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Postnatal depression and intimate partner violence: a nationwide clinic-based study in Malaysia

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ABSTRACT

Introduction

Worldwide, an estimated 13% of postnatal women are suffering from postnatal depression (PND). Other than under-privileged women, those who were exposed to violence are at higher risk of PND. This study aimed to investigate the relationship between intimate partner violence (IPV) and PND in Malaysia.

Methods

Randomly selected women at 6 to 16 weeks postnatal, registered at randomly selected government health clinics throughout Malaysia between June to October 2016, were invited to join this study. This survey was conducted as a nation-wide clinic-based study using cluster sampling design. PND was assessed using self-administered Edinburgh Postnatal Depression Scale (EPDS), while demographic profile and IPV was assessed using locally validated WHO Multi-country Study on Women's Health and Life Events Questionnaire, administered as face-to-face interview. EPDS score of 12 or more and/or positive for suicidal behaviour were considered as having PND.

Results

Out of 6669 randomly selected respondents, 5727 respondents were successfully interviewed, resulting in response rate of 85.9%. The prevalence of PND in Malaysia was 4.4% (95% CI: 2.9, 6.7). Overall prevalence of IPV was 4.9% (95% CI: 3.8, 6.4), of which 3.7%, 2.6% and 1.2% experienced psychological, physical, and sexual violence, respectively. Logistic regression analysis noted that postnatal women at risk of having depression were

those reported psychological or sexual violence, and those from low household income, whose husband/partner consumed alcohol and those with lack of family support during confinement.

Discussion and Conclusion

Exposure to psychological or sexual violence was significantly associated with PND. Other factors include low household income, husband/partner who consumed alcohol and lack of family support. These findings highlighted the importance of screening for PND and IPV during postpartum period, followed by appropriate intervention particularly for underprivileged population.

Keywords: depression, post-partum, intimate partner violence, family support

Strength ands and limitations of this study

- Nationwide study using cluster sampling design enabled the findings of this study to be generalised to Malaysian population as majority of postnatal mothers sought care at government health facilities
- Objective assessment of the postnatal depression using locally validated self-administered tool
- Intimate partner violence were assessed using locally validated questionnaires
- Postnatal depression was based on screening tool and not diagnostic

INTRODUCTION

World Health Organization estimates that 13% of post-partum women experince mental disorders, particularly depression [1]. The problem was observed to be higher in developing countries, ranges from 4.9% to 50.8% among mothers four to eight weeks postpartum [2]. Among Asian women, using self-rated questionnaires, the prevalence was 23.7%, 16.5% and 17.4% at six weeks, three months, and six months after childbirth, respectively [3]. The prevalence in Malaysia varies based on the setting; 20.7% at primary care setting [4] and 31.7% at hospital setting [5].

Postnatal depression, PND, generally observed within four to six weeks after childbirth, presented with symptoms such as low mood, anhedonia, forgetfulness, irritability, anxiety, sleep disturbance, and poor functioning [6]. Various factors were found to be associated with PND. Young age, low socioeconomic status, and partner's factors such as alcoholism, uneducated, marital conflict, lack of husband's support, and psychological factors such as antenatal depression, stressful life event, and IPV were associated with PND [2, 3]. While depression at any time through out a woman's lifetime is always devastating, depression during the perinatal period; antenatal and postnatal, is of special importance and a public health concern due to its detrimental effects to women, families and their children. It may lead to serious complications such as maternal suicide, child abuse and neglect and increased risk of children's emotional and behavioural problems in later life.

Violence against women, particularly IPV is an important public health problem especially if the affected women become pregnant. IPV refers to any behaviour within an intimate relationship that causes physical, psychological or sexual harm to those in the relationship. Such behaviour includes acts of physical aggression, forced intercourse and other forms of sexual coercion and various controlling behaviours [7]. It is associated with fatal and non-fatal health effects including homicide and suicide as well as negative health behaviour during pregnancy, poor reproductive outcomes and adverse physical and mental

consequences. IPV has been described as one of the most important predictors for depression in women. A review on studies exploring the determinants of PND in South Asia noted the association with physical violence by intimate partner [8]. A household-hold survey done in Peninsular Malaysia, revealed that 7.8% of women were emotionally abused, 5.0% were physically abused and 1.7% were sexually abused [9]. However, this survey only targeted adult women and not post-partum mothers.

Although PND and IPV have been studied in several countries showing positive association, there is no study investigating the relationship between the two in Malaysia. Thus, this study aimed to determine the magnitude of PND in Malaysia and its associated factors, particularly IPV. Both conditions, PND and IPV, while being pressing public health concerns worldwide, are generally undetected in perinatal care services without proper screening program and intervention in place.

METHODS

Study design and sampling

This cross-sectional study targeted women at six to 16 weeks postpartum, registered at government primary care clinics for postpartum care, throughout Malaysia, from June to October 2016. In Malaysia, the Ministry of Health is the main provider of perinatal healthcare services via the government primary care clinics which are available throughout Malaysia. To ensure national representativeness, cluster sampling design was used in the study. Government primary care clinics within each state, considered as cluster, were randomly selected and eligible randomly selected mothers within the clinics were considered as unit of analysis. Clinics were selected from the sampling frame of all government primary care clinics in Malaysia using systematic probability proportional to size sampling techniques.

Based on the estimated prevalence of IPV in Malaysia of 8.0% [9], sample size was calculated using a single proportion formula for the estimation of prevalence. In addition, based on the design effect of 2 and estimated non-response rate of 20%, the sample size required was 6,584 postpartum mothers.

Questionnaire

PND was assessed using locally validated self-administered Edinburgh Postnatal Depression Scale (EPDS) [10, 11]. This scale comprises of 10 statements on common depressive symptoms and using Likert-type of responses; 0-3 scores, reflecting the severity of the symptoms. Demographic profile and IPV was assessed using locally validated WHO Multi-country Study on Women's Health and Life Events Questionnaire [9].

In assessing psychological violence, questions asked were; "At any time, has your current partner or any partner before this degraded or humiliated you in front of others?", "At anytime, has your current partner or any partner previously do things to threaten or make you

scared (example: by the way he looks at you, shouts or break things)?“, or, “At any time, has your current partner or any partner previously treatened to hurt you or somebody whom you cared about?“.

For physical violence, questions asked were; “At any time, has your current partner or any partner before this slapped or thrown something at you that could hurt you?”,“At any time, has your current partner or any partner before this pushed or grabed you or pulled your hair?or “At any time, has your current partner or any partner previously beat you with his fist or anything else that could hurt you? “At any time, has your current partner or any partner previously kicked, dragged or beaten you?“ or “At any time, has your current partner or any partner previously choked or burnt you on purpose?“ or “At any time, has your current partner or any partner previously threatened you using a gun, knife or any other weapon?“

Questions asked for identifying sexual violence were; “At any time, has your current partner or any partner previously physically forced you to have sexual intercourse when you did not want to?“ or “Have you ever entered into an unwanted sexual relationship with your partner or any partner previously because of fear of what your partner might do?“, or “Has your partner forced you to do something sexual that you feel is degrading or humiliating?“

This questionnaire was installed into mobile devise and administered as face-to-face interview by trained nurses. Both questionnaires were available in bilingual; *Bahasa Malaysia* and English.

Statistical analysis

Only data with complete responses on EPDS module was used for analysis. Data was analysed using complex sample module in the IBM Statistical Package of Social Sciences (SPSS) for Windows version 23.0 (IBM Corp., Armonk, NY, USA), taking into consideration the complexity of the sampling design. The overall prevalence of PND and its estimated population affected were determined. Bivariate analysis was done to determine the factors

associated with PND. Crude odds ratios were used to describe the strength of association between dependent and independent variables. Multivariable logistic regression model was fitted to determine the factors associated with PND. The independent variables that were included were locality, sex, ethnicity, household income, age group, ethnicity, marital status, education level, occupation, household income, partner's alcohol consumption, family support during confinement and the three types of IPV; emotional, physical and sexual violence. As the dependent variable was dichotomous, we used a logistic regression model to produce crude odds ratio as a measure of association. For the final model, FORWARD LR variable selection method was used to obtain significant variables. Only variables with *p*-value of less than 0.25 were included. The statistical significance of the individual regression coefficient was tested using Wald chi-square statistic. The adjusted OR, with the respective 95% confidence intervals (CIs), was then calculated. A p-value of less than 0.05 was considered significant. Model fit was tested by the Hosmer-Lemeshow statistic, which should be non-significant (p>0.05).

Variable definition

Age was grouped into four categories; 18-24 years, 25-29 years, 30-34 years, and 35 years and more. Ethnicity was classified based on three major ethnic groups in Malaysia, namely Malay, Malaysian Chinese and Malaysia Indian, followed by 'Other Bumiputera' and 'Others'. Other Bumiputera comprised of indigenous groups, local Sabahans and Sarawakians, while 'Others' were mostly foreigners, immigrants, both legal and illegal, residing in Malaysia.

Education levels were categorised based on the Malaysian education system. Respondents were considered as having no formal education/primary education if they had not attended any formal schooling up to those who had completed up to six years of primary school. Those who had completed 11 years of formal schooling were considered as completed secondary education, while respondents with diploma or higher qualifications were

considered as having completed tertiary education. Household income was calculated based on the pooled income of family members and categorised into four groups; lowest to highest.

PND was defined based on EPDS result. Respondent was considered as having depression based on EPDS score of 12 and/or more, positive response to the last statement on self-harming. The cut-off score was based on local validation studies [10,11].

For IPV, this study assessed three types of violence; psychological, physical and sexual violence. Psychological violence was defined as positive response to ever been publicly humiliated, or ever been threatened or threatened to hurt respondent or someone she cared. Physical violence was considered when respondent gave positive response to history of being slapped, pushed, beaten, kicked, chocked or threatened with weapon, while sexual violence was defined as positive response for any history of sexual coercion, sex out of fear, or forced to engage in degraded sexual act.

RESULTS

Out of 6639 randomly selected respondents, 5745 were successfully interviewed, resulting in response rate of 86.5%. A total of 442 respondents defaulted follow-up at the clinics, non-contactable or moved out from the clinic's operation area during their eligibility period; 6-6 weeks postpartum. Another 452 respondents refused to participate, while 18 data had incomplete EPDS (**Figure 1**). No difference was found in the characteristics of the postpartum mothers; age, ethnicity or sex, among the respondents and non-respondents. 5727 data was used in the analysis. By profiles, majority of the respondents were between the ages of 25 and 35 years. Majority of them were married, had attained at least secondary education level, and half of them were working mothers (**Table 1**).

Prevalence of postnatal depression

Prevalence of PND among mothers 6 to 16 weeks postpartum in Malaysia was 4.4% (95% Confidence Interval, CI: 2.9, 6.7) with estimated 22,249 mothers affected. There was no difference in the prevalence of PND by different age groups. PND was higher among 'other Bumiputeras' and 'other ethnics' as compared to the Malays. Mothers who were unmarried, low education status, not working, and low household income were also observed to have higher prevalence of PND. Mothers with partners who consumed alcohol, those with unplanned pregnancy and mothers without family support during confinement were also noted to have higher prevalence of PND (**Table 2**).

Prevalence of intimate partner violence

With regards to intimate partner violence, 4.9% of postpartum women reported IPV with 3.7%, 2.6% and 1.2% experienced psychological, physical and sexual violence, respectively. Most of the abuse happened in combination. Analysis noted that 1.7%, 0.7%, and 0.5%, reported psychological violence only, physical violence only, and sexual violence only, respectively. In this study, history of psychological, physical or sexual violence were associated with higher prevalence of PND (**Table 2**).

