) women in Ethiopia, 112 (5.6%) women in India, 30 (1.5%) women in Peru and 118 (5.9%) women in Vietnam. Hence, the analytical sample size for examining the association between unintended births and risk of PPD is 1811 women in Ethiopia, 1800 women in India, 1992 women in Peru and 1835 women in Vietnam.

2.2. Outcome variable

The outcome variable of interest is PPD (captured in the survey as “no”, “yes”). The information on PPD was collected from women who had delivered their babies in 5–21 months prior to the survey. PPD was measured by using self-reported-questionnaire (SRQ), a tool developed by the World Health Organization (WHO) particularly for developing countries and often used to detect depression in mothers (Harpham et al., 2003; Tuan, Harpham, & Huong, 2004; WHO, 1994). The SRQ consists of 20 questions and answer of each question was reported in “yes/no” with a reference period of last 30 days. Studies have shown that SRQ-20 is a reliable and valid instrument for measuring PPD among women in a number of developing countries (Hu et al., 2008; van der Westhuizen, Wyatt, Williams, Stein, & Sorsdahl, 2016; WHO, 1994). Cut-off scores to determine how many “yes-answers” constitute a possible case, have been validated against clinical assessments in each of the study countries (Beusenbergh, Orley, & Organization, 1994; Tuan et al., 2004). Tuan et al. (2004) have also shown that a score cut-point of 7/8 to separate risk of non-cases/cases of PPD is valid.

2.3. Exposure variable

The key exposure variable of interest is: birth intention (intended, unintended). The YLS asked mothers “At the time you became pregnant with index child, did you want to become pregnant”. If mother said “yes” then the birth was coded as intended and if she said “no” then the birth

was coded as unintended.

2.4. Other variables

Existing studies on PPD have identified a number of other variables that are possibly associated with PPD. This list includes variables such as social support, preterm birth, low birth weight, economic status of household, place of residence, etc. Accordingly, we included the following variables as control variables in our statistical models; social support (low, medium/high); mode of delivery (vaginal, cesarean); difficult labor (no, yes); women's education (non-literate, primary, secondary, higher secondary and above); women's age at birth of index child (<20, 20–24, 25–29, ≥30); marital status (permanent partner, divorced/separated/widowed, single); parity (1,2, 3, ≥4); sex of child (boy, girl); preterm birth (no, yes); birth size (below average, average and above); health of child compared to other children of the same age (same/better, worse); child had any life threatening illness (no, yes); wealth index (poor, middle, rich); stressful life events (no events, one or more events); and place of residence (rural, urban).

Information on any kind of economic support, emotional support or assistance was also collected in the survey. The survey asked mothers, since last 12 months, did they receive any kind of economic help, emotional help or assistance from work related/trade union (yes, no), community association/co-op (yes, no), women's group (yes, no), political group (yes, no), religious group (yes, no), credit or funeral group (yes, no), sports group (yes, no), family (yes, no), neighborhood (yes, no), friends (yes, no), community leaders (yes, no), religious leader (yes, no), politicians (yes, no), government official/civil service (yes, no), charitable organization/NGO (yes, no), and other (yes, no). If mothers received any kind of help from afore-mentioned group or person, then the response was coded as '1' and '0' otherwise. Further, help from each group/person added together ranges from 0 to 16. If a mother reported no help or assistance, then it was coded as 'low' social support. If the number of supports ranges from 1 to 4, it was considered as 'medium' social support and from 5 to 16 were considered as high social support. The details of the description of social support measurement are presented elsewhere (Galab et al., 2003).

YLS also collected information on respondent's (mother/caregiver) perception about size of the baby at birth. YLS asked the respondent when child was born he/she was "very small", "small", "average", "large" or "very large"? Very small or very small size at birth were categorized as "below average". Average, large and very large size at birth were categorized as 'average and above average'.

The information on health of child compared to the other children were also collected in YLS. YLS asked the mother – "compared to other children of this age would you say the child's health is the same, better or worse". Mothers who answered same or better were coded as "same/better". Mothers who answered worse were coded as "worse".

The wealth index was calculated using principal component analysis on a set of variables based on household assets (including radio, refrigerator, bicycle, television, motorbike/scooter, car, pump, sewing machine, mobile, phone, landline telephone, fan, almirah, clock, table, chair, sofa, bedsheet and animals), household quality (including wall, roof and floor) and services (including electricity, drinking water, toilet facility). The generated index was then divided into three categories: the lowest 33.3% households were coded as poor, the next 33.3% as middle and the highest 33.3% as rich. Items considered under household assets varied only slightly from one country to another.

Stressful life event was assessed by the answer to the following question in the YLS:

Since pregnancy of child, whether the household suffered from natural disaster (yes; no), decrease in food availability (yes; no), livestock died (yes; no), crop failed (yes; no), job loss (yes; no), serious illness/injury (yes; no), death of household members (yes; no), victim of crime (yes; no), divorce/separated (yes; no) and moved/migrated/fled (yes; no).

Households that suffered from any one of afore-mentioned events were coded as '1' and rest were coded as '0'.

