



## ORIGINAL ARTICLE

## Prevalence of Medicinal Herbs Use during Pregnancy in the World: A Systematic Review and Meta-Analysis

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### KEYWORDS

Herbal Medicine;  
Pregnancy;  
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**ABSTRACT:** The use of herbs during pregnancy is on the rise today, but some of these plants can not only cause side effects in the mother and fetus but also have drug interactions. This systematic survey and meta-analysis reading were administered to define the outbreak of herbs used by women during pregnancy. The present work was performed using the meta-analysis method from March 2000 to February 2019. The search process was carried out in Iranian databases such as SID, Regional Information Center for Science and Technology (RICST), Mag-Iran, IranDoc, Barakat Knowledge Network System, Iranian National Library and international databases such as PubMed / Medline, Cochrane Library, Scopus, Science Direct, Web of Sciences, Embase, EBSCO, and Google Scholar. Keywords including medicinal herbs, Medicinal plant, Plant, Extract, Women, and pregnancy. The heterogeneity of investigations was scrutinized using the  $I^2$  index. Analysis was carried out using Comprehensive Meta-Analysis software. A total of 73 articles were contained in the meta-analysis process. Based on the results, the general outbreak of medicinal herbs use during pregnancy was 32.4% (95% CI: 28.2%-36.8%). The results of meta-regression showed that increasing in sample size leads to decreased overall prevalence of herbal medicine consumption during pregnancy and increasing in the year of research leads to increased overall prevalence of herbal drug use during pregnancy, which both were statistically significant ( $P < 0.05$ ). The prevalence of medicinal herbs consumption during pregnancy is relatively high.

### INTRODUCTION

Pregnancy is a situation with many physiologic changes that cause plenty of pregnancy-relevant complications,

including vomiting, nausea, heartburn, and constipation [1]. Following the onset of complications, pregnant women

usually seek self-treatment and due to the believe that herbs are safer for embryo than chemical medicines, they often prefer herbs to prescribed medicines and following the fear and anxiety that arises from the notion that use of chemical medicines may be harmful to the fetus, they refuse to take these medicines and tend to use herbs [2]. However, some herbs may also result in side effects in the mother and the fetus or cause medicine interactions [3].

Nowadays, the use of herbs is increasing, especially in developing countries. It is estimated that 65%-80% of the population use herbal products [4]. A review showed that the outbreak of herbal medicines consumption varies from 23.3% to 82.3%, which means that the tendency to use herbal drugs in pregnancy has increased. It is noteworthy that ginger, peppermint, thyme, salvia, chamomile, orange, and green tea are the most common herbs used during pregnancy [1]. In a study in Yazd city, Iran, 90% of women who gave birth to their children reported herbs to use in their recent pregnancies [5]. Another study showed that, nearly 40% of pregnant women in Bojnord, Iran used herbs in pregnancy [6].

The usage of herbal medicines does not contain rigid provisions similar to modern drugs and according to the growing trend in using these products, especially in pregnancy, the following complications are worrying. Studies in world have reported a different Prevalence of medicinal herbs use during pregnancy, indicating the inconsistency and uncertainty of the Prevalence of medicinal herbs use during pregnancy in world. Systematic review and meta-analysis studies are very useful for coordinating different values from different studies; the research question is that what is the overall Prevalence of medicinal herbs use during pregnancy in the world?

### **Objectives**

This study aims to determine the prevalence of medicinal herbs use during pregnancy in the world with a systematic review and meta-analysis.

## **MATERIALS AND METHODS**

### **Study protocol**

This research carried out according to the systematic review and meta-analysis articles check list (PRISMA).

### **Search strategy**

This systematic study was performed based on studies on the outbreak of herbal drug use during pregnancy and included articles published in English-language journals. Each paper was studied by two referees, independently. In the case of article rejection, the reason for the rejection is stated

and in case of disagreement between the two referees, the paper was scrutinized with the third referee and the idea of the third referee was considered. The search process was carried out in Iranian databases such as SID, Regional Information Center for Science and Technology (RICST), Mag-Iran, Iran Doc, Barakat Knowledge Network System, Iranian National Library and international databases such as PubMed / Medline, Cochrane Library, Scopus, Science Direct, Web of Sciences, Embase, EBSCO, and Google Scholar.

The strategy of this study included "pregnant" AND "plant" or "phytochemical" or "herb" or "herbal" or "medicine" or "remedies" and possible combinations of keywords.

An example of a search strategy in PubMed is as follows:  
(pregnant [Title/Abstract]) AND plant [Title/Abstract]) OR phytochemical [Title/Abstract]) OR herb [Title/Abstract]) OR herbal [Title/Abstract]) OR medicine [Title/Abstract]) OR remedies [Title/Abstract]

### **Inclusion criteria**

English-language and Persian language studies were contained in the study according to the inclusion criteria.

### **Exclusion criteria**

Cross-sectional studies on the prevalence of herbs use during pregnancy that was published as original research and in review articles, cohort, case-control, and

interventional investigations were excluded from the study.