Factors associated with postnatal depression

Multivariate analysis found that PND was significantly higher among mothers exposed to psychological or sexual violence; adjusted Odds Ratio, aOR: 4.41; CI: 2.47, 7.88, and aOR: 3.47; CI: 1.38, 8.76, respectively, while controlling for other variables. In addition, PND was three times higher among those with household income of less than RM1500 (aOR: 2.97; CI: 1.62, 5.46) as compared to those earned more than RM5000, 58% higher among those reported husband's alcohol consumption (aOR: 1.58; CI: 1.07, 2.34), and almost doubled among mothers without family support during confinement (aOR: 1.80; CI: 2.47, 7.88) (**Table 3**).

DISCUSSION

To the best of our knowledge, this is the first study investigating the relationship between PND and IPV using a large number of subjects in Malaysia. This study examined the association between physical, sexual and psychological violence with PND in a population-based sample of women in Malaysia. Although various studies have explored the relationship between exposures to IPV as a whole [14, 15], this study contributes to the empirical literature by demonstrating the individual effects of each type of violence on the PND. An earlier population-based study observed that IPV is a significant public health problem in Malaysia [9], and studies on PND have also demonstrated its importance [5, 6]. Our study clearly noted the overlap between these two problems, which has implication for the planning of intervention strategies.

Prevalence of postnatal depression

The prevalence of PND in our study of 4.4%, was lower than the earlier study conducted in Kelantan in 2000, with a prevalence of 20.3% [4]. Both studies were conducted at primary care clinics, using similar screening tool with similar cut-off score, but targeting women at different timing of postpartum. Our nation-wide study targeted women at 6 to 16 weeks postpartum while the Kelantan study targeted women at 4 to 6 weeks postpartum. The difference in the prevalence might be due to the different timing of screening. Longitudinal studies reported that the incidence rates decreased over post-partum period [12, 13]. The prevalence in this study was also lower than an earlier nation-wide household survey conducted in Malaysia, using similar screening tool and target population, with prevalence of postnatal depression of 12.7% [14]. Thus, another possible reason for the lower prevalence in this study was the reluctance to disclose their problem, possibly due to fear of being stigmatized. Study in Indonesia among women at 6 weeks postpartum, using similar cut-off score as our study, reported prevalence of 6.6%, while Singapore study among similar target group but using lower cut-off score, reported a prevalence of 6.8% [2].

Association between intimate partner violence and postnatal depression

The relationship between psychological, physical and sexual violence with PND were reported in various studies [8, 17-25]. Our study found significant association between PND with psychological and sexual violence, but not physical violence. We recorded strong association between psychological violence with the occurrence of PND, even after adjustments. Our findings concur with previous studies that observed psychological violence as more common compared to physical or sexual violence [18-21]. The impact of psychological violence was also found to be strongly associated with postnatal depression, independently of physical or sexual violence [19]. Psychological violence has a negative impact on emotions and mental health of post-partum mothers and often potentially contributes to physical or sexual violence [22]. The evidence on the association between psychological violence with PND in Malaysia is very much lacking. Effect of the psychological violence might not be visible to the naked eyes but based on the current evidence, supported by our study, this factor should be taken into consideration in the planning of the intervention strategies, particularly towards the perpetrator. Perpetrator of this psychological violence might not realise the adverse effect of their actions on these post-partum mothers.

We found positive association between sexual violence and PND. A prospective study among Norwegian mothers also noted higher PND among those exposed to adult abuse including sexually abused [24]. On the other hand, a study in Bangladesh noted no significant association between sexual violence before or during pregnancy with postpartum depression [25]. Our findings revealed a possibility that women in Malaysia were more open to disclosure compared to women in Bangladesh. These mothers possibly felt trapped in their relationship and had to endure the sexual violence for the sake of their children. Most of the studies on the association between IPV and PND focused on physical violence [26-29]. These studies demonstrated strong association between history of physical violence and PND. The study in Bangladesh, evaluating the influence of physical, sexual and psychological IPV, found that only physical violence showed direct effect on PND [25]. Our

study found lower prevalence of physical violence compared to psychological violence, with no association between physical violence and PND after controlling for confounders. These findings might be due to negative attitude of society to husbands/partners who abused their wives physically, particularly during pregnancy, resulting in lower prevalence. In contrast, another possible explanation is the possibility that the women did not view the physical act of aggressions that they received, if any, as violence, due to cultural factors that view wife beating as a man's right to punish disobedient wife.

Other factors associated with postnatal depression

Other than IPV, our study also noted higher odds of PND among mothers of low income families, husband who consumed alcohol and those with lack of support during confinement. Financial difficulties have been identified as risk factors for PND independent of IPV [8, 23, 26]. The association between partner's substance use as in our study was also observed in the Canadian study [23]. Substance use by husbands/partners often associated with IPV against women which may give rise to the problem of PND in post-partum women [29]. Family support during confinement is very important in Asian community. Our study demonstrated that lack of family support independently associated with higher odds of PND. Our findings concurred with other studies that demonstrated similar associations [8, 15, 16]. A study from China concluded that lack of postnatal family support, particularly the support from husband, is an important risk factor of PND [31].

Strengths and limitations

The main strength of our study is the large nationally representative data with a robust method. Moreover, the response rate was quite high (85.9%) despite the sensitive nature of the issue. We also examined various socio-demographic and socio-cultural factors. Most importantly, this study used an internationally recognized tool which was locally validated with standard training given to data collectors. Another strength was the individual analysis by type of violence which is important for the planning of intervention strategies.

Nevertheless, our findings have several limitations. One of the limitations of this study was the cross-sectional nature of the study which prevents the determination of temporal relationship between exposure to IPV and PND. Even though a substantial number of possible confounders were adjusted in this study, some of the important variables were not controlled for, such as birth complication, child morbidity and breastfeeding. However, with all the limitations, this study was able to provide a baseline data and offers insight of the association between IPV and PND in Malaysia.

CONCLUSION AND POLICY IMPLICATIONS

Higher odds of PND was observed among mothers with history of psychological or sexual violence. Mothers from low income families, with husbands who consumed alcohol and those with lack of family support during confinement were more at-risk of PND. Screening for postnatal depression at primary care level should be considered, together with planning of intervention strategies specifically targeted those at-risk populations.

Pregnancy care and postnatal programmes must address issues related to PND and IPV as there is overwhelming evidence that there are adverse health effects on both mother and child. Health care personnel must be trained to be able to detect and confidently communicate regarding these issues and be aware that IPV may be a factor in some of the medical and health problems faced during and after pregnancy. There must be proper setting and facilities as well as trained personnel to provide help and proper counselling or referral. Issues pertaining to sexual and reproductive health, women's rights and violence should be incorporated into the well-established pre-marital course. Courses on family values and parenting skills for young couples and parents could be another platform to reduce IPV specifically and violence and abuse in general.

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Authors' contribution

NAA, UAS, and TA were responsible for the study design and concept. NAA was responsible for the stdy conduct, subjects selection, study implementation, data analysis, data interpretation, drafting, critical revision and final approval of the manuscript. UAS, AR, MM

and CYY were responsible in drafting, critical revision and final approval of the manuscript. NMK, MY, AAR, MO, FAAA, and RJ were responsible for subjects recruitment, data collection, data entry, critical revision and final approval of the manuscript. FI and NI were responsible for data interpretation, critical revision and final approval of the manuscript.

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Competing interest statement

All authors declare no conflict of interest

Patient consent

All respondents consented to involve in this study

Ethics approval

Medical Research and Ethics Committee, Ministry of Health Malaysia

Data sharing statement

Data which were used for this study is not publicly available. Data are however available from the corresponding author upon reasonable request and with permission of the Director General of Health Malaysia.

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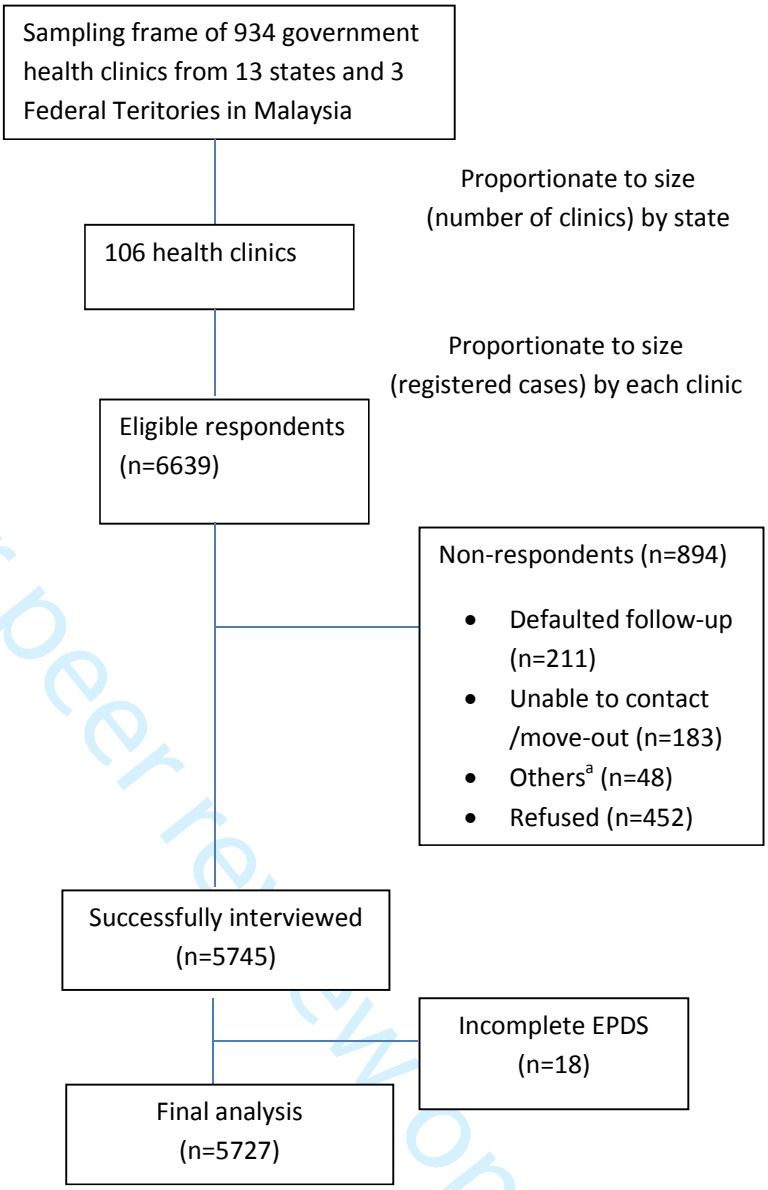

[a]Others include communication/language barriers or duplicated name in the database

Figure 1 Flow diagram of respondents recruitment

Table 1: Sociodemographic profile of respondents (n=5727)

	Unweighted count	Percentage (%)
Age		
18-24	1043	18.2
25-29	1842	32.2
30-34	1749	30.5
35 and above	1093	19.1
Ethnic		
Malay	3889	67.9
Chinese	549	9.6
Indians	262	4.6
Other Bumis	753	13.1
Others	274	4.8
Marital Status		
Married/have partner	5654	98.7
Not married/no current partner	73	1.3
Education status		
No formal/ Primary	382	7.2
Secondary	3300	60.0
Tertiary	2045	32.8
Occupation		
Working	2807	49.0
Not working/ Housewife	2920	51.0
Household income*		
Less than RM1500	1575	27.5
RM1501-RM3000	1879	32.8

RM3001-RM5000	1308	22.9
RM5001 and more	958	16.7

*missing data=7

Table 2: Factors associated with postnatal depression (n=5727)