3. Statistical analysis

Bivariate analysis was carried out to compare birth intention by socioeconomic and demographic characteristics for each country. Bivariate analysis was also conducted to examine socioeconomic determinants of PPD. As the outcome variable is binary in nature, we used multivariable binary logistic regression models to examine the association between unintended births and the risk of PPD in each of the four countries. We also estimated a multivariable binary logistic regression model by pooling the data from four countries. The 'exposure' and 'other' variables were tested for possible multi-collinearity using variance inflation factor (VIF) before being included in the regression models. Various cut-offs are used by researchers to identify multi-collinearity in multivariable regression models. According to Hair, Black, Babin, Anderson, and Tatham (2010), multicollinearity is high when the VIF exceeds 4.0. Some researchers argue that multicollinearity is high when the VIF exceeds 10 (Kutner, Nachtsheim, & Neter, 2004, pp. 168–170). In our study VIF ranged between 1.01 and 2.35. The VIF values obtained in our paper are much below the permissible limits based on any of the above criteria. All the statistical computations were done in STATA 13.0.

4. Results

The prevalence of PPD was highest in Ethiopia (33%) and lowest in Vietnam (21%). The prevalence of PPD was 30% each in India and Peru. Fig. 1 shows the risk of PPD by birth intention in selected countries and pooled data. The risk of PPD varied substantially by birth intention; the risk of PPD being considerably higher among mothers reporting unintended births. Among mothers who had an unintended birth, 44% in Ethiopia, 39% in India, 35% in Peru, and 24% in Vietnam suffered from PPD. Among mothers who had an intended birth, 26% in Ethiopia, 30% in India, 26% in Peru, and 21% in Vietnam suffered from PPD. In pooled data, 36% of recent mothers with an unintended birth suffered from PPD compared with only 26% of the mothers with an intended birth.

Birth intention according to selected characteristics are shown in Table 1. The highest percentage of unintended births was reported in Peru (45.8%), followed by Ethiopia (37.4%), Vietnam (16.9%), and India (8.2%). Children of mothers who had below primary level of education were more likely to be unintended compared with children of mothers who had primary and above education. Children of mothers who were 30 years or older, had higher parity and were single or divorced/separated/widows were more likely to be unintended compared with their respective counterparts. While economic status was negatively associated with unintended births in India and Peru, it was positively associated in Ethiopia and Vietnam. Risk of PPD by selected characteristics are shown in Table 2. The risk of PPD varied considerably by socio-economic, demographic and residence related characteristics in all the four countries included in the analysis.

The results of multivariable binary logistic regression models for examining the association between birth intention and risk of PPD in Ethiopia, India, Peru, and Vietnam are shown in Table 3. Birth intention was statistically associated with PPD in Ethiopia and Peru. In Ethiopia, mothers reporting unintended birth were 1.99 times as likely as mothers reporting intended birth to suffer from PPD. Likewise, mothers reporting unintended birth were 1.29 times as likely as mothers reporting intended birth to suffer from PPD in Peru. Birth intention was also associated with PPD in the pooled analysis. Mothers reporting unintended births in the pooled data were 1.46 times as likely as mothers who reported intended birth to suffer from PPD.

A number of other variables were associated with risk of PPD. Mother's health during pregnancy was associated with PPD in all the four countries. Mothers whose health during pregnancy was bad were

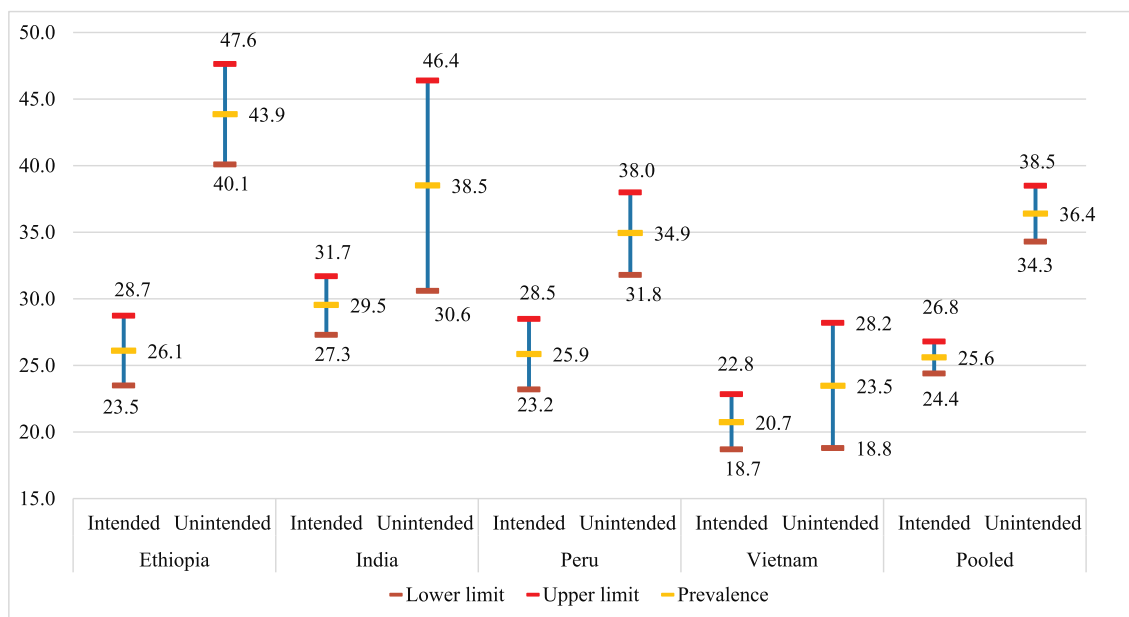


Fig. 1. Risk of postpartum depression by birth intention in Ethiopia, India, Peru and Vietnam, YLS 2002.