#### **Study selection and quality assessment of the articles**

First, all papers were recognized based on the elected keywords and an inventory of abstracts was collected. After blinding for article information including the journal name and the name of the authors, the complete text of the papers was provided to the referees. For investigating gray literature, unpublished studies were also searched using the Google search engine and the topic of the related websites was also evaluated. References of included papers were also reviewed to select similar articles and be reviewed if they were missed.

#### **Quality assessment and data extraction**

For quality assessment, the STROBE check list was used; this checklist includes of 22 sections, including 18 common questions that are enforceable for all observational scrutinizes containing cohort, case-control and cross-sectional, and 4 special sections depending on the kind of study to assess several methodological aspects including objectives of the study, suitable sample size determination, kind of study, sampling method, studied population, data collection method, defining variables and samples examining method, data collecting tools, statistical experiment and the obtained results of the study. Based on the quality assessment, a checklist of selected article information including author names, heading of the paper, year and place of the review, sample size, and prevalence of medicinal herbs use during pregnancy was extracted from studies based on PRISMA 2009 (Figure 1). In the last step, the relevant papers (73 related articles) were contained in the meta-analysis (Table 1).

#### **Data Extraction**

A checklist including the author's name, country, year of publication, age of participants, number of women and prevalence were designed.

#### **Statistical analysis**

In each study, the prevalence of medicinal herbs consumption in pregnancy was extracted. The heterogeneity of studies was assessed using the  $I^2$  test. In general, heterogeneity is divided into three classes; low heterogeneity (lower than 25%), moderate heterogeneity (between 25 and 75%), and high heterogeneity (above 75%). Considering the mentioned cut-offs, the heterogeneity of the studies in this meta-analysis was high ( $I^2=99\%$ ), also, the random-effects model was applied for combining the obtained results from the investigations. The Comprehensive Meta-Analysis software version 3 (Biostat, Englewood, NJ, USA) was used for the data analyzing. The Egger test was used to measure the possibility of publication bias.