	Variables	Prevalence (95% CI)	Crude OR (95% CI)
Age-group (years)	18-24	6.9 (3.8, 12.4)	1.49 (0.96, 2.13)
	25-29	4.6 (3.0, 7.2)	0.93 (0.63, 1.37)
	30-34	3.1 (1.9, 4.8)	0.69 (0.45, 1.04)
	35 and above	4.0 (2.2, 7.1)	R
Ethnicity	Malay	3.7 (2.5, 5.5)	R
	Chinese	1.7 (0.8, 3.7)	0.69 (0.38, 1.26)
	Indian	4.5 (2.0, 9.7)	1.48 (0.81, 2.72)
	Other Bumiputera	9.1 (3.6, 20.9)	2.63 (1.90, 3.62)
	Others	5.1(2.3, 10.5)	1.92 (1.12, 3.27)
Marital Status	Married/Have partner	4.2 (2.7, 6.5)	R
	Unmarried/no current partner	17.6 (7.1, 37.5)	3.14 (1.49, 6.64)
Education level	No formal/Primary education	8.9 (3.5, 20.9)	2.46 (1.53, 3.95)
	Secondary education	4.7 (3.1, 6.9)	1.45 (1.06, 1.97)
	Tertiary education	2.9 (1.8, 4.6)	R
Occupation	Working	2.5 (1.5, 4.1)	R
	Not working/housewife	6.1 (3.9, 9.5)	1.88 (1.42, 2.49)
Household income	Lower than RM1500	8.5 (5.0, 13.9)	3.75 (2.29, 6.14)
	RM1500-RM3000	3.4 (2.3, 5.0)	1.74 (1.04, 2.93)
	RM3001-RM5000	2.2 (1.2, 3.9)	1.00 (0.55, 1.82)
	RM5001 and more		R
Partner's consumed alcohol	Yes	5.6 (3.3, 9.4)	1.71 (1.20, 2.42)
	No	3.5 (2.2, 5.5)	R

Unplanned pregnancy	Yes	11.5 (5.6, 22.2)	4.19 (3.10-5.67)
	No	2.7 (1.7, 4.1)	R
Family support during confinement	Yes	3.8 (2.5, 5.7)	R
	No	10.8 (6.2, 18.1)	2.80 (1.96, 3.99)
Psychological violence	Yes	27.1 (18.1, 38.4)	8.94 (6.21, 12.87)
	No	3.5 (2.2, 5.8)	R
Physical violence	Yes	29.7 (19.4, 42.6)	7.50 (4.75, 11.83)
	No	3.7 (2.3, 6.0)	R
Sexual violence	Yes	43.8 (27.9, 61.1)	15.10 (8.91, 25.60)
	No	3.9 (2.4, 6.2)	R

CI= Confidence interval, OR= Odds Ratio

Table 3: Multivariate analysis on factors associated with postnatal depression (n=5727)

	Variables	Wald	Adjusted OR (95% CI)	p value
Household income	Lower than RM1500	12.361	2.97 (1.62, 5.46)	<0.001
	RM1500-RM3000	3.556	1.83 (0.98, 3.42)	0.06
	RM3001-RM5000	0.028	1.06 (0.52, 2.18)	0.87
	RM5001 and more		R	
Husband consumed alcohol	Yes	5.251	1.58 (1.07, 2.34)	0.02
	No		R	
Family support during confinement	Yes		R	
	No	6.01	1.80 (1.13, 2.87)	0.01
Psychological violence	Yes	25.14	4.41 (2.47, 7.88)	<0.001
	No		R	
Sexual violence	Yes	6.96	3.47 (1.38, 8.76)	0.01
	No		R	

CI= Confidence interval, OR= Odds Ratio,

Controlled for age, marital status, education level, occupation, ethnic

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	6
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	6-7
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	8-9
Objectives	3	State specific objectives, including any prespecified hypotheses	9
Methods			
Study design	4	Present key elements of study design early in the paper	10
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	10
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	10
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	10-11
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	12-13
Bias	9	Describe any efforts to address potential sources of bias	*12*
Study size	10	Explain how the study size was arrived at	10
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	12-13
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	11-12
		(*b*) Describe any methods used to examine subgroups and interactions	11-12
		(*c*) Explain how missing data were addressed	11
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	12
		(*e*) Describe any sensitivity analyses	NA
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	14
		(b) Give reasons for non-participation at each stage	14
		(c) Consider use of a flow diagram	14
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	14
		(b) Indicate number of participants with missing data for each variable of interest	14
Outcome data	15*	Report numbers of outcome events or summary measures	14
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	15
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	16
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	18-19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16-18
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
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	21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Postnatal depression and intimate partner violence: a nationwide clinic-based cross-sectional study in Malaysia

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Postnatal depression and intimate partner violence: a nationwide clinic-based cross-sectional study in Malaysia

ABSTRACT

Introduction

Worldwide, an estimated 13% of women in postnatal period are suffering from postnatal depression (PND). Other than under-privileged women, those who were exposed to violence are at higher risk of PND. This study aimed to investigate the relationship between intimate partner violence (IPV) and PND in Malaysia.

Methods

Randomly selected women at 6-16 weeks postnatal, registered at randomly selected government health clinics throughout Malaysia between June and October 2016, were invited to join this study. This survey was conducted as a nationwide clinic-based cross-sectional study using cluster sampling design. Probable PND was assessed using self-administered Edinburgh Postnatal Depression Scale (EPDS), while demographic profile and IPV was assessed using locally validated WHO Multi-country Study on Women's Health and Life Events Questionnaire via face-to-face interview. An EPDS total score of 12 or more and/or a positive tendency to self-harm were considered as having PND.

Results

Out of 6669, 5727 respondents were successfully interviewed with response rate of 85.9%. The prevalence of probable PND was 4.4% (95%CI: 2.9, 6.7). Overall prevalence of IPV was 4.9% (3.8, 6.4), of which 3.7% (95%CI: 2.7, 5.0), 2.6% (95%CI: 1.9, 3.5), and 1.2% (95%CI: 0.9, 1.7), experienced psychological, physical, and sexual violence, respectively. Logistic regression analysis revealed that women who exposed to IPV were 2.3 times higher risk for

probable PND; adjusted OR, aOR: 2.34 (95%CI: 1.12, 4.87). Other factors were those reported emotional violence (aOR: 3.79, 95%CI: 1.93, 7.45), unplanned pregnancy (aOR: 3.32, 95%CI: 2.35, 4.69), lack of family support during confinement (aOR: 1.79, 95%CI: 1.12, 2.87), partner's consumed alcohol (aOR: 1.59, 95%CI: 1.07, 2.35) and those from low household income (aOR: 2.99; 95%CI: 1.63, 5.49).

Conclusions

Exposure to IPV was significantly associated with probable PND. Other factors include emotional violence, unplanned pregnancy, lack of family support, partner's consumed alcohol and low household income.

Keywords: depression, postpartum, intimate partner violence, family support

Strength and limitations of this study

- Nationwide study using cluster sampling design enabled the findings of this study to be generalised to Malaysian population as majority of postnatal mothers sought care at government health facilities
- Objective assessment of the probable postnatal depression using locally validated self-administered EPDS
- Intimate partner violence, IPV, were assessed using locally validated questionnaires
- Postnatal depression was based on screening tool and not diagnostic

INTRODUCTION

The World Health Organization estimated that 13% of women in postpartum period experience mental disorders, particularly depression [1]. The problem was observed to be higher in developing countries, ranges from 4.9% to 50.8% among mothers at four to eight weeks postpartum [2]. Among Asian women, using self-rated questionnaires, the prevalence was 23.7%, 16.5% and 17.4% at six weeks, three months, and six months after childbirth, respectively [3]. The prevalence in Malaysia varies based on the setting; 20.7% at primary care setting [4] and 31.7% at hospital setting [5].

Postnatal depression (PND) generally occurs within four to six weeks after childbirth, presented with symptoms such as low mood, anhedonia, forgetfulness, irritability, anxiety, sleep disturbance, and poor functioning [6]. Various factors were found to be associated with PND. Young age, low socioeconomic status, and partner's factors such as alcoholism, uneducated, marital conflict, lack of husband's support, and psychological factors such as antenatal depression, stressful life event, and IPV were associated with PND [2, 3]. While depression at any time throughout a woman's lifetime is always devastating, depression during the perinatal, antenatal and postnatal periods, is of special importance and a public health concern due to its detrimental effects to women, families and their children. It may lead to serious complications such as maternal suicide, child abuse and neglect and increased risk of children's emotional and behavioural problems in later life [7-10].

Intimate partner violence (IPV) refers to any behaviour within an intimate relationship that causes physical, psychological or sexual harm to those in the relationship. Such behaviour includes acts of physical aggression, forced intercourse and other forms of sexual coercion and various controlling behaviours [11]. It is associated with fatal and non-fatal health effects including homicide and suicide as well as negative health behaviour during pregnancy, poor reproductive outcomes and adverse physical and mental consequences [12]. IPV has been described as one of the most important predictors for depression in women. A review on

studies exploring the determinants of PND in low- and lower-middle-income countries indicated an association with physical violence by intimate partner [13]. A household survey done in Peninsular Malaysia, revealed that 7.8% of women were emotionally abused, 5.0% were physically abused and 1.7% were sexually abused [14]. However, this survey only targeted adult women and not women in postpartum period.

With regards to the conceptual framework, a theoretical and conceptual model, which describes the hierarchical relationship between postnatal depression and risk factors is suitable for an epidemiological study. This framework divides levels of determinants into three; proximal, intermediate and distal [15].

[INSERT FIGURE 1]

Other than proximal determinants such as violence and controlling behaviour by partner, intermediate determinants encompass partner and family factors, including the role of family support during confinement (**Figure 1**). 'Confinement' is widely practiced among women after giving birth regardless of the socio-demographic and cultural differences in Malaysia, due to the beliefs of its beneficial effect to women's wellbeing [16]. During this period, family support by keeping company and care for the mother, is crucial and this may be the key protective element against postnatal depression rather than the rituals itself [16, 17].

Although PND and IPV have been studied in several countries showing positive association, there is no study investigating the relationship between the two in Malaysia. Thus, this study aimed to determine the magnitude of PND in Malaysia and its associated factors, particularly IPV. Both conditions, PND and IPV, while being pressing public health concerns worldwide, are generally undetected in perinatal care services without proper screening program and intervention in place.

METHODS

Study design

This study was a nationwide clinic-based cross-sectional study. To ensure national representativeness, cluster sampling design was employed.

Setting

The study was conducted at the Maternal and Child Health Unit at the government primary care clinics throughout Malaysia. Malaysia operates a dichotomous system; public and private sector, with the Ministry of Health as the main provider of health care services. Health facilities are well distributed with a mean distance of 8.4 km [18]. Majority (98.2%) of women consulted one-month postnatal care, with more than 80% of the children received primary vaccination at these government primary care clinics [19].

Participants

Women at 6-16 weeks postpartum and registered at the government primary care clinics for postnatal care and/or child immunisation were eligible to be included in the sampling frame. Women who did not register and/or unable to communicate in either English or *Bahasa Malaysia* were considered as not eligible.

Recruitment strategies

Sampling was done by the resident statistician who was not directly involved in this study, using two-stage random sampling design. In the first stage, sampling frame of all government primary care clinics in Malaysia was used. These clinics, considered as cluster, were then randomly selected using systematic probability proportionate to size sampling techniques. For the second stage, women at 6-16 weeks postpartum, registered for postnatal care and/or child immunisation at the randomly selected clinics, and given appointment for consultation from 1 June to 30 October 2016, were listed to form a sampling frame. Number of women

selected per state was then determined proportionate to the number of registered women. The clinic-based cards containing the women's profile and the appointment date were extracted and tagged to indicate eligible respondents.

The women were invited to join the study on the day of the appointment date. The women were given Information Sheet and Consent Form by the trained nurses at the registration counter. Those who consented to involve in the study were called into a private room within the clinic, without their partner, and were then given the self-administered screening form, Edinburgh Postnatal Depression Scale (EPDS), for assessment of PND [20, 21]. Upon completion of the screening, the trained nurses proceed with face-to-face interview, in the same private room, using the WHO Multi-country Study on Women's Health and Life Events questionnaire [22] including few added questions based on the variables in the conceptual framework. The added questions were tested for face validity before being used in this study.