1.74–2.24 times as likely as mothers whose health during pregnancy was good to suffer from PPD. In the pooled analysis, mothers whose health during pregnancy was bad were 1.99 times as likely as mothers whose health during pregnancy was good to suffer from PPD. Other variables that were associated with PPD in all the four countries are child health in comparison to other children and stressful life events. Mothers of children whose health in comparison to other children was bad were more likely to suffer from PPD compared with mothers of children whose health in comparison to other children was good. Likewise, mothers who experienced stressful life events were more likely to suffer from PPD compared with mothers who did not experience stressful life events. In the pooled analysis, mothers who experienced stressful life events were 1.75 times as likely as mothers who did not to suffer from PPD.

Difficulty in labor was associated with the risk of PPD in Ethiopia, Peru, and Vietnam; mothers who experienced difficulty in labor were more likely to suffer from PPD compared with mothers who did not experience difficulty in labor in these countries. Difficulty in labor was also associated with PPD in the pooled analysis. Women's education was negatively associated with PPD in India, Peru, and the pooled analysis. The risk of PPD increased with increase in parity of mothers in India, Peru, and pooled analysis. The risk of PPD was also high when the child had any life threatening illness in Ethiopia and Peru. In the pooled analysis, mothers of children who had any life threatening illness were 1.33 times as likely as mothers of children who did not have any life threatening illness to suffer from PPD. Sex of the baby was associated with PPD only in India. In India, mothers who delivered a female baby were 0.80 times as likely as mothers who delivered a male baby to suffer from PPD.

5. Discussion

Using data from the Young Lives Study, we in this study examine the effect of birth intention on the risk of PPD in Ethiopia, India, Peru and Vietnam. Our findings indicate that mothers having unintended birth are more likely to have PPD in Ethiopia, Peru, and the pooled analysis. This result holds even after controlling for a multitude of variables such as mother's health during pregnancy, difficulty in labor, mother's education, social support, health of children compared to other children, stressful life events, etc. Our findings are consistent with the findings of a few studies conducted in other countries (Brito et al., 2015; Mercier

et al., 2013). For example, mothers having an unintended birth in Korea were at a 20–25% higher risk of PPD (Bahk, Yun, Kim, & Khang, 2015) compared with mothers with intended birth. Another study from southwest Ethiopia also reported that mothers having unintended birth were 4.49 time more likely to experience PPD compared with mothers having intended birth (Kerie, Menberu, & Niguse, 2018). Some other studies conducted in developed countries have also reported similar findings (Cheng, Schwarz, Douglas, & Horon, 2009; Lancaster et al., 2010).

Our study provides first evidence on the effect of unintended birth on the risk of PPD in selected countries. In the past, majority of studies in these countries have examined antenatal depression and very few studies address the risk of depression during postpartum period. Existing literature on PPD in Peru and Vietnam examined the role of intimate partner violence in increasing the risk of PPD (Fisher et al., 2013; Gomez-Beloz, Williams, Sanchez, & Lam, 2009). Studies from India have mostly examined the socioeconomic and demographic factors associated with the risk of PPD (Bodhare, Sethi, Bele, Gayatri, & Vivekanand, 2015; Chandran, Tharyan, Muliylil, & Abraham, 2002; Patel et al., 2015). However, majority of the previous studies have not taken into account unintended births as a risk factor for PPD. Moreover, the study from Peru was based on only those women who delivered in hospitals and hence is subject to selection bias (Bowling, 2005). Other studies from India and Vietnam lack representativeness as those were either based on samples from rural or urban settings (Fisher et al., 2013; Shivalli & Gururaj, 2015).

In our analysis, birth intention was not associated with PPD in India. This finding is in line with the findings of previous research in India (Hegde et al., 2012; Shivalli & Gururaj, 2015). In a systematic review of the risk factors for PPD in India, Upadhyay et al. (2017) found only a few studies that have reported unintended birth as a risk factor for PPD in India.

In our analysis, risk of PPD was associated with mother's poor health during pregnancy in all the four countries. This finding is consistent with the past research on this subject (Underwood et al., 2017). Further, our findings show that stressful life events such as job loss, death of a household member, natural disaster, crop failure etc. were associated with the risk of PPD in all the four countries. A review of literature on the risk factors for PPD revealed that stressful life event is one of the leading causes of PPD (Beck, 2001; O'hara, Neunaber, & Zekoski, 1984).

Table 1
Prevalence of unintended births by selected characteristics in Ethiopia, India, Peru and Vietnam, YLS 2002.