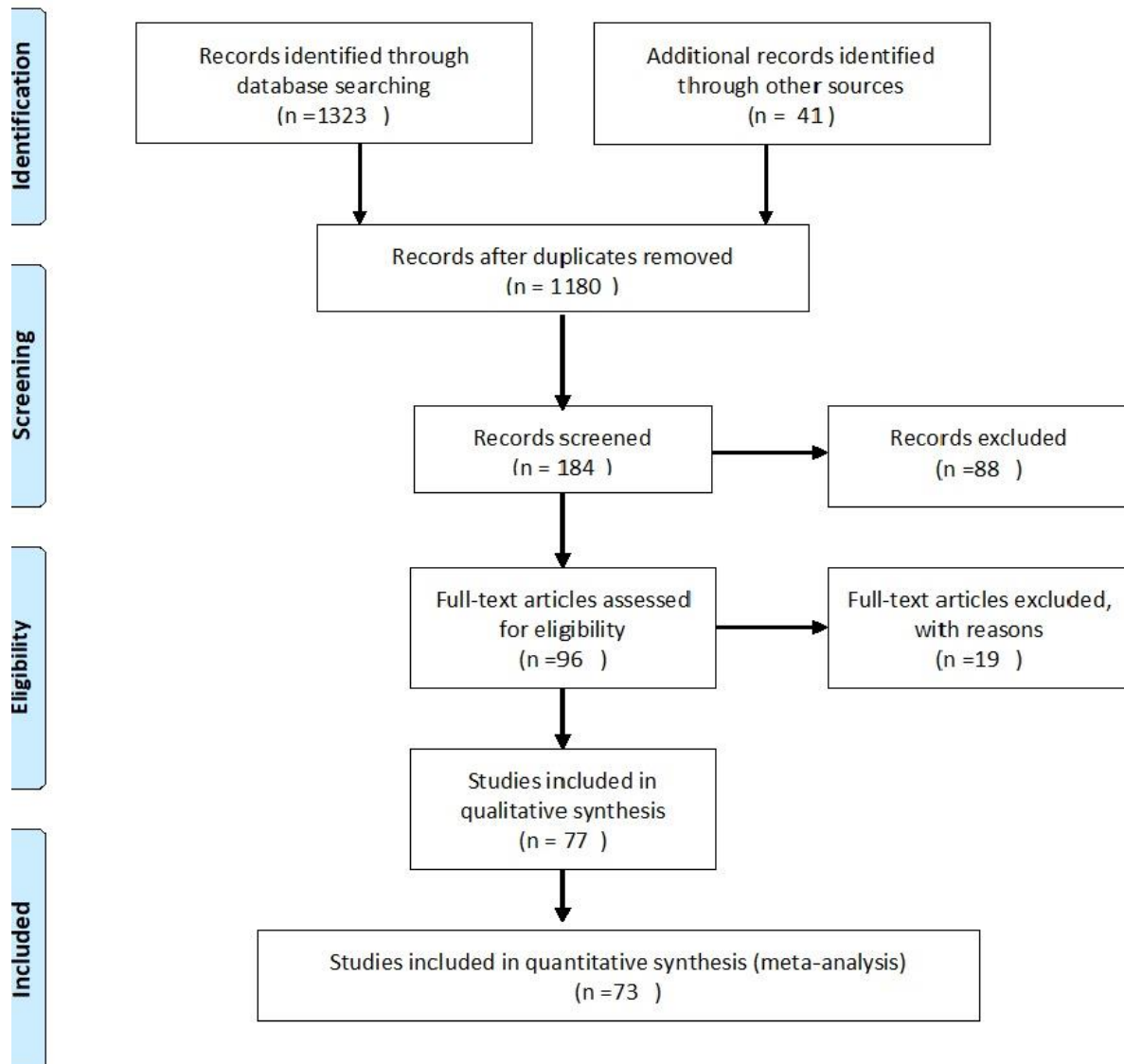
## **RESULTS**

The search for studies on the prevalence of medicinal plants use during pregnancy in international journals resulted in the identification of 365 articles in Medline (PubMed), 591 articles in Science Direct and 367 articles in Scopus databases. Then, a preliminary investigation was performed to eliminate repetitive articles and unrelated topics and secondary investigations were performed to eliminate papers without full text and low-quality studies, which resulted in the inclusion of 73 articles in the meta-analysis (Figure 1). The total number of individuals was 108062 with the age ranged from 15 to 50 years old. According to the obtained results of the meta-analysis, the overall outbreak of medicinal herbs use during pregnancy was 32.4% (95% CI: 28.2%-36.8%). The highest prevalence of medicinal herbs use during pregnancy was in Uganda and Kenya with 99.9% (95% CI: 98.4%-100%) in 2007 [49] and 97.6% (95% CI: 71.3%-99.9%) in 2011 [47], respectively. The lowest prevalence was 2% (95% CI: 1%-3%) in Ethiopia in 2014 [44]. The possibility of publication bias was obtained using a funnel plot (Fig. 2) and the Egger test ( $P = 0.078$ ). Considering the statistical significance level of  $P < 0.05$ , publication bias was not statistically significant in this meta-analysis.

Figure 3 demonstrates the random effects model in the

prevalence of medicinal herbs use during pregnancy. The black square demonstrates the prevalence speed and partial length on the square represents a 95% confidence distance in each search and the lozenge shape represents the global prevalence for all studies. In order to survey the potential effect of factors on the heterogeneity of prevalence of medicinal herbs use during pregnancy, meta-regression was

applied for two important factors like sample size and publication year) (Figures 4 and 5). As Figure 4 shows, increasing sample size significantly decreased the prevalence of medicinal herbs use during pregnancy ( $P < 0.05$ ). As shown in Figure 5, increasing in the publication year significantly increased the prevalence of medicinal herbs use during pregnancy ( $P < 0.05$ ).



**Figure1.** The flowchart on the stages of including the studies in the systematic review and meta-analysis (PRISMA 2009).

**Table1.** Specifications of papers included in the study

Row	Publication year	Country	Age of participants	Number of women	Prevalence (%)	References
1	2006	Iran		447	51.9%	[7]
2	2018	Iran	28±5.2	400	48.4%	[8]
3	2017	Africa	26	364	48.6%	[9]
4	2018	Australia	18-49	167	36.6%	[10]
5	2013	Australia	-	1835	48.1%	[11]
6	2016	Africa	-	363	73.1%	[12]
7	2016	Nigeria	28.9	500	36.8%	[13]
8	2018	Bangladesh	26.2	243	70%	[14]
9	2019	Denmark	20-40	225	22.7%	[15]
10	2019	Saudi Arabia	31.5	297	56%	[16]
11	2018	Australia	18-30	134	62.7%	[17]
12	2017	Turkey	20-36	366	47.3%	[18]
13	2015	Australia	33-38	588	77.9%	[19]
14	2017	Nigeria	11-45	350	11.8%	[20]
15	2016	Nigeria	16-45	450	11%	[21]
16	2015	Ghana	15-49	384	6.5%	[22]
17	2015	Nigeria	18-40	360	4.4%	[23]
18	2015	Nigeria	20-40	378	42%	[24]
19	2015	Mali	20-31	209	79.9%	[25]
20	2014	Nigeria	17-40	355	12.2%	[26]
21	2014	Nigeria	15-40	120	10%	[27]
22	2013	Nigeria	-	440	25%	[28]
23	2013	Nigeria	32.80±10.84	300	39.3%	[29]
24	2012	Nigeria	18-40	518	9.1%	[30]
25	2012	Nigeria	16-36	119	22.7%	[31]
26	2011	Nigeria	29±5.3	410	46.3%	[32]
27	2011	Côte d'Ivoire	20-46	55	90.3%	[33]
28	2011	Nigeria	18-46	796	21.7%	[34]
29	2011	Nigeria	27 ± 5.3	1594	19.9%	[35]
30	2011	Nigeria	18-40	500	31.4%	[36]
31	2009	Nigeria	18-45	595	67.5%	[37]
32	2008	Nigeria	15-35	1400	68%	[38]
33	2007	Ghana	17-45	597	56.3%	[39]
34	2000	Nigeria	16-42	1200	12.1%	[40]
35	2016	Uganda	25.32±6.16	383	21%	[41]
36	2015	Ethiopia	26.5±6	518	7.8%	[42]
37	2014	Ethiopia	18-35	250	50.4%	[43]
38	2014	Ethiopia	15-47	400	2%	[44]
39	2014	Kenya	-	333	12%	[45]
40	2014	Tanzania	-	187	43%	[46]
41	2011	Kenya	40-50	20	100%	[47]
42	2009	Ethiopia	-	1268	2.2%	[48]
43	2007	Uganda	-	483	100%	[49]
44	2015	Lesotho	-	72	47.2%	[50]
45	2016	Egypt	16-43	600	41.8%	[51]
46	2014	Egypt	17-45	300	27.3%	[4]
47	2016	Congo	15-35	920	45%	[52]
48	2016	Chin	18-44	695	43.5%	[53]
49	2016	Europe, Australia, North and South America	-	2673	29.3%	[54]
50	2013	Palestine	17-45	300	40%	(55)
51	2013	Malaysia	18-46	460	34.3%	[56]
52	2011	Landen	17-45	14115	5.8%	[57]