The nurses, two nurses per selected clinic, were given a five-day training on interview technique and exposure to PND and IPV, including management and referral process. Potential risk of interviewer bias was minimized by assessing interviewer skill during role-play sessions and ad-hoc supervision at the clinics by research team members. The whole questionnaire, except for EPDS, was installed as web-based application into mobile device with in-built quality check and administered as computer-assisted personal interview. The responses from EPDS were manually key-in into the application after the interview session ended. Data collection started from 1 June and completed by end of October 2016.

Variables

Outcome variable

The main outcome of this study, probable postnatal depression (PND), was assessed using self-administered locally validated Edinburgh Postnatal Depression Scale, EPDS. This scale comprises of 10 statements on common depressive symptoms and using Likert-type of

responses; 0-3 scores, reflecting the severity of the symptoms. Wan Mahmud et al found that, at 11/12 cut-off score, the sensitivity and specificity of the EPDS were 100% and 98.18%, respectively [20]. Another validation study recommended cut-off score of 11.5 with sensitivity of 72.7% and specificity of 92.6% [21]. In the first study, EPDS was tested against ICD-10 criteria, with assessment of concurrent validity against Malay version of General Health Questionnaire and the Hamilton Depression Rating Scale (HDRS) score [20]. The second study was tested and showed good correlation with both Malay version of Beck-Depression Inventory and the HDRS [21]. Based on these two studies and consensus from the content expert, we categorised women who have a total score of 12 or more and/or positive response to Question 10 on risk of self-harming in EPDS as having probable postnatal depression in this study.

Predictor variables

Intimate partner violence (IPV) as the main predictor was defined as lifetime/ever experiences of physical and/or sexual violence. The IPV was assessed based on the questionnaire used in the WHO Multi-country Study on Women's Health and Life Events [23]. In this study, we used locally validated questionnaire by Saddki et al, which reported Cronbach's α values ranged from 0.767 to 0.858 across domains [22]. Using this questionnaire, four types of violence behaviours were assessed; physical, sexual, emotional violence and controlling behaviour. Physical violence was considered when respondent gave positive response to history of being slapped, pushed, beaten, kicked, chocked or threatened with weapon, while sexual violence was defined as positive response for any history of sexual coercion, sex out of fear, or forced to engage in degraded sexual act. Emotional violence was defined as positive response to ever been insulted, publicly humiliated, intimidated or ever been threatened or threatened to hurt respondent or someone she cared. Controlling behaviour was defined as positive response to ever been kept away from friends and/or immediate family, insisted to know where about at all times, treated indifferently, felt angry if spoke to other man, suspicious of being unfaithful and/or expected permission to

seek healthcare of herself by their former or present husbands/partners. In this study, the emotional violence and controlling behaviour were considered as possible predictors for PND, and not part of IPV.

Other important predictors are lack of family support and unplanned pregnancy. Family support during confinement was considered when the respondent answer "Yes" to the questions; "Did you observed confinement period after your last child birth?" and "When you need help or have a problem, can you usually count on family members for support?" Response to the question; "Was your last pregnancy planned or not planned?" was taken into account to categorise the pregnancy as planned or unplanned.

Possible confounding variables include age, ethnicity, marital status, education level, occupation and household income. Age was grouped into four categories; 18-24 years, 25-29 years, 30-34 years, and 35 years and more. Ethnicity was classified based on three major ethnic groups in Malaysia, namely Malay, Malaysian Chinese and Malaysian Indian, followed by 'Other Bumiputera' and 'Others'. Other Bumiputera comprised of indigenous groups, local Sabahans and Sarawakians, while 'Others' were mostly foreigners, immigrants, both legal and illegal, residing in Malaysia.

Education levels were categorised based on the Malaysian education system. Respondents were considered as having no formal education/primary education if they had not attended any formal schooling up to those who had completed up to six years of primary school. Those who had completed 11 years of formal schooling were considered as completed secondary education, while respondents with diploma or higher qualifications were considered as having completed tertiary education. Household income was calculated based on the pooled income of family members and categorised into four groups.

Sample size

To the best of our knowledge, there is no information on the prevalence of IPV among women during postnatal period in Malaysia. Thus, sample size in this study was determined based on three available sources; 20.7% prevalence of probable PND in Malaysia [4], 8.0% prevalence of IPV in Malaysia [14], and 35.2-38.9% of family violence among women with probable perinatal depression from a systematic review [24]. To ensure adequate sample, the sample size was calculated based on the lowest prevalence (8.0%) using a single proportion formula for the estimation of prevalence. In addition, based on the design effect of 2 and estimated non-response rate of 20%, the sample size required was 6,639 women.

Data management and analysis

Data from the mobile device was automatically uploaded into the server at the institute and converted into CSV and SPSS files. Only data with complete responses on EPDS module was used for analysis. Data was analysed using complex sample module in the IBM Statistical Package of Social Sciences (SPSS) for Windows version 23.0 (IBM Corp., Armonk, NY, USA), taking into consideration the complexity of the sampling design. The survey or final weight was calculated based on design weight and non-response weight, and plan for analysis was created. Categorical variables were defined based on the variable operational definitions. Using complex sample module, the overall prevalence of PND and its estimated population affected were determined. Bivariate analysis was done to determine the factors associated with PND. Crude odds ratios were used to describe the strength of association between dependent and independent variables. Multivariable logistic regression model was fitted to determine the factors associated with PND. The primary predictor was IPV (physical and/or sexual violence). Other independent variables included in this study were emotional violence, controlling behaviour, family support during confinement, unplanned pregnancy, and partner's alcohol consumption. Other possible confounders such as ethnicity, respondent's age, marital status, education level, occupation, and household income were also included. We used a logistic regression model to produce crude odds ratio as a measure of association between PND and the independent variables. For the final

model, FORWARD LR variable selection method was used to obtain significant variables. Only variables with *p*-value of less than 0.25 were included. The statistical significance of the individual regression coefficient was tested using Wald chi-square statistic. The adjusted OR, with the respective 95% confidence intervals (CIs), was then calculated. A p-value of less than 0.05 was considered significant. Model fit was tested by the Hosmer-Lemeshow statistic, which was non-significant (p>0.05).

Ethics

Approval from the Medical Research and Committee, Ministry of Health Malaysia was obtained prior to the implementation of this study (NMRR-15-2404-26677). All participants gave their informed consent to participate. Identifiable data was not key-in into the mobile device. Women who were found as having positive EPDS and/or positive for any type of violence were referred to the Family Physician at the respective clinics for further management.

RESULTS

Out of 6639 randomly selected respondents, 5745 were successfully interviewed, but only 5727 completed the EPDS questions, resulting in a response rate of 85.9%. A total of 442 respondents defaulted clinic appointments, non-contactable or moved out from the clinic's operation area during their eligibility period (6-16 weeks postpartum). Another 452 respondents refused to participate, while 18 respondents had incomplete EPDS data (**Figure 2**). No difference was found in the characteristics; age, ethnicity or sex of the respondents and non-respondents.

[INSERT FIGURE 2]

We used 5727 data in the analysis. By profiles, majority of the respondents were between the ages of 25 and 35 years. Majority of them were married, had attained at least secondary education level, and half of them were working mothers (**Table 1**).

Table 1: Sociodemographic profile of respondents (n=5727)

	Unweighted count	Percentage (%)
Age		
18-24	1043	18.2
25-29	1842	32.2
30-34	1749	30.5
35 and above	1093	19.1
Ethnic		
Malay	3889	67.9
Malaysian Chinese	549	9.6
Malaysian Indians	262	4.6
Other Bumiputeras	753	13.1
Others	274	4.8
Marital Status		
Married/have partner	5654	98.7
Not married/no current partner	73	1.3
Education status		
No formal/ Primary	382	7.2
Secondary	3300	60.0
Tertiary	2045	32.8
Occupation		
Working	2807	49.0

Not working/ Housewife	2920	51.0
Household income*		
Less than RM1500	1575	27.5
RM1501-RM3000	1879	32.8
RM3001-RM5000	1308	22.9
RM5001 and more	958	16.7

*missing data=7; 1USD= RM3.89 (currency exchange on 3 February 2018).

Prevalence of probable postnatal depression

Prevalence of probable PND among women at 6-16 weeks postpartum was 4.4% (95% Confidence Interval, CI: 2.9, 6.7). There was no difference in the prevalence by different age groups. The prevalence was higher among 'other Bumiputeras' and 'other ethnics' compared to the Malays. Women who were unmarried, low education status, not working, and low household income were observed to have a higher prevalence. Women with partners who consumed alcohol, those with unplanned pregnancy and without family support during confinement were also found to have a higher prevalence of probable PND (**Table 2**).

Table 2: Factors associated with probable postnatal depression (n=5727)

	Variables	Prevalence (95% CI)	Crude OR (95% CI)
Respondent's age	18-24	6.9 (3.8, 12.4)	1.49 (0.96, 2.13)
(years)	25-29	4.6 (3.0, 7.2)	0.93 (0.63, 1.37)
	30-34	3.1 (1.9, 4.8)	0.69 (0.45, 1.04)
	35 and above	4.0 (2.2, 7.1)	R
Ethnicity	Malay	3.7 (2.5, 5.5)	R
	Malaysian Chinese	1.7 (0.8, 3.7)	0.69 (0.38, 1.26)
	Malaysian Indian	4.5 (2.0, 9.7)	1.48 (0.81, 2.72)

	Other Bumiputeras	9.1 (3.6, 20.9)	2.63 (1.90, 3.62)
	Others	5.1(2.3, 10.5)	1.92 (1.12, 3.27)
Marital Status (current)	Married/Have partner	4.2 (2.7, 6.5)	R
	Unmarried/ no current partner	17.6 (7.1, 37.5)	3.14 (1.49, 6.64)
Education level	No formal/ Primary education	8.9 (3.5, 20.9)	2.46 (1.53, 3.95)
	Secondary education	4.7 (3.1, 6.9)	1.45 (1.06, 1.97)
	Tertiary education	2.9 (1.8, 4.6)	R
Occupation	Working	2.5 (1.5, 4.1)	R
	Not working/housewife	6.1 (3.9, 9.5)	1.88 (1.42, 2.49)
Household income	Lower than RM1500	8.5 (5.0, 13.9)	3.75 (2.29, 6.14)
	RM1500-RM3000	3.4 (2.3, 5.0)	1.74 (1.04, 2.93)
	RM3001-RM5000	2.2 (1.2, 3.9)	1.00 (0.55, 1.82)
	RM5001 and more		R
Unplanned pregnancy	Yes	11.5 (5.6, 22.2)	4.19 (3.10-5.67)
	No	2.7 (1.7, 4.1)	R
Partner's consumed alcohol	Yes	5.6 (3.3, 9.4)	1.71 (1.20, 2.42)
	No	3.5 (2.2, 5.5)	R
Lack of family support during confinement	Yes	10.8 (6.2, 18.1)	2.80 (1.96, 3.99)
	No	3.8 (2.5, 5.7)	R
Emotional violence	Yes	27.1 (18.1, 38.4)	8.94 (6.21, 12.87)
	No	3.5 (2.2, 5.8)	R
Physical violence	Yes	29.7 (19.4, 42.6)	7.50 (4.75, 11.83)
	No	3.7 (2.3, 6.0)	R
Sexual violence	Yes	43.8 (27.9, 61.1)	15.10 (8.91, 25.60)
	No	3.9 (2.4, 6.2)	R

Partner's controlling behaviour	Yes	7.2 (5.0, 10.1)	2.31 (1.76, 3.03)
	No	3.2 (1.7, 6.1)	R
IPV*	Yes	32.6 (22.8, 44.1)	9.32 (6.29, 13.82)
	No	3.5 (2.1, 5.7)	R

CI= Confidence interval, OR= Odds Ratio; IPV: ever exerienced physical and/or sexual violence

1USD= RM3.89 (currency exchange on 3 February 2018).