	Ethiopia		India		Peru		Vietnam	
	Sample size (N)	Prevalence (95%CI)	Sample size (N)	Prevalence (95%CI)	Sample size (N)	Prevalence (95%CI)	Sample size (N)	Prevalence (95%CI)
Women's health during pregnancy								
Good	1305	34.6(32.1, 37.2)	1537	7.4(6.0, 8.7)	1495	44.9(42.4, 47.4)	1545	15.5(13.7, 17.3)
Bad	506	44.5(40.1, 48.8)	263	13.3(9.2, 17.4)	497	48.7(44.3, 53.1)	290	24.5(19.5, 29.4)
Difficulty in labor								
No	1116	36.6(33.8, 39.5)	1203	7.9(6.4, 9.4)	1336	46.6(44.0, 49.3)	1463	17.4(15.4, 19.3)
Yes	695	38.6(34.9, 42.2)	597	8.9(6.6, 11.2)	656	44.2(40.4, 48.0)	372	15.3(11.7, 19.0)
Mode of delivery								
Vaginal	1766	37.4(35.2, 39.7)	1545	9.1(7.7, 10.6)	1748	47.3(44.9, 49.6)	1668	17.1(15.3, 18.9)
Cesarean	45	35.6(21.4, 49.7)	255	2.7(0.7, 4.8)	244	35.7(29.6, 41.7)	167	15.6(10.1, 21.1)
Women's education								
Non-literate	1072	35.7(32.7, 38.7)	1066	9.5(7.7, 11.2)	155	63.9(56.3, 71.5)	491	17.1(13.8, 20.4)
Primary	361	39.1(34.0, 44.1)	150	7.3(3.1, 11.5)	739	46.7(43.1, 50.3)	690	19.7(16.7, 22.7)
Secondary	230	44.3(37.9, 50.8)	210	6.2(2.9, 9.5)	775	43.5(40.0, 47.0)	419	15.3(11.8, 18.7)
Higher secondary and above	148	37.2(29.3, 45.0)	373	6.2(3.7, 8.6)	323	40.9(35.5, 46.2)	235	11.5(7.4, 15.6)
Women's age								
<20 years	306	40.5(35.0, 46.0)	581	6.4(4.4, 8.4)	435	44.8(40.1, 49.5)	226	4.0(1.4, 6.5)
20–24 years	531	36.5(32.4, 40.6)	804	8.5(6.5, 10.4)	581	44.4(40.4, 48.5)	648	13.9(11.2, 16.6)
25–29 years	547	35.6(31.6, 39.7)	319	8.8(5.7, 11.9)	463	46.2(41.7, 50.8)	501	17.8(14.4, 21.1)
≥30 years	427	38.4(33.8, 43.0)	96	15.6(8.3, 22.9)	513	48.0(43.6, 52.3)	460	26.7(22.7, 30.8)
Marital status								
Permanent partner	1571	33.7(31.3, 36.0)	–	–	1720	44.5(42.1, 46.8)	–	–
Divorced/separated/widowed	179	60.3(53.1, 67.5)	–	–	161	52.8(45.1, 60.5)	–	–
Single	61	65.6(53.5, 77.6)	–	–	111	56.8(47.5, 66.0)	–	–
Parity								
1	388	39.2(34.3, 44.0)	672	6.0(4.2, 7.7)	722	38.5(35.0, 42.1)	814	3.2(2.0, 4.4)
2	341	31.1(26.2, 36.0)	684	6.3(4.5, 8.1)	494	42.5(38.1, 46.9)	656	20.1(17.1, 23.2)
3	272	36.8(31.0, 42.5)	264	9.8(6.2, 13.5)	308	47.1(41.5, 52.7)	232	39.2(32.9, 45.5)
≥4	810	39.4(36.0, 42.8)	180	21.7(15.6, 27.7)	468	59.8(55.4, 64.3)	133	46.6(38.1, 55.1)
Sex of the child								
Boy	970	37.3(34.3, 40.4)	968	8.2(6.4, 9.9)	1000	46.2(43.1, 49.3)	949	16.2(13.9, 18.6)
Girl	841	37.5(34.2, 40.7)	832	8.3(6.4, 10.2)	992	45.5(42.4, 48.6)	886	17.7(15.2, 20.2)
Preterm birth								
No	1629	37.2(34.9, 39.5)	1631	8.3(7.0, 9.7)	1453	46.0(43.5, 48.6)	1607	17.0(15.2, 18.8)
Yes	182	39.0(31.9, 46.1)	169	7.1(3.2, 11.0)	539	45.3(41.1, 49.5)	228	16.7(11.8, 21.5)
Birth size								
Below average	538	41.6(37.5, 45.8)	457	10.3(7.5, 13.1)	551	47.7(43.6, 51.9)	354	16.1(12.3, 19.9)
Average or above	1273	35.6(33.0, 38.2)	1343	7.5(6.1, 8.9)	1441	45.1(42.5, 47.7)	1481	17.2(15.2, 19.1)
Child had any life threatening illness								
No	1253	36.6(33.9, 39.2)	1387	7.7(6.3, 9.1)	1353	45.6(42.9, 48.3)	1598	16.5(14.6, 18.3)
Yes	588	39.2(35.2, 43.3)	413	9.9(7.0, 12.8)	639	46.3(42.5, 50.2)	237	20.3(15.1, 25.4)
Child health in comparison to other children								
Same/better	1375	34.8(32.2, 37.3)	1552	7.8(6.5, 9.1)	1702	45.5(43.1, 47.8)	1358	16.1(14.2, 18.1)
Worst	436	45.6(41.0, 50.3)	248	10.9(7.0, 14.8)	290	47.9(42.2, 53.7)	477	19.3(15.7, 22.8)
Stressful life events								
No events	535	37.0(32.9, 41.1)	1002	6.4(4.9, 7.9)	1216	44.8(42.0, 47.6)	1059	13.2(11.2, 15.3)
One or more events	1276	37.5(34.9, 40.2)	798	10.5(8.4, 12.7)	776	47.4(43.9, 50.9)	776	22.0(19.1, 25.0)
Wealth index								
Poor	602	30.4(26.7, 34.1)	578	10.7(8.2, 13.3)	665	50.1(46.3, 53.9)	602	15.0(12.1, 17.8)
Middle	609	35.5(31.7, 39.3)	607	8.2(6.0, 10.4)	666	43.8(40.1, 47.6)	606	17.3(14.3, 20.3)
Rich	600	46.4(42.4, 50.5)	615	5.9(4.0, 7.7)	661	43.6(39.8, 47.4)	627	18.5(15.5, 21.5)
Social support								
Low	152	34.9(27.3, 42.5)	335	7.8(4.9, 10.6)	610	38.7(34.8, 42.6)	63	25.4(14.6, 36.2)
Medium/high	1659	37.6(35.3, 39.9)	1465	8.3(6.9, 9.7)	1382	49.0(46.4, 51.6)	1772	16.6(14.9, 18.4)
Place of residence								
Rural	1193	31.7(29.0, 34.3)	1345	9.5(7.9, 11.1)	666	49.8(46.0, 53.7)	1466	14.8(13.0, 16.6)
Urban	618	48.4(44.4, 52.3)	455	4.4(2.5, 6.3)	1326	43.8(41.1, 46.5)	369	25.5(21.0, 29.9)
Total	1811	37.4(35.2, 39.6)	1800	8.2(7.0, 9.5)	1992	45.8(43.6, 48.0)	1835	16.9(15.2, 18.7)