53	2011	Norway	29.1	600	39.7%	[58]
54	2011	Oman	28 ± 5	139	19%	[59]
55	2011	Iran	25.2±4.6	530	30.8%	[60]
56	2010	Italy	17-45	392	27.8%	[61]
57	2010	Italy	32.4±0.4	172	48%	[62]
58	2004	Norway	25-36	400	36%	[63]
59	2010	Hispanic	18-42	485	19%	[64]
60	2010	America	17-45	4239	9.4%	[65]
61	2010	Chin	18-46	4290	10.1%	[66]
62	2009	England	-	578	57.8%	[67]
63	2009	Taiwan	20-34	21248	33.6%	[68]
64	2009	Taiwan	20-35	28437	20.9%	[69]
65	2007	Taiwan	19-35	2048	24.1%	[70]
66	2006	Australia	18-46	588	36%	[71]
67	2005	Norway	26-35	400	36%	[72]
68	2001	America	-	150	13%	[73]
69	2012	Iran	26.4±5.2	400	22.3%	[74]
70	2015	Palestine	28.1±5.7	218	45.8%	[75]
71	2005	Qatar	29	393	65.2%	[76]
72	2012	Iran	25.7±5.1	919	49.2%	[77]
73	2012	Palestine	17-45	300	40%	[78]