Prevalence of intimate partner violence

With regards to violence, 3.7% (95% CI: 2.7, 5.0), 2.6% (95% CI: 1.9, 3.5) and 1.2% (95% CI: 0.9, 1.7) ever experienced emotional, physical and sexual violence, respectively. Partner's controlling behaviour was experienced by 30.2% (95% CI: 24.2, 36.9) of women. Most of the violence happened in combination. Analysis showed that 1.7%, 0.7%, and 0.5%, reported emotional violence only, physical violence only, and sexual violence only, respectively. Intimate partner violence; ever experienced physical and/or sexual violence, was observed among 3.3% (95% CI: 2.5, 4.3) of women.

Factors associated with probable postnatal depression

Multivariate analysis proved the relationship between IPV and probable PND. The odds of having probable PND was doubled among women who ever experienced IPV (adjusted Odds Ratio, aOR: 2.34; 95% CI: 1.12, 4.87), after controlling for age, marital status, ethnicity, education level, occupation, and partner's controlling behaviour. Probable PND was almost four times higher among women who ever experienced emotional violence (aOR: 3.79; 95% CI: 1.93, 7.45), after controlling for other variables. In addition, probable PND was three times higher among women with unplanned pregnancy (aOR: 3.32; 95% CI: 2.35, 4.69), 79% higher among those who lack of family support during confinement (aOR: 1.79; 95% CI: 1.12, 2.87), 59% higher among those reported partner's alcohol consumption (aOR: 1.59, 95% CI:

1.07, 2.35), and tripled among women with household income of less than RM1500 (aOR: 2.99; 95% CI: 1.63, 5.49) as compared to those earned more than RM5000 (**Table 3**).

Table 3: Multivariate analysis on factors associated with probable postnatal depression (n=5727)

	Variables	Wald	Adjusted OR (95% CI)	p value
Intimate Partner Violence	Yes	5.141	2.34 (1.12, 4.87)	0.023
	No		R	
Emotional Violence	Yes	14.935	3.79 (1.93, 7.45)	<0.001
	No		R	
Unplanned pregnancy	Yes	46.591	3.32 (2.35, 4.69)	<0.001
	No		R	
Lack of family support during confinement	Yes	5.999	1.79 (1.12, 2.87)	0.014
	No		R	
Partner's consumed alcohol	Yes	5.351	1.59 (1.07, 2.35)	0.021
	No		R	
Household income	Lower than RM1500	12.438	2.99 (1.63, 5.49)	<0.001
	RM1500-RM3000	3.459	1.82 (0.97, 3.41)	0.063
	RM3001-RM5000	0.054	1.09 (0.53, 2.23)	0.816
	RM5001 and more		R	

CI= Confidence interval, OR= Odds Ratio,

Controlled for age, marital status, education level, occupation, ethnic, partner's controlling behaviour

DISCUSSION

To the best of our knowledge, this is the first study investigating the relationship between probable PND and IPV using a large number of respondents in Malaysia. This study examined the associated factors of probable PND, with IPV as the main predictor. An earlier population-based study observed that IPV is a significant public health problem in Malaysia [14], and studies on PND have also demonstrated its importance [4, 5]. Our study clearly revealed the relationship between these two problems, which has implication for the planning of services and intervention strategies.

Prevalence of probable postnatal depression

The prevalence of probable PND (4.4%) in our study was lower than those reported in an earlier study conducted in one of the states in Malaysia, named Kelantan (20.3%) [4]. Both studies were conducted at primary care clinics, using similar screening tool with similar cut-off score, but targeting women at different timing of postpartum. Our nationwide study targeted women at 6-16 weeks postpartum while the Kelantan study targeted women at 4-6 weeks postpartum. The difference in the prevalence might be due to the different timing of screening. Longitudinal studies reported that the incidence rates decreased over postpartum period [25, 26]. The prevalence in this study was also lower than an earlier nationwide household survey conducted in Malaysia, using similar screening tool and target population, with prevalence of probable postnatal depression of 12.7% [27]. Another possible reason for the lower prevalence in this study was the reluctance of the women to disclose their problem, possibly due to fear of being stigmatized. The clinic environment may not be conducive for study involving sensitive issues such as this. Postnatal depression and violence by an intimate partner are relatively hidden in our community and there is a possibility of a higher prevalence if we were able to create awareness and desensitised the issues before embark on this study. However, the prevalence of this study is comparable to those reported in Indonesia (6.6%) among women at 6 weeks postpartum, using similar cut-off score, and in Singapore (6.8%) among similar target group but using lower cut-off score[2].

Association between intimate partner violence and probable postnatal depression

Our study demonstrated significant association between probable PND and IPV (defined as ever/lifetime physical and/or sexual violence). This finding concurs with previous studies that recorded the independent effect of IPV with PND [24, 28-32]. The effect of IPV on women's mental health was not related to time of occurrence. Khalifa et al described history of violence as the strongest determinant of PND [28], while studies in France and Bangladesh supported the association of ever had IPV before or during pregnancy with PND [31, 32]. A prospective study among Norwegian mothers also showed higher risks of PND among those with history of exposure to adult abuse including sexually abused [33]. We also recorded strong association between emotional violence with the occurrence of probable PND, even after adjustment for partner's controlling behaviour and other confounding variables. Psychological effect of emotional violence towards PND was more prominent than IPV, as seen in other studies [34-37]. Emotional violence has a negative impact on emotions and mental health of women in postpartum period and often potentially contributes to physical or sexual violence [38].

Other factors associated with probable postnatal depression

Other than IPV, we also noted higher odds of probable PND among mothers of low income families, those with partners who consumed alcohol and those with lack of support during confinement. Financial difficulties have been identified as risk factors for PND independent of IPV [13, 30, 39]. The association with partner's substance use was also observed in the Canadian study [39]. Substance use by husbands/partners often associated with IPV which may give rise to the problem of PND in women [28]. Family support during confinement is very important in Asian community. Our study demonstrated that lack of family support during confinement independently associated with higher odds of PND. Our findings concur with other studies that demonstrated similar associations [13, 40, 41]. A study from China concluded that lack of postnatal family support, particularly the support from husband, is an important risk factor of PND [42]. We observed that marital status, education level, and

occupation do not contribute directly to PND. As in many Asian countries, women in Malaysia are expected to primarily care for children and manage housechores as prescribed by traditional gender roles, regardless whether they are working or not [43]. The cultural norms may assign an inferior status to women and lead to misconceptions that may cause women to blame themselves, minimize abuse and prevent help-seeking when abuse occurred. Perpetrators may manipulate cultural practices or religious teaching to make it seems as if it supports IPV. Many women struggle because they believe that their husbands have the rights to beat them, a belief originated from misinterpreted religious teaching [44]. In contrast, women in Malaysia are more empowered, evidenced by the increasing number of educated women and women in workforce, and this may challenge the traditional view on gender roles [43]. The stronger affiliation to religion and its true teaching among Asians can be protective against IPV as religion promotes general commitment to family life, regards the institution of marriage highly and provides understanding of women's rights [44]. Interestingly, a large prevalence study on IPV in Malaysia found that 83% of women who experienced IPV were assertive in seeking help for their survival in abusive relationship rather than continuing to suffer in silence [45].

Strengths and limitations

The main strength of our study is the large nationally representative data with robust methods. Moreover, the response rate was relatively high (85.9%) despite the sensitive nature of the issue. We also examined various socio-demographic and socio-cultural factors. Most importantly, this study used an internationally recognized tool which was locally validated with standard training given to data collectors. Nevertheless, our findings have several limitations. One of the limitations of this study was the cross-sectional nature of the study which prevents the determination of temporal relationship between exposure to IPV and probable PND. Even though a substantial number of possible confounders were adjusted in this study, some of the important variables were not studied, such as birth

complication, child morbidity and breastfeeding. We were only able to identify probable PND due to the use of a screening tool without further diagnostic confirmation process. It is also acknowledged that 'postnatal depression' is an umbrella term rather than a distinct psychological state. The term "postpartum depression" encompasses several mood disorders that follow childbirth, including anxiety disorders, trauma and adjustment reactions [46]. This broad spectrum of perinatal mental health may be associated with different sets of risk factors that may or may not overlap with each other, thus confounding the outcome of this study. Furthermore, the WHO tool used to identify IPV, while used widely, may not be exhaustive in terms of types of violence, which may underestimate the prevalence of IPV. However, with all the limitations, this study was able to provide a baseline data and offers insight of the association between IPV and probable PND in Malaysia.

CONCLUSION AND POLICY IMPLICATIONS

A higher odds of probable PND was observed among women with history of IPV. Women who were exposed to emotional violence, those with husbands who consumed alcohol, lack of family support during confinement and from low income families, were also at-risk of PND. Pregnancy care and postnatal programmes must address issues related to PND and IPV as there is overwhelming evidence of adverse health effects on both mother and child. Health care personnel must be professionally trained to be able to detect and confidently communicate these issues. There must be proper setting as well as trained personnel to provide help and proper counselling or referral. Issues pertaining to sexual and reproductive health, women's rights and violence should be incorporated into the well-established pre-marital course [47]. Courses on family values and parenting skills for young couples and parents could be another platform.

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Authors' contribution

NAA, UAS, and TA were responsible for the study design and concept. NAA was responsible for the study conduct, respondents selection, study implementation, data analysis, data interpretation, drafting, critical revision and final approval of the manuscript. UAS, AR, MM and CYY were responsible in drafting, critical revision and final approval of the manuscript. NMK, MY, AAR, MO, FAAA, and RJ were responsible for respondnets recruitment, data collection, data entry, critical revision and final approval of the manuscript. FI and NI were responsible for data interpretation, critical revision and final approval of the manuscript.

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Competing interest statement

All authors declare no conflict of interest

Patient consent

All respondents consented to participate in this study

Data sharing statement

Data which were used for this study is not publicly available. Data are however available from the corresponding author upon reasonable request and with permission of the Director General of Health Malaysia.