Studies have reported mixed results when it comes to the relationship between birth size/weight of the baby and PPD. While there are studies that have reported significant effect of birth weight on PPD (Helle et al., 2015), there are others that found no relationship (Vigod, Villegas, Dennis, & Ross, 2010). In our study, birth size was not associated with PPD in any of the four countries. In our analysis, medium/high social support was associated with higher risk of PPD in

Ethiopia and Peru. Due to the cross-sectional nature of data, reverse causality cannot be ruled out in our analysis. For example, mothers who have PPD might receive more support from family, friends, and individuals from the community compared with mothers who do not have PPD. Future studies should examine the association between social support and PPD in a longitudinal set up.

At this juncture, it is important to discuss the main strengths of our

Table 2

Risk of postpartum depression by selected characteristics in Ethiopia, India, Peru and Vietnam, YLS 2002.

	Ethiopia (N = 1811)	India (N = 1800)	Peru (N = 1992)	Vietnam (N = 1835)
Birth intention				
Intended	26.1(23.5, 28.7)	29.5(27.3, 31.7)	25.9(23.2, 28.5)	20.7(18.7, 22.8)
Unintended	43.9(40.1, 47.6)	38.5(30.6, 46.4)	34.9(31.8, 38.0)	23.5(18.8, 28.2)
Women's health during pregnancy				
Good	26.0(23.6, 28.4)	26.8(24.6, 29.0)	25.9(23.7, 28.1)	16.9(15.0, 18.8)
Bad	50.2(45.8, 54.6)	50.6(44.5, 56.6)	42.5(38.1, 46.8)	44.1(38.4, 49.9)
Difficulty in labor				
No	28.7(26.0, 31.3)	29.3(26.7, 31.8)	27.5(25.1, 29.9)	19.0(17.0, 21.0)
Yes	39.3(35.6, 42.9)	32.3(28.6, 36.1)	35.1(31.4, 38.7)	29.8(25.2, 34.5)
Mode of delivery				
Vaginal	32.5(30.3, 34.7)	30.5(28.2, 32.8)	30.8(28.6, 32.9)	21.3(19.4, 23.3)
Cesarean	42.2(27.6, 56.8)	29.0(23.4, 34.6)	24.6(19.2, 30.0)	19.8(13.7, 25.8)
Women's education				
Non-literate	34.9(31.9, 37.9)	36.7(33.8, 39.6)	46.5(38.6, 54.3)	24.0(20.2, 27.8)
Primary	29.9(25.2, 34.6)	26.0(19.0, 33.0)	32.1(28.7, 35.4)	22.0(18.9, 25.1)
Secondary	28.7(22.8, 34.6)	26.7(20.7, 32.7)	28.5(25.3, 31.7)	19.3(15.5, 23.1)
Higher secondary and above	27.0(19.8, 34.2)	15.8(12.1, 19.5)	21.1(16.6, 25.5)	16.2(11.5, 20.9)
Women's age at birth of child				
<20 years	29.1(24.0, 34.2)	28.6(24.9, 32.2)	24.6(20.5, 28.7)	16.4(11.5, 21.2)
20–24 years	30.7(26.8, 34.6)	29.4(26.2, 32.5)	24.4(20.9, 27.9)	21.0(17.8, 24.1)
25–29 years	31.6(27.7, 35.5)	32.9(27.7, 38.1)	33.7(29.4, 38.0)	22.8(19.1, 26.4)
≥30 years	39.3(34.7, 44.0)	39.6(29.7, 49.4)	37.6(33.4, 41.8)	22.2(18.4, 26.0)
Marital status				
Permanent partner	31.3(29.0, 33.5)	–	28.8(26.6, 30.9)	–
Divorced/separated/widowed	45.3(37.9, 52.6)	–	42.2(34.6, 49.9)	–
Single	34.4(22.4, 46.5)	–	31.5(22.8, 40.2)	–
Parity				
1	29.4(24.8, 33.9)	25.0(21.7, 28.3)	23.0(19.9, 26.1)	19.7(16.9, 22.4)