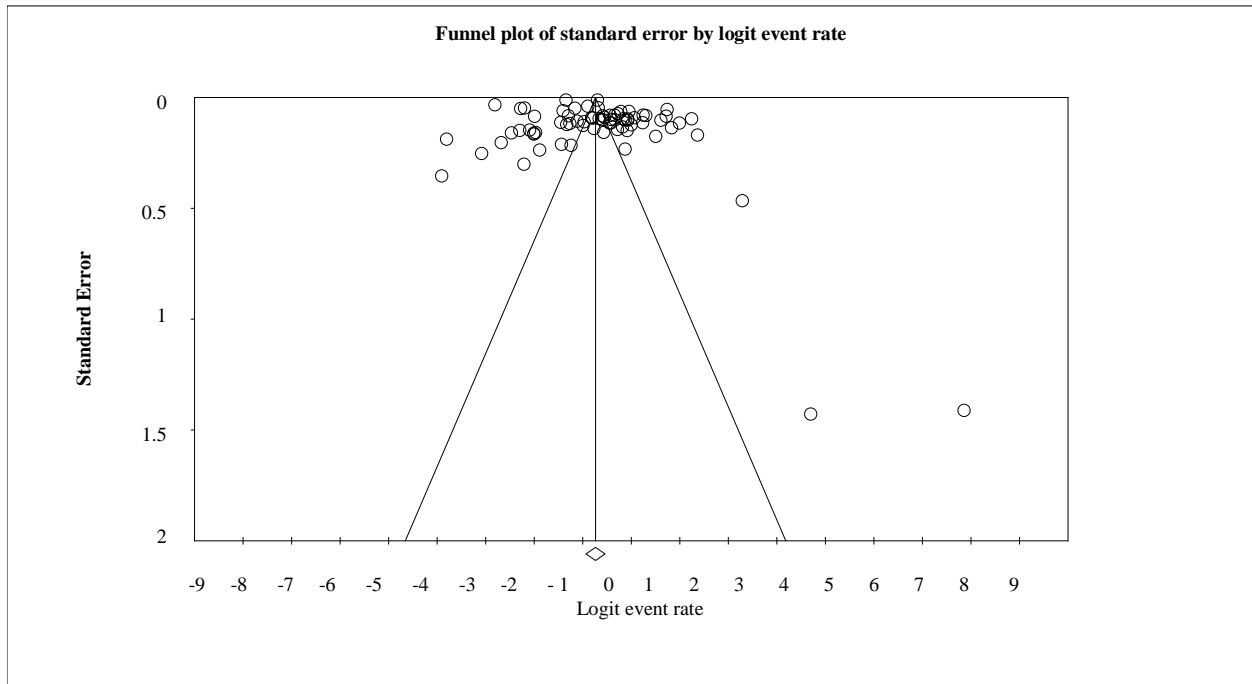
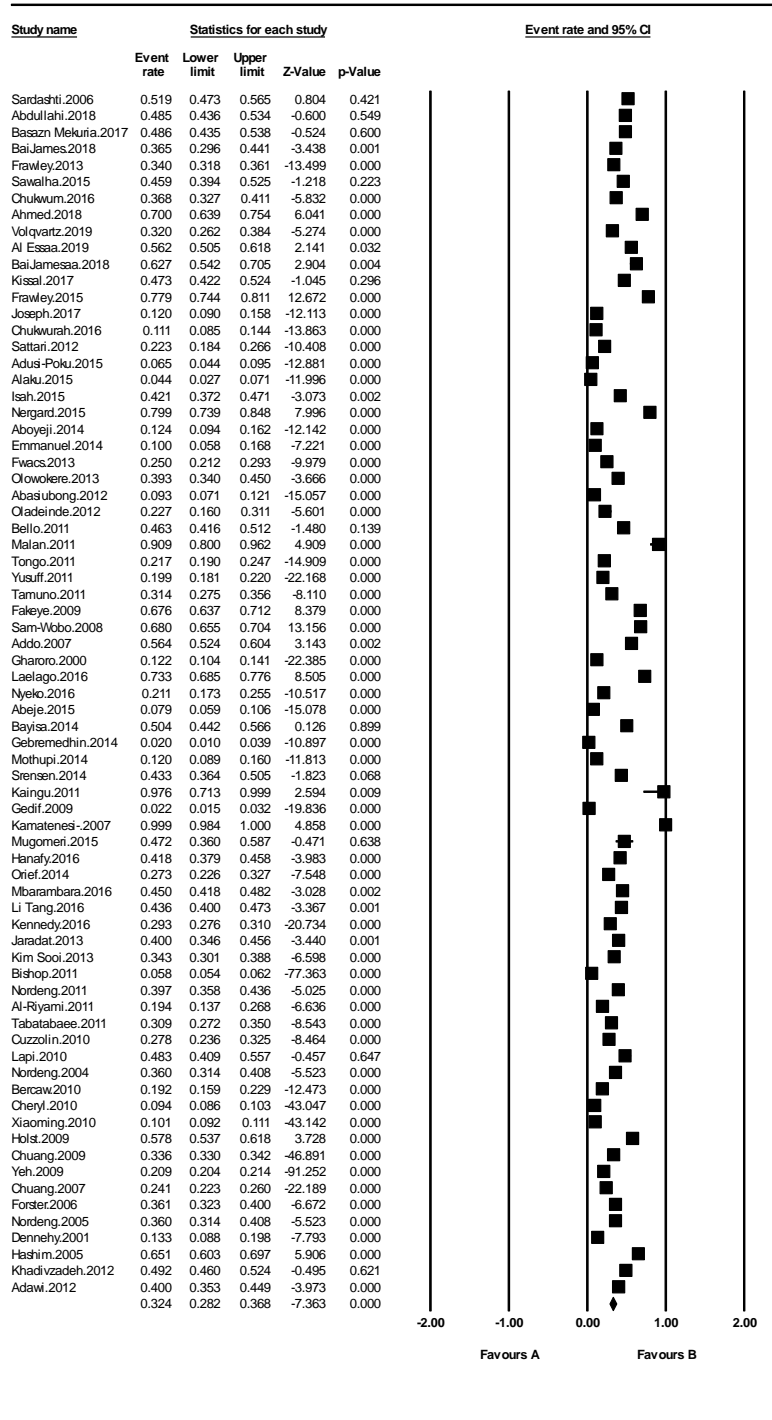
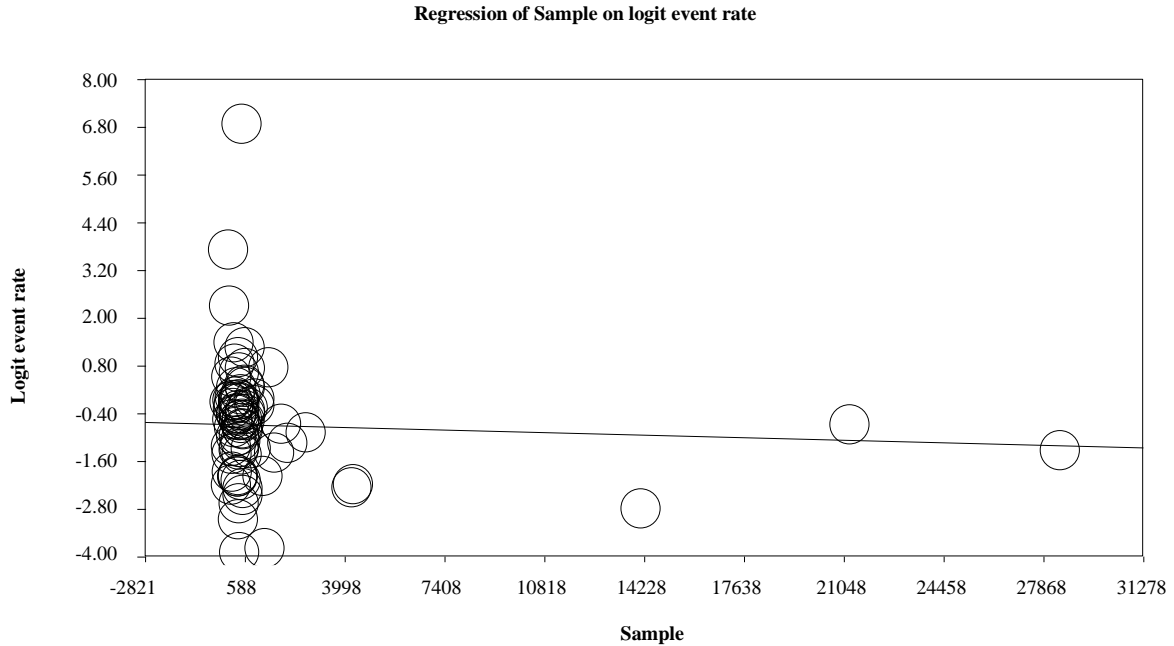