Figures:

Figure 1: Conceptual framework illustrating hierarchical model of risk factors for postnatal depression

Figure 2: Flow diagram of respondents recruitment

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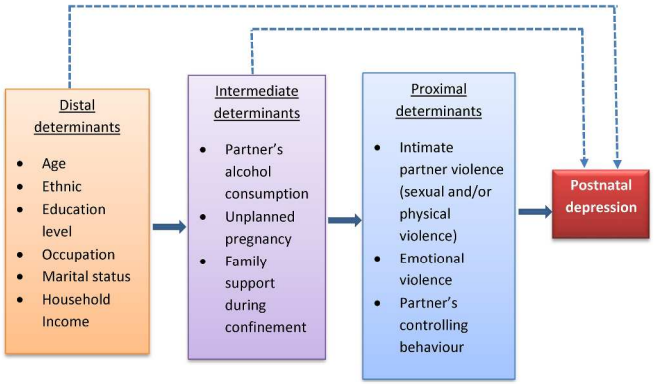

Figure 1: Conceptual framework illustrating hierarchical model of risk factors for postnatal depression

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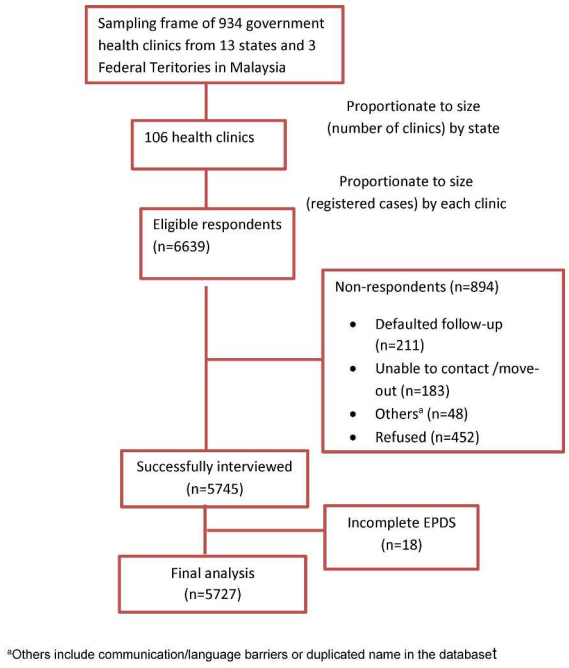

Figure 2: Flow diagram of respondents recruitment

297x420mm (300 x 300 DPI)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	6
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	6-7
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	8-9
Objectives	3	State specific objectives, including any prespecified hypotheses	9
Methods			
Study design	4	Present key elements of study design early in the paper	10
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	10-11
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	10-11
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	10-13
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	10-13
Bias	9	Describe any efforts to address potential sources of bias	*11*
Study size	10	Explain how the study size was arrived at	14
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	14-15
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	14-15
		(*b*) Describe any methods used to examine subgroups and interactions	14-15
		(*c*) Explain how missing data were addressed	14
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	11
		(*e*) Describe any sensitivity analyses	NA
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	15
		(b) Give reasons for non-participation at each stage	15
		(c) Consider use of a flow diagram	15
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	16-17
		(b) Indicate number of participants with missing data for each variable of interest	17
Outcome data	15*	Report numbers of outcome events or summary measures	17-20
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	17-20
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	21-23
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	23-24
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	24
Generalisability	21	Discuss the generalisability (external validity) of the study results	23
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	25

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Postnatal depression and intimate partner violence: A nationwide clinic-based cross-sectional study in Malaysia

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Postnatal depression and intimate partner violence: A nationwide clinic-based cross-sectional study in Malaysia

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Postnatal depression and intimate partner violence: A nationwide clinic-based cross-sectional study in Malaysia

ABSTRACT

Introduction

An estimated 13% of women in the postnatal period suffer from postnatal depression (PND) worldwide. In addition to under-privileged women, women who are exposed to violence are at higher risk of PND. This study aimed to investigate the relationship between intimate partner violence (IPV) and PND in Malaysia.

Methods

This survey was conducted as a nationwide cross-sectional study using a cluster sampling design. Probable PND was assessed using a self-administered Edinburgh Postnatal Depression Scale (EPDS). Demographic profiles and IPV were assessed using a locally validated WHO Multi-country Study on Women's Health and Life Events Questionnaire that was administered in a face-to-face interview. An EPDS total score of 12 or more and/or a positive tendency to self-harm were used to define PND.

Results

Out of 6,669 women, 5,727 respondents were successfully interviewed with a response rate of 85.9%. The prevalence of probable PND was 4.4% (95%CI: 2.9, 6.7). The overall prevalence of IPV was 4.9% (95%CI: 3.8, 6.4). Among the women in this group, 3.7% (95%CI: 2.7, 5.0), 2.6% (95%CI: 1.9, 3.5), and 1.2% (95%CI: 0.9, 1.7) experienced emotional, physical, and sexual violence, respectively. Logistic regression analysis revealed that women who were exposed to IPV were at 2.3 times the risk for probable PND, with an adjusted OR, aOR, of

2.34 (95%CI: 1.12, 4.87). Other factors for PND were reported emotional violence (aOR: 3.79, 95%CI: 1.93, 7.45), unplanned pregnancy (aOR: 3.32, 95%CI: 2.35, 4.69), lack of family support during confinement (aOR: 1.79, 95%CI: 1.12, 2.87), partner's use of alcohol (aOR: 1.59, 95%CI: 1.07, 2.35), or being from a household with a low income (aOR: 2.99; 95%CI: 1.63, 5.49).

Conclusions

Exposure to IPV was significantly associated with probable PND. Health care personnel should be trained to detect and manage both problems. An appropriate referral system and support should be made available.

Keywords: depression, postpartum, intimate partner violence, family support

Strength and limitations of this study

- A nationwide study using a cluster sampling design that allowed the findings of this study to be generalized to the overall Malaysian population as a majority of postnatal mothers seek care at government health facilities
- Objective assessment of the potential causes of postnatal depression using a locally validated, self-administered EPDS
- Intimate partner violence, IPV, was assessed using locally validated questionnaires
- Postnatal depression was based on the screening tool and was not diagnostic

INTRODUCTION

The World Health Organization estimates that 13% of women in the postpartum period experience mental disorders, with depression being particularly common [1]. Depression has been observed to be higher in developing countries, ranging from 4.9% to 50.8% among mothers at four to eight weeks postpartum [2]. According to self-reported questionnaires, the prevalence of depression among Asian women is 23.7%, 16.5% and 17.4% at six weeks, three months, and six months after childbirth, respectively [3]. The prevalence in Malaysia varies based on the setting, with 20.7% in primary care settings [4] and 31.7% in hospital settings [5].

Postnatal depression (PND) generally occurs within four to six weeks of childbirth and presents with symptoms such as an upset mood, anhedonia, forgetfulness, irritability, anxiety, sleep disturbances, and poor functioning [6]. Various factors were found to be associated with PND. A young maternal age; low socioeconomic status; partner's habits, such as alcoholism; lack of education; marital conflict; unsupportive partner; and psychological factors, such as antenatal depression, stressful life events, or IPV are all associated with PND [2, 3]. While depression at any time in a woman's life is devastating, depression during the perinatal, antenatal and postnatal periods is of special importance and is a public health concern due to its detrimental effects on women, families and their children. It can lead to serious complications, such as maternal suicide, child abuse and neglect and an increased risk of the child having emotional and behavioural problems later in life [7-10].

Intimate partner violence (IPV) refers to any behaviour in an intimate relationship that causes physical, psychological or sexual harm to those in the relationship. Such behaviour includes acts of physical aggression, forced intercourse and other forms of sexual coercion and various controlling behaviours [11]. IPV is associated with fatal and non-fatal health effects, including homicide and suicide, as well as negative health behaviours during pregnancy, poor reproductive outcomes and adverse physical and mental consequences [12]. IPV has been described as one of the most important predictors for depression in women. A review of studies exploring the determinants of PND in low- and lower-middle-income countries reported an association between physical violence by intimate partners and PND [13]. A household survey performed in Peninsular Malaysia revealed that 7.8% of women were emotionally abused, 5.0% were physically abused and 1.7% were sexually abused [14]. However, this survey only targeted adult women and not women in the postpartum period.

There is an existing theoretical and conceptual framework that describes the hierarchical relationship between postnatal depression and its risk factors that is suitable for use in an epidemiological study. The framework divides determinants into three levels: proximal, intermediate and distal [15].

[INSERT FIGURE 1]

Proximal determinants include violence and controlling behaviour from partners, and intermediate determinants encompass both partner and family factors, including the role of family support during confinement (**Figure 1**). 'Confinement' is widely practiced among

Malaysian women after giving birth regardless of their socio-demographic and cultural differences. It is practiced due to a belief that it is beneficial to women's wellbeing [16]. During this period, family support in the form of accompaniment and caring for the mother is crucial. These behaviours may be the key protective element against postnatal depression rather than the ritual itself [16, 17].

Although studies from several countries have shown a positive association between PND and IPV, currently no study has investigated the relationship between these factors in Malaysia. Thus, this study aimed to determine the magnitude of PND in Malaysia and its associated factors, with a particular focus on IPV. Though both conditions, PND and IPV, are pressing public health concerns worldwide, they are generally undetected by perinatal care services without proper screening programs and interventions in place.

METHODS

Study design

This study was a nationwide clinic-based cross-sectional study. To ensure national representativeness, a cluster sampling design was used.

Setting

The study was conducted at the Maternal and Child Health Unit at government primary care clinics throughout Malaysia. Malaysia operates a dichotomous system with both public and private sectors. The Ministry of Health serves as the main provider of health care services. Health facilities are well distributed, with a mean distance of 8.4 km [18]. The majority

(98.2%) of women consulted one-month after delivery with more than 80% of the children received a primary vaccination at these government primary care clinics [19].

Participants

Women who were at 6-16 weeks postpartum and who registered at a government primary care clinic for postnatal care and/or child immunization were eligible to be included in the sampling frame. Women who did not register and/or were unable to communicate in either English or *Bahasa Malaysia* were not eligible.

Recruitment strategies

Sampling was performed by a resident statistician who was not directly involved in this study. Sampling was conducted using a two-stage random sampling design. The first stage used the sampling frame of all government primary care clinics in Malaysia. These clinics, considered to be clusters, were then randomly selected using the systematic probability proportionate to the size sampling technique. For the second stage, the sampling frame was formed from women between 6 and 16 weeks postpartum who registered for a postnatal care and/or child immunization at the randomly selected clinics and who were given consultation appointments between 1 June and 30 October 2016. The number of women selected from each state was then determined in proportion to the number of registered women. The clinic-based cards containing the women's profiles and the appointment dates were extracted and tagged to indicate eligible respondents.

The women were invited to join the study on the day of their appointment date. The women were given an Information Sheet and Consent Form by trained nurses at the registration

counter. Those who consented to participate in the study were called into a private room within the clinic without their partners and were then given the self-administered Edinburgh Postnatal Depression Scale (EPDS) for assessment of PND [20, 21]. Upon completion of the screening, the trained nurses conducted a face-to-face interview in the same private room using the WHO Multi-country Study on Women's Health and Life Events questionnaire [22]. The questionnaire also included a few additional questions based on the variables in the conceptual framework. The added questions were tested for face validity before being used in this study.

Two nurses per selected clinic were given a five-day training on interview techniques and were trained to handle PND and IPV, including the management and referral processes. The potential risk of interviewer bias was minimized by assessing interviewer skills during role-play sessions and ad-hoc supervision at the clinics by the research team members. The entire questionnaire, except the EPDS, was installed as web-based application into a mobile device with a built-in quality assessment feature and was administered as a computer-assisted personal interview. The responses from EPDS were manually entered into the application after the interview session ended. Data collection took place from 1 June through October 2016.

Patient and public involvement

Patients and public were not involved in either the development of the reasearch question, study design or recruitement process. Patients who were detected as having probable PND or IPV were referred for appropriate management by the Family Physician at the respective clinics.

Variables

Outcome variables

The main outcome of this study, probable postnatal depression (PND), was assessed using a self-administered locally validated Edinburgh Postnatal Depression Scale, EPDS. This scale is composed of 10 statements on common depressive symptoms that use Likert-type responses (0-3 scores) that reflect the severity of symptoms. Wan Mahmud et al found that, at a cut-off score of 11/12, the sensitivity and specificity of the EPDS were 100% and 98.18%, respectively [20]. Another validation study recommended a cut-off score of 11.5 with a sensitivity of 72.7% and specificity of 92.6% [21]. In the first study, EPDS was tested against the ICD-10 criteria, with assessment of its concurrent validity against the Malay version of the General Health Questionnaire and the Hamilton Depression Rating Scale (HDRS) score [20]. The second study was tested and showed good correlations with both the Malay version of the Beck-Depression Inventory and HDRS [21]. Based on these two studies and a consensus from the content expert, this study categorized women who had a total score of 12 or more and/or a positive response to Question 10 on the risk of self-harm in the EPDS as having probable postnatal depression.

