Sensitivity and specificity of the three *Whooley* and *Arroll* questions for detecting perinatal depression in Mexican women

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Abstract

Objective. To evaluate the sensitivity and specificity of the Two Whooley questions and the Arroll question, using the SCID, The Structured Clinical Interview (SCID-I) as the gold standard for detecting perinatal depression. **Materials and methods.** We interviewed 210 women during pregnancy and 6 months postpartum. **Results.** The criterion with the greatest sensitivity was responding positively to either *Whooley question* (pregnancy= 94.7 %; postpartum=100.0%), while the most specific criterion was responding positively to the two *Whooley questions* plus the *Arroll question* (Pregnancy=90.0% Postpartum = 85.7%). **Conclusion.** The Whooley and Arroll questions have adequate psychometric properties to detect possible cases of depression during the perinatal period. They can be applied during prenatal check-ups and postpartum consultations. Timely detection of women at risk of perinatal depression can contribute to their treatment for reducing their adverse consequences in mothers and infants.

Keywords: depression postpartum; screening; sensitivity and specificity; primary healthcare

Resumen

Objetivo. Evaluar la sensibilidad y la especificidad de la Escala de las dos preguntas de *Whooley* y la pregunta de *Arroll* para detectar riesgo de depresión perinatal, usando la SCID como estándar de oro. **Material y métodos.** Se entrevistó a 210 mujeres durante el embarazo y 6 meses después del parto. **Resultados.** El criterio con mayor sensibilidad fue responder positivamente a cualquiera de las Preguntas de *Whooley* (embarazo = 94.7%; posparto = 100.0%) y, el más específico, responder positivamente a las preguntas de *Whooley* más la de *Arroll* (embarazo = 90.0% , Posparto = 85.7%). **Conclusiones.** Las preguntas de *Whooley* y *Arroll* tienen propiedades psicométricas adecuadas para detectar posibles casos de depresión durante el periodo perinatal. Pueden aplicarse durante las citas de control prenatal y consultas en el postparto. Detectar de manera oportuna a mujeres en riesgo de depresión perinatal puede ayudar a su atención para reducir sus consecuencias adversas en madres e infantes.

Palabras clave: depresión posparto; tamizaje; sensibilidad y especificidad; primer nivel de atención

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Perinatal depression (depression in pregnancy and within the first year post-partum)[1] is a common disorder worldwide. Since it is a condition that casts a shadow over motherhood,[2] causing a state of distress in women, its timely detection and treatment should be a priority. During pregnancy, between 2 and 21 % of women suffer major depression worldwide,[3,4] whereas in Mexico, between 9 and 14 % develop this condition.[5-7] Postpartum depression (PPD) affects 10 to 19.8 % of women internationally[4,8] and between 13.3 and 24.1% of those in Mexico.[5,7,9-11]

Prenatal depression has been linked to an increased risk of emergency service use,[12] substance use by the mothers and premature birth, as well as insufficient fetal weight gain and late seeking of prenatal care services.[13] There is evidence that PPD also has extremely negative consequences for both mother and infant. Untreated PPD affects the quality of the interaction between the mother and her baby, making it more likely for the infant to develop an insecure attachment pattern; it also affects the infant's health and performance, as well as its cognitive, behavioral and emotional development.[14] Low socioeconomic status increases the risk of PPD, since women with low resources are more likely to lack access to health services, infant care and information.[15] In low-income countries, babies of depressed mothers have a higher risk of health problems such as more frequent bouts of diarrhea.[16] In Mexico, the only study on this issue showed that low-income women with children up to the age of 5 who suffered from depression were at an increased risk for never breastfeeding the baby, health problems, acute respiratory disease, accidents requiring child hospitalization, and food insecurity.[17]

Despite the high prevalence of perinatal depression and its negative effects on maternal and infant health even in developed countries, it is estimated that between 75 and 90% of women suffering from this condition fail to be detected during the routine clinical check-ups delivered by primary healthcare.[18-20] This may be due to the lack of adequate tools at the primary care level for accurately identifying women at risk of depression,[21] since the extremely high demand for health services prevents professionals from conducting lengthy diagnostic interviews.[22]