2	29.3(24.5, 34.2)	29.4(26.0, 32.8)	27.9(24.0, 31.9)	20.6(17.5, 23.7)
3	26.5(21.2, 31.7)	36.0 (30.2, 41.8)	33.1(27.9, 38.4)	25.0(19.4, 30.6)
≥4	37.9(34.6, 41.2)	45.0(37.7, 52.3)	41.0(36.6, 45.5)	27.1(19.5, 34.6)
Sex of the child				
Boy	34.1(31.1, 37.1)	32.5(29.6, 35.5)	30.7(27.8, 33.6)	21.8(19.2, 24.4)
Girl	31.2(28.0, 34.3)	27.6(24.6, 30.7)	29.3(26.5, 32.2)	20.5(17.9, 23.2)
Preterm birth				
No	32.1(29.8, 34.4)	29.8(27.6, 32.0)	29.5(27.2, 31.9)	20.7(18.7, 22.6)
Yes	38.5(31.4, 45.6)	34.9(27.7, 42.1)	31.4(27.4, 35.3)	25.0(19.4, 30.6)
Birth size				
Below average	40.5(36.4, 44.7)	33.7(29.4, 38.0)	32.7(28.7, 36.6)	30.2(25.4, 35.0)
Average and above	29.5(27.0, 32.0)	29.1(26.7, 31.5)	29.0(26.7, 31.4)	19.0 (17.0, 21.0)
Child had any life threatening illness				

Table 2 (continued)

	Ethiopia (N = 1811)	India (N = 1800)	Peru (N = 1992)	Vietnam (N = 1835)
No	27.6(25.1, 30.1)	27.8(25.4, 30.1)	26.6(24.3, 29.0)	19.2(17.3, 21.1)
Yes	44.3(40.1, 48.4)	38.7(34.0, 43.4)	37.2(33.5, 41.0)	34.6(28.5, 40.7)
Child health in comparison to other children				
Same/better	27.6(25.2, 29.9)	27.7(25.5, 29.9)	28.1(26.0, 30.3)	15.2(13.3, 17.2)
Worst	49.1(44.4, 53.8)	46.4(40.2, 52.6)	41.0(35.4, 46.7)	38.2(33.8, 42.5)
Stressful life events				
No events	22.1(18.5, 25.6)	24.6(21.9, 27.2)	25.2(22.8, 27.7)	12.8(10.8, 14.9)
One or more events	37.2(34.6, 39.9)	37.5(34.1, 40.8)	37.5(34.1, 40.9)	32.6(29.3, 35.9)
Wealth index				
Poor	34.2(30.4, 38.0)	42.4(38.4, 46.4)	30.2(26.7, 33.7)	22.9(19.6, 26.3)
Middle	31.0(27.3, 34.7)	33.3(29.5, 37.0)	34.4(30.8, 38.0)	23.6(20.2, 27.0)
Rich	33.0(29.2, 36.9)	15.9(13.0, 18.8)	25.4(22.1, 28.7)	17.2(14.3, 20.2)
Social support				
Low	25.7(18.7, 32.6)	32.2(27.2, 37.3)	25.4(22.0, 28.9)	33.3(21.6, 45.1)
Medium/high	33.4(31.1, 35.7)	29.8(27.5, 32.2)	32.1(29.6, 34.5)	20.8(18.9, 22.7)
Place of residence				
Rural	31.9(29.3, 34.6)	34.0(31.4, 36.5)	31.5(28.0, 35.1)	20.7(18.6, 22.7)
Urban	34.3(30.6, 38.1)	19.3(15.7, 23.0)	29.3(26.8, 31.7)	23.3(19.0, 27.6)
Total	32.7(30.6, 34.9)	30.3(28.2, 32.4)	30.0 (28.0, 32.0)	21.2(19.3, 23.1)

study. A key strength of our study is that we have used a relatively large study population from countries, which are typically underrepresented in mental health research, and where the evidence on the association between unintended births and the risk of PPD is generally lacking. A majority of the studies on the adverse consequences of birth intention on PPD are based on Western countries (Cheng et al., 2009; Gauthreaux et al., 2017). Another uniqueness of this study is to control for social support received by mothers in the last 12 months preceding the survey. In the past, only a few studies were able to control for maternal social support while analyzing the association between birth intention and PPD.