Predictor variables

Intimate partner violence (IPV) was defined as a single or repeated experience of physical and/or sexual violence. IPV was assessed based on the questionnaire used in the WHO Multi-country Study on Women's Health and Life Events [23]. In this study, we used a locally validated questionnaire from Saddki et al that reported Cronbach's α values ranging from 0.767 to 0.858 across domains [22]. Using this questionnaire, four types of violent

behaviours were assessed; physical, sexual, emotional violence and controlling behaviour. Physical violence was defined as positive responses to a history of being slapped, pushed, beaten, kicked, choked, or threatened with a weapon, and sexual violence was defined as a positive response for any history of sexual coercion, sex out of fear, or forced to engage in a degrading sexual act. Emotional violence was defined as a positive response to ever having been insulted, publicly humiliated, intimidated or threatened or had a partner who threatened to hurt the respondent herself or someone she cared about. Controlling behaviour was defined as a positive response to ever having been kept away from friends and/or immediate family, partner insisting on knowing the participant's whereabouts at all times, treated indifferently, partner feeling angry if the participant spoke to another man, partner suspicious of the participant being unfaithful and/or expected permission to seek healthcare for herself by their former or present husbands/partners. In this study, emotional violence and controlling behaviours were considered to be possible predictors for PND, and not part of IPV.

Other important predictors of PND are a lack of family support and unplanned pregnancy. Family support during confinement was defined as an answer of "Yes" to the questions "Did you observe a confinement period after your last child birth?" and "When you need help or have a problem, can you usually count on family members for support?" The response to the question "Was your last pregnancy planned or unplanned?" was used to categorize the pregnancy as planned or unplanned.

Possible confounding variables included age, ethnicity, marital status, education level, occupation and household income. Age was grouped into four categories: 18-24 years, 25-29

years, 30-34 years and 35 years and greater. Ethnicity was classified based on the major ethnic groups in Malaysia: Malay, Malaysian Chinese and Malaysian Indian and was followed by 'Other Bumiputera' and 'Other'. Other Bumiputera was composed of indigenous groups and local Sabahans and Sarawakians, and 'Other' was mostly composed of foreigners, immigrants, both legal and illegal, residing in Malaysia.

The education levels were categorized based on the Malaysian education system. Respondents were considered to have no formal education/primary education if they had not attended any formal schooling or had only completed up to six years of primary school. Those who had completed 11 years of formal schooling were defined as having completed secondary education while respondents with diplomas or higher qualifications were considered as having completed tertiary education. Household income was calculated based on the pooled income of family members and categorized into four groups.

Sample size

To the best of our knowledge, there is currently no information on the prevalence of IPV among women during the postnatal period in Malaysia. Thus, the sample size in this study was determined based on three available sources: a 20.7% prevalence of probable PND in Malaysia [4], 8.0% prevalence of IPV in Malaysia [14], and 35.2-38.9% prevalence of family violence among women with probable perinatal depression taken from a systematic review [24]. To ensure an adequate sample size, the sample size was calculated based on the lowest prevalence (8.0%) using a single proportion formula to estimate prevalence. Additionally, based on a design effect of 2 and an estimated non-response rate of 20%, the required sample size was 6,639 women.

Data management and analysis

Data from mobile devices were automatically uploaded into the server at the institute and converted into CSV and SPSS files. Only data with complete responses on the EPDS module were used for analysis. Data were analysed using the complex sample module in the IBM Statistical Package of Social Sciences (SPSS) for Windows version 23.0 (IBM Corp., Armonk, NY, USA) to account for the complexity of the sampling design. The final weights were calculated based on design weight and non-response weight, and a plan for analysis was created. Categorical variables were defined based on the variable operating definitions. Using the complex sample module, the overall prevalence of PND and estimated population affected by it were determined. Bivariate analysis was conducted to determine the factors associated with PND. Crude odds ratios were used to describe the strength of the associations between dependent and independent variables. A multivariable logistic regression model was fitted to determine the factors associated with PND. The primary predictor was IPV (physical and/or sexual violence). Other included independent variables were emotional violence, controlling behaviours, family support during confinement, unplanned pregnancy and partner's use of alcohol. Other possible confounders, such as ethnicity, respondent's age, marital status, education level, occupation and household income, were also included. We used a logistic regression model to produce a crude odds ratio as a measure of the associations between PND and the independent variables. For the final model, a FORWARD LR variable selection method was used to identify significant variables. Only variables with *p*-values less than 0.25 were included. The statistical significance of the individual regression coefficients was tested using the Wald chi-square statistic. The adjusted OR, with the respective 95% confidence intervals (CIs), was then

calculated. A p-value of less than 0.05 was considered significant. The model fit was tested using the Hosmer-Lemeshow statistic, which was non-significant (p>0.05).

Ethics

Approval from the Medical Research and Committee, Ministry of Health Malaysia was obtained prior to the implementation of this study (NMRR-15-2404-26677). All participants gave their informed consent before participating. Identifiable data were not entered into the mobile device. Women who were found to be positive for EPDS and/or positive for any type of violence were referred to the Family Physician at the respective clinics for further management.

RESULTS

Out of 6,639 randomly selected respondents, 5,745 were successfully interviewed, but only 5,727 completed the EPDS questions, resulting in a response rate of 85.9%. A total of 442 respondents did not attend clinic appointments, were non-contactable, or moved out of the clinic's operation area during their eligibility period (6-16 weeks postpartum). Another 452 respondents refused to participate, and 18 respondents had incomplete EPDS data (**Figure 2**). No differences were found between the age, ethnicity or sex of respondents and non-respondents.

[INSERT FIGURE 2]

We used data from 5,727 respondents in the analysis. The majority of respondents were between 25 and 35 years of age. The majority of respondents were married and had

attained at least a secondary education level, and half of the respondents were working mothers (**Table 1**).

Table 1: Sociodemographic profile of the respondents (n=5727)

	Unweighted count	Percentage (%)
Age		
18-24	1043	18.2
25-29	1842	32.2
30-34	1749	30.5
35 and above	1093	19.1
Ethnic		
Malay	3889	67.9
Malaysian Chinese	549	9.6
Malaysian Indians	262	4.6
Other Bumiputeras	753	13.1
Others	274	4.8
Marital Status		
Married/has partner	5654	98.7
Not married/no current partner	73	1.3
Education status		
No formal/ Primary	382	7.2
Secondary	3300	60.0
Tertiary	2045	32.8

Occupation		
Working	2807	49.0
Not working/ Housewife	2920	51.0
Household income*		
Less than RM1500	1575	27.5
RM1501-RM3000	1879	32.8
RM3001-RM5000	1308	22.9
RM5001 and more	958	16.7

*missing data=7; 1USD= RM3.89 (currency exchange on 3 February 2018).

Prevalence of probable postnatal depression

The prevalence of probable PND among women at 6-16 weeks postpartum was 4.4% (95% Confidence Interval, CI: 2.9, 6.7). There was no difference in prevalence in different age groups. The prevalence was higher among 'other Bumiputeras' and 'other' ethnicities compared to the Malays. Women who were unmarried, had a low education status, were not working and had low household incomes had a higher prevalence of probable PND. Women with partners who consumed alcohol, those with unplanned pregnancy and those without family support during confinement were also found to have a higher prevalence (**Table 2**).

Table 2: Factors associated with probable postnatal depression (n=5727)

Variables	Prevalence (95% CI)	Crude OR (95% CI)

Respondent's age (years)	18-24	6.9 (3.8, 12.4)	1.49 (0.96, 2.13)
	25-29	4.6 (3.0, 7.2)	0.93 (0.63, 1.37)
	30-34	3.1 (1.9, 4.8)	0.69 (0.45, 1.04)
	35 and above	4.0 (2.2, 7.1)	R
Ethnicity	Malay	3.7 (2.5, 5.5)	R
	Malaysian Chinese	1.7 (0.8, 3.7)	0.69 (0.38, 1.26)
	Malaysian Indian	4.5 (2.0, 9.7)	1.48 (0.81, 2.72)
	Other Bumiputeras	9.1 (3.6, 20.9)	2.63 (1.90, 3.62)
	Others	5.1(2.3, 10.5)	1.92 (1.12, 3.27)
Marital Status (current)	Married/Has partner	4.2 (2.7, 6.5)	R
	Unmarried/ no current partner	17.6 (7.1, 37.5)	3.14 (1.49, 6.64)
Education level	No formal/ Primary education	8.9 (3.5, 20.9)	2.46 (1.53, 3.95)
	Secondary education	4.7 (3.1, 6.9)	1.45 (1.06, 1.97)
	Tertiary education	2.9 (1.8, 4.6)	R
Occupation	Working	2.5 (1.5, 4.1)	R
	Not working/housewife	6.1 (3.9, 9.5)	1.88 (1.42, 2.49)
Household income	Lower than RM1500	8.5 (5.0, 13.9)	3.75 (2.29, 6.14)
	RM1500-RM3000	3.4 (2.3, 5.0)	1.74 (1.04, 2.93)
	RM3001-RM5000	2.2 (1.2, 3.9)	1.00 (0.55, 1.82)
	RM5001 and more		R
Unplanned pregnancy	Yes	11.5 (5.6, 22.2)	4.19 (3.10-5.67)

	No	2.7 (1.7, 4.1)	R
Partner's consumed	Yes	5.6 (3.3, 9.4)	1.71 (1.20, 2.42)
alcohol	No	3.5 (2.2, 5.5)	R
Lack of family support	Yes	10.8 (6.2, 18.1)	2.80 (1.96, 3.99)
during confinement	No	3.8 (2.5, 5.7)	R
Emotional violence	Yes	27.1 (18.1, 38.4)	8.94 (6.21, 12.87)
	No	3.5 (2.2, 5.8)	R
Physical violence	Yes	29.7 (19.4, 42.6)	7.50 (4.75, 11.83)
	No	3.7 (2.3, 6.0)	R
Sexual violence	Yes	43.8 (27.9, 61.1)	15.10 (8.91, 25.60)
	No	3.9 (2.4, 6.2)	R
Partner's controlling	Yes	7.2 (5.0, 10.1)	2.31 (1.76, 3.03)
behaviour	No	3.2 (1.7, 6.1)	R
IPV*	Yes	32.6 (22.8, 44.1)	9.32 (6.29, 13.82)
	No	3.5 (2.1, 5.7)	R

CI= Confidence interval, OR= Odds Ratio; IPV: ever experienced physical and/or sexual violence

1USD= RM3.89 (currency exchange on 3 February 2018).

Prevalence of intimate partner violence

For partner violence, 3.7% (95% CI: 2.7, 5.0), 2.6% (95% CI: 1.9, 3.5) and 1.2% (95% CI: 0.9, 1.7) of women had ever experienced emotional, physical or sexual violence, respectively. Controlling behaviour was experienced by 30.2% (95% CI: 24.2, 36.9) of women. Most of the violence occurred as combinations of emotional, sexual, and physical violence. Analyses

showed that 1.7%, 0.7%, and 0.5%, reported experiencing only emotional violence, only physical violence, and only sexual violence, respectively. Ever experiencing intimate partner sexual and/or physical violence was reported by 3.3% (95% CI: 2.5, 4.3) of women.

Factors associated with probable postnatal depression

Multivariate analysis proved the relationship between IPV and probable PND. The odds of having probable PND doubled for women who had ever experienced IPV (adjusted Odds Ratio, aOR, 2.34; 95% CI: 1.12, 4.87) after controlling for age, marital status, ethnicity, education level, occupation and partner's controlling behaviour. Probable PND was almost four times higher among women who had ever experienced emotional violence (aOR: 3.79; 95% CI: 1.93, 7.45) after controlling for other variables. Additionally, probable PND was three times higher in women with unplanned pregnancies (aOR: 3.32; 95% CI: 2.35, 4.69), 79% higher among those who lacked family support during confinement (aOR: 1.79; 95% CI: 1.12, 2.87), 59% higher among those who reported partner alcohol consumption (aOR: 1.59, 95% CI: 1.07, 2.35) and was three times higher in women with household incomes of less than RM1500 (aOR: 2.99; 95% CI: 1.63, 5.49) compared to those earned more than RM5000 (**Table 3**).