Although there are several instruments for detecting perinatal depression in primary care settings, including the Edinburgh Postnatal Depression Scale (EPDS),[23] validated in Mexico by Juárez *et al.*[24] and by Alvarado-Esquivel *et al.*,[25] and the Center for Epidemiological Studies Depression-Scale (CES-D),[26] validated in Mexico by Lara and Navarrete,[27] these screening scales are not routinely used at healthcare centers. Among the reasons for not using them are the fact that, although there is an official standard for the detection of perinatal depression, it is not put into practice, since doctors prefer to ask a general question about their patients' emotional state if they find any abnormal physical symptoms.[28] In other countries, screening scales are often not used in primary health care either, partly due to the doctors' belief that they are too long and reduce the time spent on patients during consultation.[29]

There is evidence from Australia[30] and the UK[31] that brief instruments can accurately identify women at risk of PPD. The *Whooley questions*[32] are a tool recommended by the NICE (National Institute for Health and Care Excellence) Guidelines on Clinical Management and Service Guidance[31] for the detection of depressive symptoms during the perinatal period. The *Whooley questions* are an abridged version of the Primary Care Evaluation of Mental Disorders Procedure (PRIME-MD)[33] consisting of a two-stage screening for five of the most common groups of disorders in primary care including depression. The two original *Whooley questions* include the two main criteria for diagnosing major depression according to the DSM-V[34] regarding depressed mood and loss of pleasure. Arroll *et al.*[35] suggested adding a third one related to the need for help, in order to improve the specificity of these questions. The response options for the three items are yes or no.

A short instrument like this one might contribute to the detection of probable cases of perinatal depression if it were systematically used by the healthcare staff –nurses and social workers– who are more directly in contact with perinatal women[31] in countries like Mexico, where this problem has been overlooked.

The *Whooley questions* have demonstrated adequate psychometric properties, both in the general population[32,36] and in women in perinatal care.[37] However, the psychometric properties of the *Whooley questions* for perinatal women in Latin America have not been assessed. Their validation is important since they constitute a viable and economic tool in terms of the time required for their administration.[38] Detection of depressive symptoms is a necessary initial step for implementing prevention strategies within prenatal care and for referring severe cases to specialized treatment, with the aim of reducing the negative consequences of untreated perinatal depression in both mother and child.

Accordingly, the purpose of this study is to evaluate the sensitivity and specificity of the *Whooley*[32] and *Arroll questions*[35] using the Structured Clinical Interview (SCID-I)[39] as the gold standard for diagnosing perinatal depression in a sample of perinatal Mexican women.

Materials and methods

Sample

A non-probabilistic sample of 280 pregnant women receiving prenatal care agreed to participate in the research. All the women in the waiting room were invited to verify whether or not they met the inclusion criteria. Out of this total, 210 women (75.0%) were assessed during pregnancy and followed up at six months postpartum, and therefore they were included in the study. The women were selected at various healthcare institutions: 1) a secondary healthcare hospital offering comprehensive medical care for state workers and their dependents; women who come to this hospital simultaneously receive prenatal care at family clinics, from which they are referred to this hospital for periodic check-ups and medical studies that are unavailable at the family clinic; these health services are provided for state workers and their families; and 2) a community healthcare center that provides prenatal and other forms of medical care to the local population. Women are referred to secondary care hospitals for childbirth. This population is not covered by Social Security. Women were eligible if a screening checklist had determined that they were aged ≥ 20 years, ≥ 26 weeks pregnant, did not have a bipolar condition, and lived in the Mexico City Metropolitan Area. All the respondents were from an urban area.

Measures

Demographic data included age, educational attainment, monthly family income and marital status. For the purposes of this study, reported family income was divided into two categories: 1) low income (≤5 246 Mexican pesos), which corresponds to deciles 1-3, comprising families with the highest poverty level in Mexico, and 2) medium and high income (>5 246 Mexican pesos) corresponding to deciles 4-10, according to the statistics provided by the National Institute of Statistics and Geography (*Instituto Nacional de Estadística y Geografía*).[40,*]

Depression was assessed by the mood disorders module of the Structured Clinical Interview (SCID-I).[39] The SCID-I is a semi-structured interview for diagnosing current major depression according to DSM-IV criteria. The SCID-I has previously been used with perinatal Mexican women.[41] The diagnostic assessment was carried out by psychologists who also conducted the general interview. They received 15 hours' training in the SCID-I from a certified psychiatrist and met with her for supervision at four different points during the data collection.