Limitations of the study must also be noted. First, like other instruments used to measure the depression, SRQ-20 is designed to identify risk of mental health, with appropriate psychometric properties. The SRQ-20 identifies risk of both depression and anxiety/stress but does not distinguish between the two. In addition to SRQ-20, there are other methods of measuring mental health particularly during postpartum period such as Edinburgh Postnatal Depression Scale (EPDS) which is developed to measure depression during postpartum. Studies comparing SRQ-20 with EPDS and other alternative tools have reported that SRQ-20 is as valid as EPDS and other tools to measure the PPD (Husain et al., 2014; Santos et al., 2007). Even, few studies have reported that SRQ-20 performs better than other tools developed to measure PPD in the context of low and middle income countries (Husain et al., 2014). So, use of SRQ-20 for measuring PPD in YLS is less problematic than otherwise thought.

Second, because of the retrospective nature of the data, the reporting of birth intention is subject to recall bias and other biases such as ex-post rationalization (Koenig, Stephenson, Ahmed, Jejeebhoy, & Campbell, 2006; Westoff and Ryder (1977)). Such a tendency is likely to increase with the increase in the recall period, such as in the Demographic and Health Surveys where the information on birth intention is generally asked with reference to the births that have taken place in the five years

Table 3

Results of multivariable binary logistic regression models assessing the association between birth intention and risk of postpartum depression among women in Ethiopia, India, Peru and Vietnam, YLS 2002.

	Ethiopia	India	Peru	Vietnam	Pooled
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Birth intention					
Intended®					
Unintended	1.99*(1.58,2.50)	1.08(0.73,1.61)	1.29*(1.04,1.59)	0.78(0.54,1.12)	1.46*(1.29,1.66)
Women's health during pregnancy					
Good®					
Bad	1.99*(1.55,2.55)	2.24*(1.66,3.02)	1.74*(1.38,2.20)	2.47*(1.83,3.33)	1.99*(1.75,2.27)
Difficulty in labor					
No®					
Yes	1.31*(1.03,1.65)	1.14(0.88,1.47)	1.59*(1.26,2.00)	1.88*(1.34,2.64)	1.37*(1.21,1.56)
Mode of delivery					
Vaginal®					
Cesarean	1.59(0.81,3.12)	1.11(0.78,1.59)	0.58*(0.40,0.83)	0.51*(0.30,0.85)	0.79*(0.64,0.97)
Women's education					
Non-literate®					
Primary	0.86(0.64,1.15)	0.72(0.47,1.08)	0.54*(0.38,0.78)	1.23(0.88,1.73)	0.89(0.77,1.04)
Secondary	0.78(0.53,1.13)	0.95(0.66,1.36)	0.45*(0.30,0.69)	1.22(0.82,1.81)	0.83*(0.69,0.99)
Higher secondary and above	0.77(0.47,1.25)	0.54*(0.38,0.78)	0.29*(0.18,0.48)	1.04(0.63,1.73)	0.58*(0.47,0.72)
Women's age at birth of child					
<20 years®					
20–24 years	0.94(0.64,1.36)	1.16(0.88,1.52)	0.90(0.65,1.25)	1.37(0.87,2.17)	1.07(0.91,1.26)
25–29 years	0.79(0.52,1.21)	1.15(0.80,1.65)	1.28(0.87,1.87)	1.45(0.88,2.41)	1.16(0.96,1.41)
≥30 years	0.84(0.52,1.34)	1.20(0.69,2.07)	1.28(0.84,1.94)	1.24(0.71,2.18)	1.20(0.96,1.50)
Marital status					
Permanent partner®					
Divorced/separated/widowed	1.54*(1.06,2.24)	–	2.01*(1.40,2.89)	–	–
Single	1.12(0.77,1.63)	–	1.51(0.95,2.39)	–	–
Parity					
1®					
2	1.12(0.77,1.63)	1.11(0.85,1.45)	1.29(0.95,1.76)	1.02(0.74,1.40)	1.06(0.91,1.23)
3	1.03(0.67,1.60)	1.36(0.95,1.96)	1.57*(1.08,2.29)	1.14(0.71,1.81)	1.12(0.93,1.36)
≥4	1.53*(1.01,2.30)	1.59*(1.02,2.46)	1.65*(1.09,2.51)	1.16(0.62,2.15)	1.28*(1.03,1.57)
Sex of the child					
Boy®					
Girl	0.97(0.77,1.21)	0.80*(0.64,0.99)	0.97(0.79,1.20)	0.91(0.71,1.17)	0.91(0.81,1.01)
Preterm birth					
No®					
Yes	1.12(0.76,1.64)	1.49*(1.05,2.12)	1.11(0.88,1.41)	1.08(0.74,1.57)	1.15(0.98,1.34)
Birth size					
Below average®					
Average and above	0.83(0.65,1.06)	1.06(0.82,1.38)	0.92(0.73,1.16)	0.88(0.65,1.20)	0.89(0.79,1.01)
Child had any life threatening illness					
No®					
Yes	1.50*(1.17,1.93)	1.16(0.90,1.51)	1.44*(1.16,1.79)	1.24(0.87,1.75)	1.33*(1.17,1.51)
Child health in comparison to other children					
Same/better®					
Worst	1.71*(1.32,2.23)	1.69*(1.24,2.30)	1.47*(1.11,1.94)	2.35*(1.80,3.07)	1.80*(1.57,2.06)
Stressful life events					
No events®					
One or more events	1.80*(1.38,2.34)	1.31*(1.03,1.66)	1.49*(1.21,1.85)	2.59*(1.99,3.36)	1.75*(1.55,1.96)
Wealth index					
Poor®					
Middle	1.01(0.76,1.35)	0.78(0.61,1.01)	1.46*(1.10,1.95)	1.05(0.77,1.44)	0.99(0.86,1.14)
Rich	1.21(0.78,1.88)	0.36*(0.26,0.51)	1.21(0.85,1.72)	0.59*(0.39,0.91)	0.74*(0.62,0.88)
Social support					
Low®					
Medium/high	1.48(0.96,2.26)	0.88(0.66,1.17)	1.38*(1.09,1.75)	0.65(0.35,1.23)	1.13(0.96,1.32)
Place of residence					
Rural®					
Urban	1.29(0.88,1.91)	1.04(0.75,1.45)	1.06(0.79,1.41)	2.11*(1.39,3.21)	1.39*(1.19,1.62)

