



Original article

Self-medication practice in pregnant women from central Mexico



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ABSTRACT

Self-medication during pregnancy represents a serious threat for mother and child health. The objective of this study was to evaluate the prevalence and the factors associated with self-medication among Mexican women living in the central region of Mexico. This is a descriptive interview-study of 1798 pregnant women or women who were pregnant no more than 3 years ago, when the interview was carried out. Data analysis was carried out with chi-square analysis and odds ratio. The prevalence of self-medication (allopathic drugs, medicinal plants, and other products, including vitamins, food supplements, among others) was 21.9%. The factors associated ($p < 0.05$) with self-medication were: higher education (college and postgraduate), smoking, and consumption of alcohol. Smoking was the strongest factor (OR: 2.536; 1.46–4.42) associated to self-medication during pregnancy, followed by consumption of alcohol (OR: 2.06; 1.38–3.08), and higher education (OR: 1.607; 1.18–2.19). Medicinal plant consumption was associated with nausea, constipation, migraine, and cold ($p < 0.05$), whereas self-medication of allopathy was associated with gastritis and migraine ($p < 0.05$). Self-medication was influenced mainly by a relative or friend, who recommended the use of herbal medicine/allopathic medication. Two of the most common medicinal plants (arnica and ruda) here informed are reported to induce abortion or toxicity during pregnancy. The findings showed that self-medication (medicinal plants and allopathic medication) is a common practice among pregnant women from central Mexico. Adequate counselling of pregnant women by healthcare professionals about the potential risks of self-medication with herbal medicine and allopathic drugs during pregnancy is strongly warranted.

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1. Introduction

Pregnancy-related ailments, including nausea, stretch marks, varicose veins, among others require relief. Self-medication is a common practice around the world. Nevertheless, self-medication during pregnancy is of high interest, because there could be a health-risk for mother and child. There is a general fear among women in the use of allopathic medications during pregnancy. Drugs such as thalidomide, used for the treatment of nausea in pregnant women from 1957 to 1963, triggered to a tragedy of many causes of teratogenicity. Approximately 10% of birth defects are related to drug consumption (i.e. carbamazepine, nifedipine,

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valproic acid and others) used for preeclampsia (Nakamura et al., 2008). Consumption of high dose of vitaminic supplements, considered as of low-risk, during pregnancy might cause malformations in the fetus. For instance, excessive supplementation with vitamin E during pregnancy is related to heart defects (Smedts et al., 2009). Medicinal plants such as fenugreek (*Trigonella foenum-graecum* L.), commonly used during pregnancy (de Araújo et al., 2016), is a human teratogen (Taloubi et al., 2013). Worldwide, the use of natural products for primary health care has increased during the last decade (Ekor, 2013). Herbal medicine is a common practice in Mexico since pre-Hispanic times. Nevertheless, many medicinal plants lack scientific evidence for their toxicity, chemical composition, and pharmacological effects. Despite improving access to healthcare in urban areas, many people rely on medicinal plants (Josabad Alonso-Castro et al., 2012; Juárez-Vázquez et al., 2013). In Mexico, 2.3 million births were recorded in 2016 (INEGI, 2017), whereas the maternal mortality reported in 2015 was 721 cases (OMM, 2017). There are 32 states in Mexico. This study was carried out in six states (Guanajuato, San Luis Potosí, State of Mexico, Mexico City, Jalisco, and Queretaro) of central Mexico, where 53% of the population live, and annually 40% of newborns are recorded (INEGI, 2017). The information on self-medication with medicinal plants and allopathic drugs during pregnancy in Mexico is limited. The objective of this study was to evaluate the prevalence and the factors associated with self-medication among Mexican women living in the central region of Mexico.