Figure 2. Funnel plot of the results of the prevalence of medicinal herbs use during pregnancy.

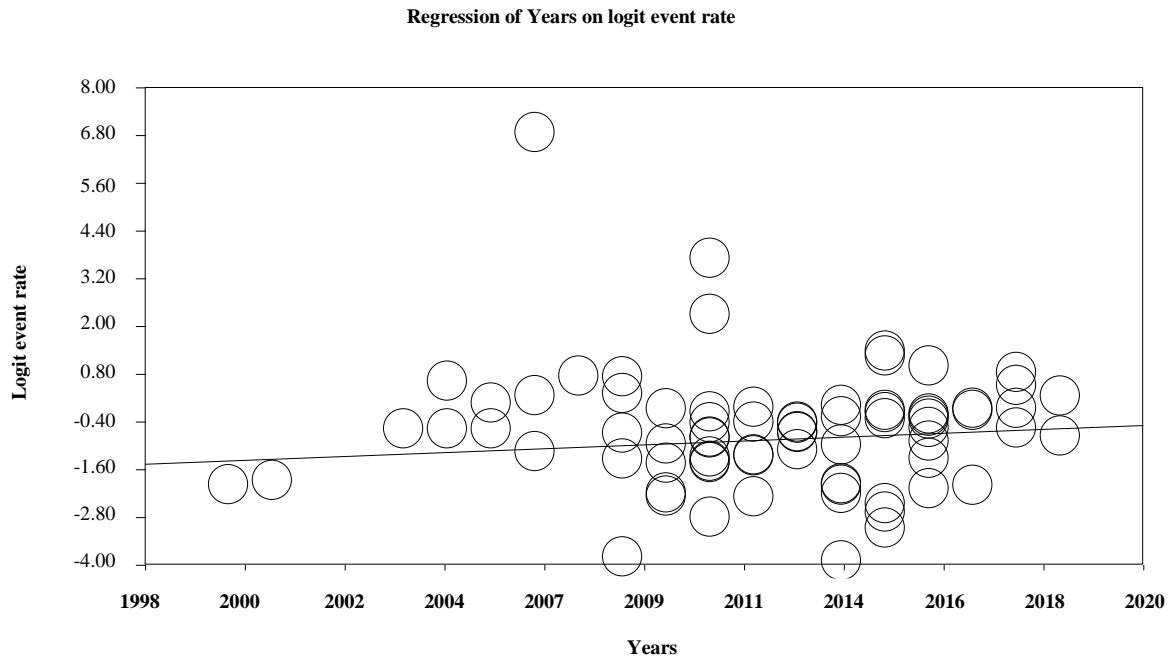


## Meta Analysis

Figure 3. Total prevalence of medicinal herbs consumption during pregnancy based on the random-effect model



**Figure 4.** Meta-regression plot for the prevalence of medicinal herbs use during pregnancy by sample size segregation.



**Figure 5.** Meta-regression plot for the prevalence of medicinal herbs consumption in pregnancy by publication year.

### DISCUSSION

Evaluation of medicinal herbs consumption in pregnancy in different countries by systematic study and meta-analysis enhances our understanding regarding the potential health dangers of these products by concentrating on the usage

patterns of herbal and traditional medicines during pregnancy. This study included 73 published articles over the past 18 years, which demonstrates a large number of studies, focusing on the usage of traditional and herbal



drugs in pregnant women. Based on the findings of this meta-analysis, the overall prevalence of medicinal herbs use during pregnancy was 32.4% (95% CI: 28.2%-36.8%). The highest prevalence of medicinal herbs use during pregnancy was in Uganda and Kenya with 99.9% (95% CI: 98.4%-100%) in 2007 [49] and 97.6% (95% CI: 71.3%-99.9%) in 2011 [47], respectively. The lowest prevalence was in Ethiopia with 2% (95% CI: 1%-3%) in 2014 [44].