Note. 1. * Significant at 5%, ® reference category.

2 Marital status of women was not included in analysis for India and Vietnam due to small number of cases in Category other than permanent partner.

3 Regression for pooled data included country fixed effect.

preceding the survey. However, since the information on birth intention in the YLS was collected soon after birth (from 5 to 21 months), the bias in recall and reporting is likely to be minimal. Moreover, if due to recall bias or ex-post rationalization some unintended births were enumerated as intended in the YLS, the association between birth intention and the risk of PPD in our study is likely to be underestimated. In such a situation, our estimates can be considered as a lower bound on the adverse

consequences of unintended birth.

Third, as mentioned earlier, the information on PPD was collected 5–21 months after the birth of the index child. Notably, studies from the past have revealed that the prevalence of PPD is generally higher during the initial months after the birth of a child and reduces over time (Aradine & Ferketich, 1990; Drewett, Blair, Emmett, Emond, & Team, 2004; TAMAKI, MURATA, & OKANO, 1997). Also, Christensen, Stuart,

Perry, and Le (2011) reported that the difference in average depressive symptoms between women with intended and unintended births was lower at 12 months postpartum than at 4 months postpartum. Another study from Australia reported that the impact of pregnancy intention on maternal depression diminished over the perinatal period (Najman, Morrison, Williams, Andersen, & Keeping, 1991). As, PPD was measured between 5-21 months after delivery, this might underestimate the prevalence of PPD and consequently underestimate the effect of birth intention on the risk of PPD in our study.

Fourth, we could not differentiate between unwanted births and mistimed births because the question asked of the mothers in YLS did not distinguish between the two. Therefore, we could not separate the negative effects of unintended birth on PPD into the negative effects of unwanted birth and the mistimed birth as in some of the earlier studies (Gauthreaux et al., 2017; Mercier et al., 2013).

Fifth, we could not establish causal relationship between unintended births and PPD due to the cross-sectional nature of data. Information regarding birth intention and the risk of PPD in YLS was collected at same point in time. While pregnancy intention can be sought for the current pregnancy but the PPD cannot be assessed for the same pregnancy in cross-sectional surveys. That is why, despite YLS being a longitudinal study, we could only look at the association between birth intention and PPD in a cross-sectional manner. Future research, therefore, should follow women from the time they get pregnant until a few months of termination of pregnancy to examine causal relationship between birth intention and PPD. Another limitation of the study is our inability to control for depression during the pregnancy. Depression during pregnancy was reported as a risk factor for PPD in earlier studies (Robertson, Grace, Wallington, & Stewart, 2004). Further, we were also unable to control intimate partner violence during pregnancy due to unavailability of such information in YLS.

Finally, YLS interviewed women only from few sentinel sites in each country. So, there might be issues with the generalizability of YLS findings to larger population. A comparison of YLS with the Demographic and Health Survey for each country suggests that the YLS sample in each country covers the diversity of women and children (Lives, 2008; Outes-Leon & Sanchez, 2008a). In addition, studies have concluded that the YLS sample is an appropriate and valuable instrument for analyzing causal relationship and modelling health and well-being of women and children (Galab, Reddy, & Himaz, 2008).

Despite these limitations, our study provides convincing evidence on the relationship between unintended births and PPD among mothers in Ethiopia and Peru. Our results suggest that reducing unintended births might help in reducing the incidence of PPD among mothers. One of the most cost-effective interventions for reducing the incidence of unintended births is the effective family planning programme. Given the high prevalence of unintended births and the relationship between unintended births and PPD in the four countries, there is a need to reposition the family planning programs in these countries.

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Ethical statement

The YLS is a publicly available dataset with no identifiable information in place. YLS can be downloaded with permission from the website of the United Kingdom Data Archives University of Essex after taking permission. The data for the current study was downloaded from the afore-mentioned website after taking permission (I.D. No. 90978).

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmph.2019.100495>.

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