2. Materials and methods

2.1. Study design

A cross-sectional assessment of self-medication practices was conducted with a pilot-testing of the questionnaire that was carried out with 150 pregnant women in the city of Guanajuato (Mexico) in July 2016. The questionnaire among 1798 pregnant women from September 2016 to October 2017 in public and private hospitals from the central states of Mexico: Guanajuato, San Luis Potosí, State of Mexico, Mexico City, Jalisco, and Queretaro was carried out. The questionnaire comprised sections about socio-demography (age, educational level, marital status, etc.), pregnancy history (smoking and alcohol consumption), use of medicinal plants and allopathic medications during pregnancy without advising physician, ailments during pregnancy and the reasons for use, sources of obtaining and recommendation of medicinal plants and allopathic medications. Content validity of the pilot questionnaire was assessed through in-depth analysis with 3 experienced senior colleagues, and minor modification was made before the commencement of the study. Raosoft software was used to calculate a suitable sample size. The n of population was 911,655 newborns in 2016 in the six selected states of Mexico, a margin error of 5% was considered, a confidence level of 99%, and a response distribution of 50%. A sample size of 664 was obtained. However, we considered the inclusion of a larger sample size to adjust for pregnant women who may decline participation. Total of 1798 women were interviewed. The inclusion criteria were: pregnant women (1–9 months of pregnancy), able to provide informed consent, and women who concluded their pregnancy for no more than 3 years ago by the time when the survey was conducted. There was no age restriction. The purpose of this study was explained to the participants. All obtained information was kept confidentially, and the name of each participant was not asked in the questionnaire. Each participant signed an informed consent. If the participant was not 18-year-old, the consent of participation was signed by an adult who was accompanying the

respondent. Each interview lasted 5–10 min. A local ethics committee (University of Guanajuato) approved the study. Results were presented as means (standard deviations), percentages and odd ratios (95% CI), when indicated. Chi-square was used to analyze associations between demographic characteristics, most frequent ailments, and self-medication. Statistical analysis was carried out using the software SPSS v20 (SPSS Inc, Chicago, IL). Statistical significance was indicated as $p < 0.05$.

3. Results

The mean age was 27.33 ± 6.60 years. Overall, 21.9% of respondents self-medicate during pregnancy: 264 respondents used medicinal plants, 110 respondents used allopathic drugs, and 76 respondents used other products (including vitamins, essential oils, and others). Self-medication during pregnancy was only associated with a higher level of education, smoking, and consumption of alcohol ($p < 0.05$) (Table 1). Smoking was the strongest factor (OR: 2.536; 1.46–4.42) associated to self-medication during pregnancy, followed by consumption of alcohol (OR: 2.06; 1.38–3.08), and higher education (OR: 1.607; 1.18–2.19).

Regarding pregnancy-related ailments, medicinal plant consumption was associated with nausea, constipation, migraine, and cold ($p < 0.05$), whereas self-medication of allopathy was associated with gastritis and migraine ($p < 0.05$) (Table 2). Other products were associated with gastritis, fatigue, and backache ($p < 0.05$) (Table 2). Approximately, 59.4% of women who self-medicated during pregnancy were influenced mainly by a relative or friend, who recommended the use of herbal medicine/allopathic medication. The medication/natural product was mainly obtained by purchase (45.2% of frequency) in supermarket or pharmacy (Table 2). The most common herb used in this study were: I) 15.8%, chamomile (*Matricaria chamomilla* L), II) 9.1%, lemon (*Citrus × limon* (L.) Osbeck), III) 6.6%, peppermint (*Mentha × piperita* L.), IV) 4.8%, arnica (*Arnica montana* L.), V) 4.3%, *Aloe vera* L, and VI) 3.9%, ginger (*Zingiber officinale* Roscoe) (Table 3). Chamomile was mainly used for the treatment of migraine and nausea. The most self-medicated allopathic drugs were: I) paracetamol (42.8%), II) bonadonin (8.2%), III) another NSAID (6.2%), and IV) omeprazole (5.2%). Paracetamol was mainly used for the treatment of fatigue and migraine (Table 3).

4. Discussion

In this study, 21.9% of pregnant self-medicate. Worldwide, self-medication during pregnancy ranges approximately from 30 to 70% (Bercaw et al., 2010; Abasiubong et al., 2012; Bayisa et al., 2014; Frawley et al., 2015). The results depend on the geographic area, social and cultural settings where the survey was carried out.

Self-medication was associated with higher level of education. Similar results were reported previously (Frawley et al., 2015; Courrier et al., 2015; Kissal et al., 2017). Another study indicated that higher education reduces the use of herbal medicines (Mothupi, 2014). The consumption of alcohol has also been associated to self-medication during pregnancy (Courrier et al., 2015). This is a potential harmful effect on the fetus, since consumption of alcohol during pregnancy induces retardation of post-natal development (Donald et al., 2016).