Procedure

Interviews were conducted by graduate psychologists affiliated to the INP and psychology students doing their social service, trained to conduct the interviews. Interviews took place at ≥26 weeks of pregnancy and six months postpartum. The pregnancy interview was carried out at the clinic, while postpartum interviews were conducted at the respondents' homes. The women's participation was based on standard informed consent procedures. Data were collected between 2012 and 2013. The study was approved by the Institutional Review Board (IRB) of the Ramón de la Fuente National Institute of Psychiatry.

Data Analysis

Descriptive statistics were calculated for sociodemographic characteristics. Sensitivity, specificity, positive predictive value, positive likelihood ratio and confidence intervals were evaluated for each of the two *Whooley questions*,[32] as well as for the *Help question*[35] and for the different combinations of responses in order to determine which approach was most useful for detecting women at risk of depression, using the SCID-I as a gold standard in the two periods evaluated. Statistical analyses were conducted using STATA, version 12.

It is important to note that the term "sensitivity" indicates the percentage of respondents with depression detected by the test, in other words, the percentage of women with depression correctly classified as positive. Specificity indicates the percentage of respondents without depression correctly classified as negative. Positive predictive value refers to the probability that a participant with a positive result actually suffers from depression. Positive likelihood ratio shows how much more likely a respondent is to obtain a positive score if she has depression, compared with a person without it.[42]

Results

The sample mean age was 29.5 years (SD=6.3); respondents had 13.0 (SD=3.8) years of schooling and most were married or living in a consensual union (80.5%). Almost half had a low family income (46.7%) (table I).

As can be seen from table II, about half the women responded affirmatively to the *Depressed mood* question at both pregnancy (59.0%), and postpartum (48.1%),

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* These ranges were calculated based on the quarterly income per household of 2012 reported by the National Household Income and Expenditure Survey, 2014.

Table I
DEMOGRAPHIC CHARACTERISTICS (N= 210),
PERINATAL DEPRESSION IN MEXICAN WOMEN.
MEXICO CITY, 2012-2013

	M	(SD)
Age	29.5	6.3
Years of schooling	13.0	3.8
	N	%
Marital status		
Partnered	168	80.5
Monthly family income		
Low income	98	46.7

while the percentage of women who responded affirmatively to the *Loss of Pleasure* criterion was higher in postpartum (37.6%) than during pregnancy (26.2%). Finally, in both periods, almost half the women (45.9 -52.2%) responded affirmatively to the *Help question*.

Sensitivity, specificity, predictive value and likelihood ratio of the *Whooley* and *Arroll* questions

The data showed that during pregnancy, the criterion with the greatest sensitivity was affirmatively answering either *Whooley question* (94.7%), while the criterion with the greatest specificity was affirmatively answering the two *Whooley questions* plus the *Help question* (90.0%). As for positive predictive values, all the criteria were below 40.0% (13.7-32.1), and the likelihood ratio for a positive

test was moderate (4.7), while the criterion that most accurately diagnosed depression in pregnancy was the two *Whooley questions* plus the *Help question* (table III).

At six months postpartum, responding positively to either *Whooley question* showed perfect sensitivity (100%). The most specific criterion (85.7%) was responding positively to the two *Whooley questions* plus the *Help question*. The positive predictive value with a percentage above 40% was responding positively to the two *Whooley questions* plus the *Help question* (44.6%). The likelihood ratio for a positive test in this period was better than during pregnancy, and the criterion that most accurately diagnosed depression in pregnancy was the two *Whooley questions* plus the *Help question* (5.2) (table III).

Discussion

The aim of this study was to evaluate the sensitivity and specificity of the *Whooley*[32] and *Arroll questions*[35] for detecting perinatal depression in a sample of Mexican women using the Structured Clinical Interview (SCID-I)[39] as a gold standard. The results show the ability of the three questions to discriminate between cases and non-cases of depression in pregnant and postpartum women.