Table 3: Multivariate analysis of the factors associated with probable postnatal depression (n=5727)

	Variables	Wald	Adjusted OR (95% CI)	p value
Intimate Partner Violence	Yes	5.141	2.34 (1.12, 4.87)	0.023

	No		R	
Emotional Violence	Yes	14.935	3.79 (1.93, 7.45)	<0.001
	No		R	
Unplanned pregnancy	Yes	46.591	3.32 (2.35, 4.69)	<0.001
	No		R	
Lack of family support	Yes	5.999	1.79 (1.12, 2.87)	0.014
during confinement	No		R	
Partner consumed alcohol	Yes	5.351	1.59 (1.07, 2.35)	0.021
	No		R	
Household income	Lower than RM1500	12.438	2.99 (1.63, 5.49)	<0.001
	RM1500-RM3000	3.459	1.82 (0.97, 3.41)	0.063
	RM3001-RM5000	0.054	1.09 (0.53, 2.23)	0.816
	RM5001 and more		R	

CI= Confidence interval, OR= Odds Ratio,

Controlled for age, marital status, education level, occupation, ethnic and partner's controlling behaviour

DISCUSSION

To our knowledge, this is the first study to investigate the relationship between probable PND and IPV using a large number of respondents in Malaysia. This study examined the factors associated with probable PND, with IPV being the main predictor. An earlier population-based study observed that IPV was a significant public health concern in Malaysia [14], and studies on PND have also demonstrated its importance [4, 5]. Our study clearly

demonstrated the relationship between these two problems, which has implications for planning future services and intervention strategies.

Prevalence of probable postnatal depression

The prevalence of probable PND (4.4%) in our study was lower than that reported in an earlier study conducted in Kelantan, one of the states in Malaysia (20.3%) [4]. Both studies were conducted at primary care clinics and used similar screening tools with similar cut-off scores, but targeted women at different times during the postpartum period. Our nationwide study targeted women at 6-16 weeks postpartum, while the Kelantan study targeted women at 4-6 weeks postpartum. The difference in the prevalence might be due to the different screening timings. Longitudinal studies have reported that incidence rates decrease over the postpartum period [25, 26]. Accordingly, the prevalence in this study was also lower than that reported by an earlier nationwide household survey conducted in Malaysia using a similar screening tool and target population. This earlier survey reported a prevalence of probable postnatal depression of 12.7% [27]. Another possible reason for the lower prevalence in this study was the reluctance of women to disclose their problem, possibly due to a fear of being stigmatized. The clinic environment may not have been conducive for conducting a study examining sensitive issues. Postnatal depression and intimate partner violence are relatively hidden in our community, and it is possible that we would have observed a higher prevalence if we had been able to create awareness and desensitize the issues before beginning this study. However, the prevalence found by this study is comparable to that reported by a study in Indonesia (6.6%) among women at 6 weeks postpartum that used a similar cut-off score as well as a study conducted in Singapore (6.8%) among a similar target group but that used a lower cut-off score[2].

Association between intimate partner violence and probable postnatal depression

Our study demonstrated a significant association between probable PND and IPV (defined as a single occurrence of/repeated physical and/or sexual violence). This finding concurs with previous studies that recorded the independent effect of IPV with PND [24, 28-32]. The effect of IPV on women's mental health was not related to the time of occurrence. Khalifa et al described a history of violence as the strongest determinant of PND [28], while studies in France and Bangladesh have supported an association between PND and experiencing IPV before or during pregnancy [31, 32]. A prospective study among Norwegian mothers also showed higher risks of PND among women with a history of exposure to adult abuse, including sexual abuse [33]. We also recorded a strong association between emotional violence and the occurrence of probable PND, even after adjusting for partner's controlling behaviour and other confounding variables. The psychological effects of emotional violence on PND was more prominent than those of IPV, which has also been seen in other studies [34-37]. Emotional violence has a negative impact on the emotional and mental health of women in the postpartum period and often contributes to physical or sexual violence [38].

Other factors associated with probable postnatal depression

Other than IPV, we also noted an increased likelihood of probable PND among mothers from low income families, those with partners who consumed alcohol and those who experienced a lack of support during confinement. Financial difficulties have been identified as a risk factor for PND, independent of IPV [13, 30, 39]. The association of PND to partner substance use was also observed in a Canadian study [39]. Substance use by husbands/partners is often associated with IPV, which may contribute to the PND problem in women [28]. Family

support during confinement is very important in Asian communities. Our study demonstrated that a lack of family support during confinement is independently associated with an increased likelihood of PND. Our findings concur with other studies that have demonstrated similar associations [13, 40, 41]. A study from China concluded that a lack of postnatal family support, particularly support from the husband, is an important risk factor for PND [42]. We observed that marital status, the education level and occupation do not contribute directly to PND. As in many Asian countries, women in Malaysia are primarily expected to care for children and manage household chores, as prescribed by traditional gender roles, regardless of whether they are working [43]. These cultural norms may assign an inferior status to women and lead to misconceptions that may cause women to blame themselves, minimize abuse and prevent them from seeking help when abuse occurs. Perpetrators may manipulate cultural practices or religious teachings to make it seems as if it supports IPV. Many women struggle because they believe that their husbands have the right to beat them, a belief originating from misinterpreted religious teachings [44]. By contrast, women in Malaysia are more empowered, as evidenced by the increasing number of educated women and women in the workforce, and this may challenge the traditional view of gender roles [43]. The stronger affiliation to religion and its true teaching among Asians can have a protective effect against IPV, as religion promotes general commitment to family life, regards the institution of marriage highly and provides an understanding of women's rights [44]. Interestingly, a large prevalence study on IPV in Malaysia found that 83% of women who experienced IPV were assertive in seeking help for their survival in abusive relationships rather than continuing to suffer in silence [45].

Strengths and limitations

The main strength of our study is its use of large nationally representative data with robust methods. Moreover, the response rate was relatively high (85.9%) despite the sensitive nature of the issue. We also examined various socio-demographic and socio-cultural factors. Most importantly, this study used an internationally recognized tool that was locally validated and data collectors received a standardized training. Nevertheless, our findings have several limitations. One of the limitation of this study was the cross-sectional nature of the study, which prevents the determination of temporal relationships between exposure to IPV and probable PND. Although this study adjusted for a substantial number of possible confounders, some important variables were not studied, such as birth complications, child morbidity and breastfeeding. Additionally, we were only able to identify probable PND using a screening tool without further diagnostic confirmation process. It is also acknowledged that 'postnatal depression' is an umbrella term rather than a distinct psychological state. The term "postpartum depression" encompasses several mood disorders that follow childbirth, including anxiety disorders, trauma and adjustment reactions [46]. This broad spectrum of perinatal mental health may be associated with different sets of risk factors that may or may not overlap with each other, thus confounding the outcome of this study. Furthermore, the WHO tool used to identify IPV, while used widely, may not be exhaustive in terms of types of violence it identifies, which may have underestimated the prevalence of IPV in this study. However, despite these limitations, this study was able to provide a baseline and offers insight into the association between IPV and probable PND in Malaysia.

CONCLUSION AND POLICY IMPLICATIONS

Higher odds of probable PND were observed among women with a history of IPV. Women who were exposed to emotional violence, those with husbands who consumed alcohol,

those with a lack of family support during confinement and those from low income families were also at-risk of PND. Pregnancy care and postnatal programmes must address issues related to PND and IPV as there is overwhelming evidence of adverse health effects for both the mother and child. Healthcare personnel must be professionally trained to detect and confidently communicate these issues. There must be a proper setting as well as trained personnel to provide help and proper counselling or referrals for these women. Issues pertaining to sexual and reproductive health, women's rights and violence should be incorporated into the well-established pre-marital course [47]. Courses on family values and parenting skills for young couples and parents could be another platform.

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Authors' contribution

NAA, UAS, and TA were responsible for the study design and concept. NAA was responsible for the study conduct, respondent selection, study implementation, data analysis, data interpretation, drafting, critical revision and final approval of the manuscript. UAS, AR, MM and CYY were responsible for drafting, critical revision and final approval of the manuscript. NMK, MY, AAR, MO, FAAA, and RJ were responsible for respondent recruitment, data collection, data entry, critical revision and final approval of the manuscript. FI and NI were responsible for data interpretation, critical revision and final approval of the manuscript.

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Competing interest statement

All of the authors declare no conflict of interest

Patient consent

All of the respondents consented to participate in this study

Data sharing statement

The data used for this study are not publicly available. However, the data are available from the corresponding author upon reasonable request and with permission of the Director General of Health Malaysia.

Figures:

Figure 1: Conceptual framework illustrating the hierarchical model of risk factors for postnatal depression

Figure 2: Flow diagram of respondent recruitment

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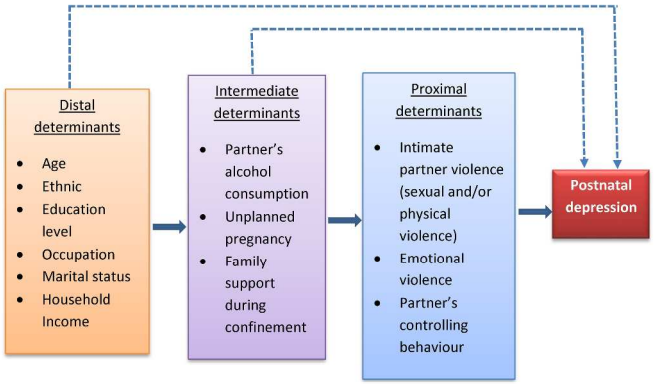

Figure 1: Conceptual framework illustrating hierarchical model of risk factors for postnatal depression

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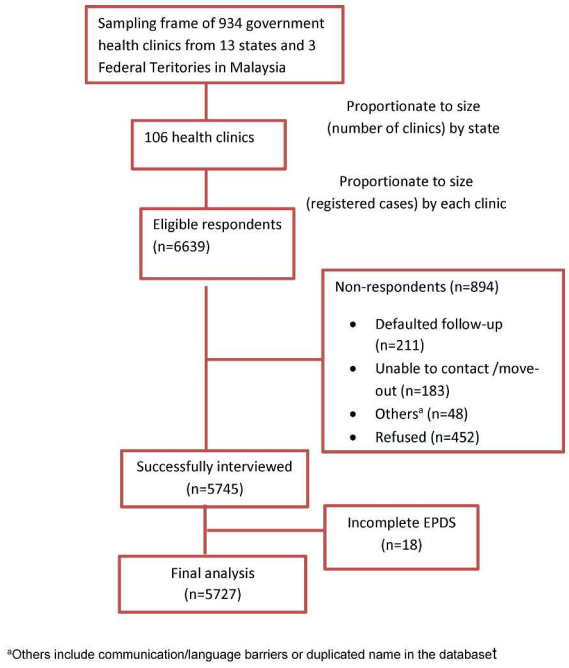

Figure 2: Flow diagram of respondents recruitment

297x420mm (300 x 300 DPI)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	6
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	6-7
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	8-10
Objectives	3	State specific objectives, including any prespecified hypotheses	10
Methods			
Study design	4	Present key elements of study design early in the paper	10
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	10-11
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	11-12
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	12-14
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	12-14
Bias	9	Describe any efforts to address potential sources of bias	*12*
Study size	10	Explain how the study size was arrived at	15
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	15-16
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	15-16
		(*b*) Describe any methods used to examine subgroups and interactions	15-16
		(*c*) Explain how missing data were addressed	15
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	12
		(*e*) Describe any sensitivity analyses	NA
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	17
		(b) Give reasons for non-participation at each stage	17
		(c) Consider use of a flow diagram	17
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	17-18
		(b) Indicate number of participants with missing data for each variable of interest	18
Outcome data	15*	Report numbers of outcome events or summary measures	19-21
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	17-20
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	23-25
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	25-27
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	27
Generalisability	21	Discuss the generalisability (external validity) of the study results	26
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	28

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.