The main symptoms related to self-medication are: nausea, cold, and migraine, which are considered as minor ailments related to pregnancy (Yusuff and Omarusehe, 2011). Self-medication using medicinal plants and allopathic drugs for the treatment of these ailments is a common trend in other regions in the world, (Yusuff and Omarusehe, 2011; Miní et al., 2012; Al-Ramahi et al.,

Table 1
Sociodemographic variables of respondents.

Characteristic	Total n = 1798 (%)	Self-medication frequency [n (%)]		p	Or (95% CI)
		No n = 1404 (78.1)	Yes n = 394 (21.9)		
<i>Age (years)</i>					
<25	688 (38.3)	540 (38.5)	148 (37.6)	0.539	
25–34	810 (45.1)	637 (45.4)	173 (43.9)		
>35	300 (16.7)	227 (16.2)	73 (18.5)		
<i>Number of children</i>					
0–1	982 (54.6)	775 (55.2)	207 (52.5)	0.189	1.113
2 or more	816 (45.4)	629 (44.8)	187 (47.5)		(0.89–1.39)
<i>Education</i>					
Elementary and middle school	710 (39.5)	559 (39.8)	151 (38.3)	0.120	0.780
High school	408 (22.7)	71 (24)	71 (18)	1	Ref.
College-postgraduate	680 (37.8)	508 (36.2)	172 (73.7)	0.003	1.607 (1.18–2.19)
<i>Marital status</i>					
Married/cohabitant	1444 (80.3)	1115 (79.4)	329 (83.5)	0.073	0.762
Single/divorced/widow	354 (19.7)	289 (20.6)	65 (16.5)		(0.57–1.03)
<i>Smoking</i>					
Smoking	54 (3)	32 (2.3)	22 (5.6)	0.001	2.536 (1.46–4.42)
<i>Consumption of alcohol</i>					
Consumption of alcohol	113 (6.3)	73 (5.2)	40 (10.2)	<0.001	2.060 (1.38–3.08)

OR, odds ratio; CI, confidence interval.

Table 2
Most frequent ailments, reasons for use, sources of obtaining and recommendation of treatments in self-medication in pregnant women.

Characteristic	Self-medication n = 394 (%)	Medicinal plant n = 264 (%)	Allopathy n = 110 (%)	Others n = 76 (%)
<i>Symptom</i>				
Nausea	110 (27.9)	87 (33) [*]	28 (25.5)	7 (9.2)
Gastritis	58 (14.7)	37 (14)	22 (20) [*]	11 (14.5) [*]
Fatigue	46 (11.7)	30 (11.4)	5 (4.5)	22 (28.9) [*]
Backache	32 (8.1)	24 (9.1)	10 (9.1)	3 (3.9) [*]
Infection	48 (12.2)	37 (14)	12 (10.9)	4 (5.3)
Constipation	62 (15.7)	49 (18.6) [*]	15 (13.6)	1 (1.3)
Migraine	89 (22.6)	33 (12.5) [*]	57 (51.8) [*]	6 (7.9)
Cold	82 (20.8)	63 (23.9) [*]	18 (16.4)	8 (10.5)
Another symptom	79 (20.1)	47 (17.8)	14 (12.7)	32 (42.1) [*]
<i>Sources to obtain the product</i>				
Buying direct	178 (45.2)	104 (39.4)	61 (57)	41 (54.7)
Gift	144 (36.5)	117 (44.3)	19 (17.7)	21 (28)
Remaining in previous treatments	32 (8.1)	10 (3.8)	24 (22.4)	3 (4)
Crop	11 (2.8)	11 (2.8)	–	–
<i>Reason for use</i>				
Previous knowledge	126 (32)	79 (29.9)	49 (45.8)	17 (22.7)
Recommended	161 (40.9)	122 (46.2)	22 (20.6)	36 (48)
Lack of time/money	257 (6.9)	17 (6.4)	7 (6.5)	5 (6.7)
Fear of allopathy	24 (6.1)	21 (8)	5 (4.7)	6 (8)
Media	18 (4.6)	14 (5.3)	2 (1.9)	4 (5.3)
<i>Sources of recommendation</i>				
Relative/friend	234 (59.4)	184 (69.7)	29 (27.1)	49 (65.3)
Own initiative	96 (24.4)	54 (20.5)	44 (41.1)	11 (14.7)
Health professional	36 (9.1)	17 (6.5)	21 (19.6)	7 (9.3)
High risk	88 (22.3)	63 (23.9)	26 (24.3)	16 (21.3)
No risk	306 (77.7)	201 (76.1)	81 (75.7)	59 (78.7)

^{*} Represents statistical significance ($p < 0.05$, χ^2), compared to self-medication.