During pregnancy and at six months postpartum, the most sensitive criterion was an affirmative response to either *Whooley question*.[32] Thus, the number of women with perinatal depression not detected through these questions was very low (pregnancy= 5.3%; six months postpartum= 0.0%). Conversely, as often happens with highly sensitive instruments,[43] specificity in the two-time points measured was low (pregnancy= 39.4%; six months postpartum= 52.5%). The most specific criterion at the two evaluation times was responding affirmatively to the two *Whooley*

Table II
PERCENTAGE OF PERINATAL WOMEN AT RISK OF DEPRESSION BASED ON *WHOOLEY*
AND *ARROLL* QUESTIONS. MEXICO CITY, 2012-2013

	Pregnancy		Six months postpartum	
	%	95%CI	%	95%CI
Depressed mood	59.0	52.9-64.7	48.1	41.1-55.0
Loss of pleasure	26.2	21.0-31.6	37.6	31.0-44.5
Two *Whooley* questions	63.3	57.2-68.8	54.8	47.7-61.6
Either *Whooley* question	21.9	17.0-27.0	31.0	24.7-37.6
Help question	45.9	40.1-52.1	52.2	45.3-59.2
Two *Whooley* questions plus *Help* question	13.3	9.4-17.7	22.4	16.9-28.6
Either *Whooley* question plus *Help* question	29.0	23.6-34.6	28.6	22.5-35.1

Table III
**Diagnostic accuracy of Whooley and Help questions using SCID
as the gold standard. Mexico City, 2012-2013**

	Sensitivity (95%CI)	Specificity (95%CI)	Positive predictive value (95%CI)	Positive likelihood ratio (95%CI)
Pregnancy				
Depressed mood	89.4 (66.8-98.7)	43.9 (36.8-51.3)	13.7 (8.1-21.0)	1.6 (1.1-2.0)
Loss of pleasure	57.8 (33.5-79.7)	76.9 (70.3-82.7)	20.0 (10.4-32.9)	2.5 (1.1-4.6)
Two *Whooley* questions	52.6 (28.8-75.5)	81.1 (74.8-86.4)	21.7 (10.9-36.3)	2.8 (1.1-5.5)
Either *Whooley* question	94.7 (73.9-99.8)	39.4 (32.4-46.8)	13.5 (8.2-20.5)	1.6 (1.1-1.9)
Help question	73.6 (48.8-90.8)	75.3 (68.5-81.3)	22.9 (13.1-35.5)	2.9 (1.5-4.9)
Either *Whooley* question plus *Help* question	73.6 (48.8-90.8)	75.3 (68.6-81.3)	22.9 (13.1-35.5)	2.9 (1.5-4.9)
Two *Whooley* questions plus *Help* question	47.3 (24.4-71.1)	90.0 (84.9-93.9)	32.1 (15.8-52.3)	4.7 (1.6-11.7)
Six months postpartum				
Depressed mood	89.2 (71.7-97.3)	58.2 (50.7-65.4)	24.7 (16.7-34.3)	2.1 (1.4-2.8)
Loss of pleasure	92.8 (76.5-99.1)	70.8 (63.7-77.3)	32.9 (22.7-44.4)	3.2 (2.1-4.4)
Two *Whooley* questions	82.1 (63.1-93.9)	76.9 (70.1-82.8)	35.3 (23.9-48.2)	3.5 (2.1-5.5)
Either *Whooley* question	100.0 (87.6-100)	52.5 (44.6-59.6)	24.3 (16.8-33.2)	0.2 (0.2-1.6)
Help question	82.1 (63.1-93.9)	79.6 (73.0-85.2)	38.3 (26.0-51.7)	4.0 (2.3-6.3)
Either *Whooley* question plus *Help* question	82.1 (63.1-93.9)	79.6 (73.0-85.2)	38.3 (26.0-51.7)	4.0 (2.3-6.3)
Two *Whooley* questions plus *Help* question	75.0 (55.1-89.3)	85.7 (79.7-90.4)	44.6 (31.1-59.8)	5.2 (2.7-9.3)

questions plus the *Help question* (pregnancy=90.0%; six months postpartum=85.7%). This means that the number of misdiagnosed women is low (pregnancy= 10.0%; six months postpartum= 14.3%). For this high level of specificity, sensitivity significantly decreased, particularly during pregnancy. This result differs from that previously reported by Arroll *et al.*,[35] where both sensitivity and specificity were above 85%.