In a review, the most prevalently consumed herbs and the reason for consumption by Middle Eastern pregnant women were assessed. The most important reasons for using herbal remedies in pregnancy were nausea and vomiting control (ginger), heartburn control (peppermint), prevention of newborn jaundice (chicory and hedge mustard) stress and anxiety relief (musk willow, borage, rose), headache alleviation (cold tea), elimination of common cold (thyme), pain relief (chamomile), and elimination of cough and sore throat (Alyssum). The most common herbal remedies used in pregnancy relate to gastrointestinal disorders, symptoms of colds and the flu. Most women applied these herbs during the first trimester and did not notify their physicians about their usage. Most women consulted their family and friends to consumption herbal drugs and presumed that they are more impressive and had fewer side effects than modern drugs, in particular in pregnancy [1]. In another study in Oman, the main reasons for herbs usage were colds and the flu [59], and in a study in Egypt, nausea and vomiting were the most popular reasons for herbal drug consumption during pregnancy [4].

Based on a review, the prevalence of medicinal herbs usage in pregnant women in Africa varied from 2 to 100 %. Twenty-eight studies (56%) reported that all women use at least one herbal drug during pregnancy. The reasons for herbs consumption were to prevent vomiting and nausea in pregnancy and to exclude preterm delivery [79].

An extensive review performed in Europe, South America, North America, and Australia. They also reported that 29.3% of women used medicinal herbs during pregnancy, and the majority of pregnant women used medicinal herbs based on their own discretion, while 30% referred to friends, family, media, and the internet as their information

sources [54]. In a study in the United States, the main reasons for herbal medicine consumption were nausea, vomiting, cold, and urinary tract infections [80].

Based on the information obtained from most of the studies included in this survey, pregnant women did not notify the physician about the usage of herbal drugs. In most cases, pregnant women declared that they considered herbs as natural and harmless products and that they were not asked about the consumption of herbs by their physicians. The major sources of information for the use of herbs and choosing plant species were relatives (family, friends) and the minor sources were books and scientific journals. In concordance with this result, a study administered in Italy, showed that 47.7% of mothers did not receive any information regarding herbs consumption during pregnancy from health care team, and 74.3% of the mothers did not even seek advice from physicians about herbs consumption. In the majority of cases in that study, women used medicinal herbs based on their personal experiences or in consultation with friends and families [61].

The diversity in the results of the articles can be attributed to cultural differences, indications of different intakes and access to herbal medicines. The high prevalence of herbs use during pregnancy can be attributed to the positive attitude of women to herbal medicines [6, 72] as well as the social, economic, and cultural status of some countries and the ease of access to herbal medicines.

The relationship between demographic variables and the consumption of herbs during pregnancy were checked out in a comprehensive study. The information of the study indicated that an increase in maternal age increases the chance of using herbal medicines [81] and that most female consumers of herbs were between the age of 31 and 40 years old [15, 82]. The number of previous pregnancies (gravida) was another variable that was associated with the consumption of herbs during pregnancy so that women with previous pregnancy experience were more interested in using herbs compared to primigravid women [67, 71].

The findings of this research demonstrated that a relatively high percentage of women use herbs in their pregnancy. Considering that increasing herbal remedies consumption in pregnancy may affect the outcome of pregnancy and

cause complications in pregnancy, including abortion, preterm labor, etc., or may expose embryo to minor or major malformations, essential steps must be taken to provide enough information to pregnant women. The limitations of this study were lack of access to some articles, incomplete search of papers, and low quality of papers.

### CONCLUSIONS

The frequency of medicinal herbs use during pregnancy is relatively high. It is noteworthy to mention that most pregnant women obtain information for the use of herbal medicines from non-scientific sources and do not inform their health care providers. Since the arbitrary use of herbal medicines can pose potential risks to the mother and fetus, it is, therefore, essential that health care providers consider pregnant women as habitual consumers of herbal medicines and ask about the type of consumed herbs in prenatal screening visits.

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### Conflict of interests

The authors declare that they have no competing interests

### ETHICAL CONSIDERATION

This study was approved by the Ethical Committee of the Kermanshah University of Medicine Science (approval number IR.KUMS.REC. 1398.029)

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### Availability of data and materials

The datasets used and/or analyzed during the current study

are available from the corresponding author on reasonable request.

### Authors' contributions

FH contributed to the design, MM contributed to the statistical analysis, and FD participated in most of the steps in the study procedure.

SH and FD prepared the manuscript, assisted in designing the study, and helped in the interpretation of the research findings. All authors have read and approved the content of the manuscript.