2013; Bayisa et al., 2014; Mothupi 2014; Courrier et al., 2015; Frawley et al., 2015; Nergard et al., 2015). NSAIDs are the most common drugs self-medicated during pregnancy for the treatment of cold and migraine. Similar results were obtained by other authors (Bercaw et al., 2010; Yusuff and Omarusehe, 2011; Abasiubong et al., 2012; Courrier et al., 2015). Prolonged use of paracetamol during pregnancy is associated to respiratory (asthma), neurological (hyperactivity, autism, among others) disor-

ders in newborns (Toda, 2017). In this study, 13% and 9% of the pregnant women used paracetamol during half of pregnancy and entire pregnancy, respectively. This represents a serious health risk for newborns. The combination of allopathic medications and herbal medicines during pregnancy should also be assessed to analyze possible pharmacodynamic and pharmacokinetic interactions.

The main source of recommendation of a product is a relative/friend. This trend is also reported in Ethiopia (Bayisa et al., 2014),

Table 3
Most frequently used medicinal plants and medications used for treating the most frequent ailments in pregnant women.

Treatment	Total n = 730 (%)	Nausea n = 119 (%)	Gastritis n = 68 (%)	Fatigue n = 53 (%)	Backache n = 38 (%)	Infection n = 61 (%)	Constipation n = 74 (%)	Migraine n = 102 (%)	Cold n = 120 (%)	Another symptom n = 95 (%)
Medicinal plant [common name]	438 (60)	82 (68.9)	35 (51.5)	27 (50.9)	23 (60.5)	45 (73.8)	53 (71.6)	36 (35.3)	89 (74.2)	48 (50.5)
<i>Arnica montana</i> L. (Asteraceae) [arnica]	21 (4.8)	1 (1.2)	1 (2.9)	6 (22.2)	7 (30.4)					6 (12.5)
<i>Citrus × limon</i> (L.) Osbeck (Rutaceae) [Lemon]	40 (9.1)	10 (12.2)	1 (2.9)		1 (4.3)	1 (2.2)	1 (1.9)	3 (8.3)	20 (22.5)	3 (6.2)
<i>Mentha × piperita</i> L. (Lamiaceae) [Peppermint]	29 (6.6)	16 (19.5)	4 (11.4)	1 (3.7)	1 (4.3)				4 (4.5)	2 (4.2)
<i>Matricaria recutita</i> L. (Asteraceae) [Chamomile]	69 (15.8)	23 (28)	4 (11.4)	4 (14.8)	4 (17.4)	4 (8.9)	2 (3.8)	11 (30.6)	12 (13.5)	5 (10.4)
<i>Mentha spicata</i> L. (Lamiaceae) [Mint]	24 (5.5)	4 (4.9)	3 (8.6)	2 (7.4)	2 (8.7)			7 (19.4)	3 (3.4)	3 (6.3)
<i>Zingiber officinale</i> Roscoe (Zingiberaceae) [Ginger]	17 (3.9)	11 (13.4)	1 (2.9)			1 (2.2)	1 (1.9)	1 (2.8)	2 (2.2)	
<i>Aloe vera</i> (L.) Burm. f. (Asphodelaceae) [Aloe]	19 (4.3)		12 (34.3)					1 (2.8)		7 (14.6)
<i>Cinnamomum verum</i> J. Presl (Lauraceae) [Cinnamon]	13 (3)	1 (1.2)		2 (7.4)	2 (8.7)				6 (6.7)	
<i>Camellia sinensis</i> (L.) Kuntze (Theaceae) [Green tea]	6 (1.4)	1 (1.2)				1 (2.2)	1 (1.9)		1 (1.1)	
<i>Apium graveolens</i> L. (Apiaceae) [Celery]	5 (1.1)		3 (8.6)		1 (4.3)	1 (2.2)				
<i>Equisetum arvense</i> L. (Equisetaceae) [Horsetail]	12 (2.7)			3 (11.1)		7 (20)				
<i>Ruta graveolens</i> L. (Rutaceae) [Rue, ruda]	7 (1.6)			2 (7.4)	2 (8.7)	1 (2.2)		1 (2.8)		1 (2.1)
<i>Citrus × sinensis</i> (L.) Osbeck (Rutaceae) [Orange]	5 (1.1)			3 (11.1)	1 (4.3)			1 (2.8)		