These findings confirmed Arroll *et al.*,[36] assertion and coincide with the results obtained by Bosanquet *et al.*[44] in that the *Help question* maintains good sensitivity and increases the specificity of the two *Whooley questions*.

Lastly, the criterion with the greatest balance in the two evaluation periods was an affirmative response to either *Whooley question* plus the *Help question*. However, at pregnancy, both sensitivity and specificity were less than 80%, which means that this criterion is less accurate in this period.

In order to determine which criteria to use, it is essential to consider the objective pursued by the health-care professional applying the instrument.[45] Thus, since the main goal at primary and secondary care levels is prevention, a sensitive instrument is required to detect the largest number of women at risk of depression so that they can be included in preventive programs. Prevention strategies for women who attend antenatal check-ups in primary health care services could include providing information on perinatal depression and risk factors, as well as suggesting self-help strategies to prevent depressive symptomatology.[46] In Mexico, there is evidence of the effectiveness of group interventions in the prevention of postpartum depression[41], while international studies show that postnatal home visits by health professionals help reduce the risk of postpartum depression.[46] Conversely, at the tertiary care level, the goal is to provide treatment for people suffering from perinatal depression, in which case, a specific instrument is needed to select only women who are depressed and therefore require treatment. This reduces the cost of care and, among other things, prevents oversaturating third-level care services.[47]

However, since these assessment tools consist of only three questions, they can be applied in full at no additional cost.

NICE[48] recommends that women who meet the risk criteria addressed by the *Whooley questions* (and in this case, Arroll's questions) receive confirmation of the diagnosis from health personnel through self-report instruments such as the PHQ-9 or the EPDS. If the institution has trained personnel, clinical interviews such as the SCID-I[39] or the MINI[49] can be applied to refer patients for treatment. This is not always feasible in low- and

middle-income countries, since mental health care is generally not included in prenatal care.

It is essential to have instruments that have proven to be psychometrically adequate for detecting women at risk of depression. In this respect, the *Whooley* and *Arroll questions* meet the criteria for sensitivity and specificity. In Mexico, the clinical guidelines (the Official Health Norms) for treating women's health during pregnancy were recently updated, taking into account the WHO (World Health Organization) recommendations for maternal and child health care, including the detection of postpartum depression.[50,51] However, the diagnosis and treatment of perinatal depression is not included within standard perinatal care, and only undertaken for at-risk populations, such as women diagnosed with HIV or victims of domestic violence, leaving a high percentage of women who also suffer from depression unattended.[52]

Moreover, identifying and providing care for women with depression or depressive symptoms in prenatal care is complicated by several factors: health professionals with a lack of information and awareness of perinatal mental health, the absence of standards to provide better, more timely care and a shortage of procedures for referring women to specialized staff.[53,54]

The strategies suggested to address these problems in developing countries, where there are limited resources and supersaturated mental health services include optimizing the use of resources, particularly in primary health care.[4,22] The time women spend waiting for their prenatal check-ups could be used to apply the *Whooley* and *Arroll questions* to detect possible cases of depression, as well as to provide them with information on perinatal depression as an initial preventive strategy. These procedures could be carried out by nurses and social workers.

It is important to bear in mind that the detection of perinatal depression is the first step of a strategy that facilitates ways to provide proper care for women who need it.[55]

It is essential to prevent or treat postpartum depression in order to reduce the negative consequences on both the mother and the infant. The depressed mother's inability to detect the infant's needs affects its emotional, social and cognitive development.[14,56] Limitations include the 25% attrition of the initial sample, which was not retained to complete the assessments. Women who failed to complete these assessments were younger, had fewer years of schooling and reported more depressive symptoms,[7] which may affect the performance evaluation of the *Whooley* and *Arroll questions.* The second limitation is that the sample is not probabilistic, meaning that caution should be exercised when results are generalized.

In conclusion, the *Whooley* and *Arroll questions* have adequate psychometric properties for detecting depressive symptoms during the perinatal period. They are an efficient instrument consisting of three questions that can be applied by non-mental health professionals during women's regular prenatal check-ups and in the infant's checkups and visits for immunization during the postpartum period. Referral and prevention strategies can be used to provide mental health care for this population. Systematic implementation of these strategies may contribute to reducing the adverse consequences for mothers and babies caused by perinatal depression.

Acknowledgements

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