<i>Rubus fruticosus</i> L. (Rosaceae) [Blueberry]	6 (1.4)					6 (13.3)				
<i>Eysenhardtia polystachya</i> (Ortega) Sarg. (Fabaceae) [Kidneywood tree]	6 (1.4)					4 (8.9)				
<i>Ananas comosus</i> (L.) Merr. (Bromeliaceae) [Pineapple]	5 (1.1)					4 (8.9)	1 (1.9)			
<i>Vitis vinifera</i> L. (Vitaceae) [Raisin]	23 (5.3)						23 (43.4)			
<i>Senna alexandrina</i> Mill. (Fabaceae) [East Indian senna]	3 (0.7)						3 (5.7)			
<i>Carica papaya</i> L. (Caricaceae) [Papaya]	5 (1.1)						5 (9.4)			
<i>Citrus × aurantiifolia</i> (Christm.) Swingle (Rutaceae) [Lime]	5 (1.1)							4 (11.1)	1 (1.1)	
<i>Eucalyptus globulus</i> Labill. (Myrtaceae) [Blue gum]	8 (1.8)								8 (9)	
Allopathy	194 (26.6)	30 (25.2)	22 (32.4)	3 (5.7)	12 (31.6)	12 (19.7)	20 (27)	60 (58.8)	23 (19.2)	13 (13.7)
Paracetamol	83 (42.8)			3 (10.0)	6 (50)			54 (90)	11 (47.8)	7 (53.8)
Another NSAID	12 (6.2)		1 (4.5)		4 (33.4)			5 (8.3)	2 (8.7)	
Bonadoxin	16 (8.2)	16 (53.3)								
Omeprazole	10 (5.2)		10 (45.5)							
Ranitidine	4 (2.1)		4 (18.2)							
Dimethicone	4 (2.1)		4 (18.2)							
Phenazopyridine	5 (2.5)					5 (31.7)				
Antibiotic	6 (3)					5 (31.7)			1 (4.3)	
Senosides	7 (3.6)						7 (35)			
Plantago	7 (3.6)						7 (35)			
Antihistamine	8 (4.1)	1 (3.3)					1 (1.7)		6 (26.1)	
Others	98 (13.4)	7 (5.9)	11 (16.2)	23 (43.4)	3 (7.9)	4 (6.6)	1 (1.4)	6 (5.9)	8 (6.7)	34 (35.8)
Essential oils	56 (57.1)	5 (71.4)	4 (36.4)	6 (26.1)	2 (66.7)	1 (25)	1 (10.0)	4 (66.7)	3 (37.5)	29 (85.3)
Vitamins	33 (33.7)	1 (14.3)	6 (54.5)	15 (65.2)	1 (33.3)	-		1 (16.7)	4 (50)	5 (14.7)

Ivory Coast (Malan and Neuba, 2011), Peru (Miní et al., 2012), Turkey (Kissal et al., 2017), Nigeria (Yusuff and Omaruseh, 2011), and Kenya (Mothupi, 2014). This result appears related to

cultural role of family in the health care decision-making. However, information provided by a relative/friend about the use of medicinal plants and/or allopathic medication might be insuffi-

cient to advise about potential toxic effects for the mother and child. This result is also associated with the lack access to basic healthcare services.

The most common herbs used in this study were in the following order: chamomile, lemon, peppermint, arnica, Aloe vera and ginger. Similar trends were reported in other studies (Fakeye et al., 2009; Bercaw et al., 2010; Al-Ramahi et al., 2013; Bayisa et al., 2014; Kissal et al., 2017). Many of the medicinal plants cited by the respondents lack scientific evidence about its use during pregnancy. The safety of chamomile, the main medicinal plant cited in this study, during pregnancy has not been validated. Moussally and Bérard (2011) found no changes in body weight of newborns of mothers who consumed chamomile during pregnancy in Canada. In this study, 13% and 7% of the pregnant women used chamomile during half of pregnancy and entire pregnancy, respectively. Further studies should be carried out to study the safe use of chamomile during pregnancy.

Herbal products are sold in pharmacies without a prescription. In many cases, the safe doses of medicinal plants are unknown. Therefore, consumption of medicinal plants during pregnancy portends a threat for the mother and child. These products, announced as harmless, are commonly found in supermarkets and on internet. In many cases, these products are sold as food supplements. Further studies are necessary to explore which herbal medicine could be safe during pregnancy. Among the medicinal plants cited in this study, ruda (*Ruta chalepensis*) is clinically reported to induce abortion (Ciganda and Laborde, 2003). In addition, arnica (*Arnica montana*), the fourth most common medicinal plant informed in this study, is also reported to induce multiple organ system failure in pregnant women (Ciganda and Laborde, 2003). Therefore, the consumption of ruda and arnica should be forbidden during pregnancy. On the other hand, fruits like papaya and raisin are used as laxative agents, and citrus fruits such as lemon, orange, and lime are used as a common remedy for respiratory diseases including cough, flu, etc. The use of these plants during pregnancy could be encouraged.

The prevention of self-medication, by giving information (public drug education) about the potential risk to fetus, should be considered by health professionals (physicians, nurses, etc.) involved in monitoring pregnancy in Mexico.

The main limitation of this study is that the information was obtained in urban areas with middle-income people. Probably, the results could have been different if the survey was carried out in low-income states in Mexico such as Guerrero, Oaxaca, and Chiapas (Southern portion of Mexico), where most of indigenous people live. Therefore, the results might not be generalizable throughout Mexico.

5. Conclusions

Self-medication might increase maternal mortality and damage to fetus. The findings showed that self-medication is a common practice among pregnant women from central Mexico. Adequate counselling of pregnant women by healthcare professionals about the potential risks of self-medication with herbal medicine and allopathic drugs during pregnancy is strongly warranted.

Conflict of interest

The authors declare that there are no conflicts of interest.

References

- Abasiubong, F., Bassey, E.A., Udobang, J.A., Akinbami, O.S., Udoh, S.B., Idung, A.U., 2012. Self-Medication: potential risks and hazards among pregnant women in Uyo, Nigeria. *Pan. Afr. Med. J.* 13, 15–22.
- Al-Ramahi, R., Jaradat, N., Adawi, D., 2013. Use of herbal medicines during pregnancy in a group of Palestinian women. *J. Ethnopharmacol.* 150, 79–84.
- Bayisa, B., Tatiparthi, R., Mulisa, E., 2014. Use of herbal medicine among pregnant women on antenatal care at nekemte hospital, Western Ethiopia. *Jundishapur J. Nat. Pharm. Prod.* 9, e17368.
- Bercaw, J., Maheshwari, B., Sangi-Haghpeykar, H., 2010. The use during pregnancy of prescription, over-the-counter, and alternative medications among Hispanic women. *Birth* 37, 211–218.
- Ciganda, C., Laborde, A., 2003. Herbal infusions used for induced abortion. *J. Toxicol. Clin. Toxicol.* 41, 235–239.
- Courrier, D., Villier, C., Jourdan, S., Hoffmann, P., 2015. Self-medication and pregnancy: Survey of 740 pregnant women enrolled in the perinatal network of the Alpes-Isère region in France [Automédication et grossesse: Enquête auprès de 740 femmes enceintes dans le réseau périnatal Alpes-Isère]. *Revue Sage-Femme* 14, 131–141.
- de Araújo, C.R., Santiago, F.G., Peixoto, M.I., de Oliveira, J.O., Coutinho, M.de S., 2016. Use of medicinal plants with teratogenic and abortive effects by pregnant women in a city in Northeastern Brazil. *Rev. Bras. Ginecol. Obstet.* 38, 127–131.
- Donald, K.A., Fouche, J.P., Roos, A., Koen, N., Howells, F.M., Riley, E.P., Woods, R.P., Zar, H.J., Narr, K.L., Stein, D.J., 2016. Alcohol exposure in utero is associated with decreased gray matter volume in neonates. *Metab. Brain Dis.* 31, 81–91.
- Ekor, M., 2013. The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. *Front Pharmacol.* 4, 177–186.
- Fakeye, T.O., Adisa, R., Musa, I.E., 2009. Attitude and use of herbal medicines among pregnant women in Nigeria. *BMC Complement Altern Med.* 9, 53–59.
- Frawley, J., Adams, J., Steel, A., Broom, A., Gallois, C., Sibbritt, D., 2015. Women's use and self-prescription of herbal medicine during pregnancy: an examination of 1,835 pregnant women. *Womens Health Issues* 25, 396–402.
- Instituto Nacional de Estadística y Geografía. Natalidad y fecundidad 2012–2015 [Natality and fecundity] Available from: <http://www.beta.inegi.org.mx/app/tabulados/default.html?nc=mdemo23>.
- Josabad Alonso-Castro, A., Jose Maldonado-Miranda, J., Zarate-Martinez, A., Jacobo-Salcedo, M.del R., Fernández-Galicia, C., Alejandro Figueroa-Zuñiga, L., Abel Rios-Reyes, N., Angel de León-Rubio, M., Andrés Medellín-Castillo, N., Reyes-Munguía, A., Méndez-Martínez, R., Carranza-Álvarez, C., 2012. Medicinal plants used in the Huasteca Potosina, México. *J. Ethnopharmacol.* 143, 292–298.
- Juárez-Vázquez, M.del C., Carranza-Álvarez, C., Alonso-Castro, A.J., González-Alcaraz, V.F., Bravo-Acevedo, E., Chamarro-Tinajero, F.J., Solano, E., 2013. Ethnobotany of medicinal plants used in Xalpatlahuac, Guerrero, México. *J. Ethnopharmacol.* 148, 521–527.
- Kissal, A., Çevik Güner, Ü., Batkın Ertürk, D., 2017. Use of herbal product among pregnant women in Turkey. *Complement. Ther. Med.* 30, 54–60.
- Mini, E., Varas, R., Vicuña, Y., Lévano, M., Rojas, L., Medina, J., Butron, J., Renzo Aranda, R., Gutierrez, E.L., 2012. *Rev. Peru. Med. Exp. Salud Publica* 29, 1–6.
- Mothupi, M.C., 2014. Use of herbal medicine during pregnancy among women with access to public healthcare in Nairobi, Kenya: a cross-sectional survey. *BMC Complement. Altern. Med.* 14, 432–439.
- Nergard, C.S., Ho, T.P., Diallo, D., Ballo, N., Paulsen, B.S., Nordeng, H., 2015. Attitudes and use of medicinal plants during pregnancy among women at health care centers in three regions of Mali, West-Africa. *J. Ethnobiol. Ethnomed.* 11, 73–83.
- Observatorio de Mortalidad Materna en México (OMM). Available from: <http://www.omm.org.mx/index.php/indicadores-nacionales/boletines-de-mortalidad-materna/2015>.
- Malan, D.F., Neuba, D.F., 2011. Traditional practices and medicinal plants use during pregnancy by Anyi-Ndenye women (Eastern Côte d'Ivoire). *Afr. J. Reprod. Health* 15, 85–93.
- Moussally, K., Bérard, A., 2011. Exposure to specific herbal products during pregnancy and the risk of low birth weight. *Altern. Ther. Health Med.* 18, 36–43.
- Nakamura, M.U., Kulay Junior, L., Pasquale, M., 2008. Use of fármacos na gravidez: benefício e custo (Use of drugs during pregnancy: benefit and cost). *Rev. Bras. Ginecol. Obstet.* 30, 1–4.
- Smedts, H.P., de Vries, J.H., Rakhshandehroo, M., Wildhagen, M.F., Verkleij-Hagoort, A.C., Steegers, E.A., Steegers-Theunissen, R.P., 2009. High maternal vitamin E intake by diet or supplements is associated with congenital heart defects in the offspring. *BJOG* 116, 416–423.
- Taloubi, L.M., Rhouda, H., Belahcen, A., Smires, N., Thimou, A., Mdaghri, A.A., 2013. An overview of plants causing teratogenicity: fenugreek (*Trigonella foenum graecum*). *Int. J. Pharm. Sci. Res.* 4, 516–519.
- Toda, K., 2017. Is acetaminophen safe in pregnancy? *Scand. J. Pain.* 17, 445–446.
- Yusuff, K.B., Omarusehe, L.D., 2011. Determinants of self medication practices among pregnant women in Ibadan, Nigeria. *Int. J. Clin. Pharm.* 33, 868–875.