### REFERENCES

1. John L.J., Shantakumari N., 2015. Herbal medicines use during pregnancy: a review from the Middle East. *Oman Med J.* 30(4), 229-36.
2. Dugoua J.J., 2010. Herbal medicines and pregnancy. *J Popul Ther Clin Pharmacol.* 17(3), e370-e378.
3. Crum C.P., Nucci M.R., Granter S.R., Howitt B.E., Parast M.M., Boyd T., Peters W., 2017. *Diagnostic Gynecologic and Obstetric Pathology E-Book: Elsevier Health Sciences.* 77-83.
4. Orief Y.I., Farghaly N.F., Ibrahim M.I., 2014. Use of herbal medicines among pregnant women attending family health centers in Alexandria. *Middle East Fertil Soc J.* 19(1),42-50.
5. Dabirifard M., Maghsoudi Z., Dabirifard S., Salmani N., 2017. Frequency, causes and how to use medicinal herbs during pregnancy. *Iran J Obstet.* 20(4),66-75.
6. Hosseini S.H., Rajabzadeh R., Nosrati H., Naseri F., Toroski M., Mohaddes Hakkak H., Ayati M.H., 2017. Prevalence of Medicinal Herbs Consumption in Pregnant Women Referring to Bojnurd Health Care Centers. *Iran J Obstet.* 20(9),33-40.
7. Sereshti M., Azari P., Rafeian-Kopaei M., Kheiri S., 2006. Use of herbal medicines by pregnant women in Shahr-e-Kord. *J Reprod Infertil.* 7(2), 125-131.
8. Abdollahi F., Khani S., Charati J.Y., 2018. Prevalence and Related Factors to Herbal Medicines Use among Pregnant Females. *Jundishapur J Nat Pharm Prod.* 13(3), 1-8.

9. Mekuria A.B., Erku D.A., Gebresillassie B.M., Birru E.M., Tizazu B., Ahmedin A., 2017. Prevalence and associated factors of herbal medicine use among pregnant women on antenatal care follow-up at University of Gondar referral and teaching hospital, Ethiopia: a cross-sectional study. *BMC Complem Altern M.*17(1),86-103.
10. James P.,Taidy-Leigh L., Bah A.J., Kanu J.S., Kangbai J.B., Sevalie S., 2018. Prevalence and correlates of herbal medicine use among women seeking care for infertility in Freetown, Sierra Leone. *Evid Based Complement Alternat Med.*2018, 1–11.
11. Frawley., Adams J., Sibbritt D., Steel A., Broom A., Gallois C., 2013. Prevalence and determinants of complementary and alternative medicine use during pregnancy: results from a nationally representative sample of Australian pregnant women. *Aust N Z J Obstet Gynaecol.* 53(4),347-52.
12. Laelago T., Yohannes T., Lemango F., 2016. Prevalence of herbal medicine use and associated factors among pregnant women attending antenatal care at public health facilities in Hossana Town, Southern Ethiopia: acility based cross sectional study. *Arch Public Health.*74(1),7-25.
13. Duru C.B., Uwakwe K.A., Chinomnso N.C., Mbachi I.I., Diwe K.C., Agunwa C.C., Anthony C.I., Irene A.M., 2016. Socio-demographic determinants of herbal medicine use in pregnancy among Nigerian women attending clinics in a tertiary Hospital in Imo State, south-east, Nigeria. *Am J Med Stud.*4(1),1-10.
14. Ahmed M., Hwang J.H., Hasan M.A., Han D., 2018. Herbal medicine use by pregnant women in Bangladesh: a cross-sectional study. *BMC Complem Altern M.*18 (1),229-333.
15. Volqvartz T., Vestergaard A.L., Aagaard S.K., Andreasen M.F., Lesnikova I., Ulbjerg N., Larsen A., Bor P., 2019. Use of alternative medicine, ginger and licorice among Danish pregnant women—a prospective cohort study. *BMC Complem Altern M.*19(1),5-7.
16. Al Essa M., Alissa A., Alanizi A., Bustami R., Almogbel F., Alzuwayed O., Abo Moti M., Alsadoun N., Alshammari W., Albekairy A., Al Harbi S., Alhokail M., Gramish J., 2019. Pregnant women’s use and attitude toward herbal, vitamin, and mineral supplements in an academic tertiary care center, Riyadh, Saudi Arabia. *Saudi pharm j.*27(1),138-44.
17. James P.B., Bah A.J., Tommy M.S., Wardle J., Steel A., 2018. Herbal medicines use during pregnancy in Sierra Leone: An exploratory cross-sectional study. *Women Birth.*31(5),e302-e9.
18. Kıssal A., Güner Ü.Ç., Ertürk D.B., 2017. Use of herbal product among pregnant women in Turkey. *Complement Ther Med.*30,54-60.
19. 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 1,8<sup>o</sup> pregnant women. *Women's Health Issues.*25(4),396-402.
20. Joseph B., Ezie I., Aya B., Dapar M., 2017. Self-medication among pregnant women attending antenatal clinics in Jos North, Nigeria. *Int J Trop Dis Health.*21(1),1-7.
21. Chukwurah J.N., Idowu E., Adeneye A.K., Aina O.O., Agomo P.U., Otubanjo A.O., 2016. Knowledge, attitude and practice on malaria prevention and sulfadoxine-pyrimethamine utilisation among pregnant women in Badagry, Lagos State, Nigeria. *MWJ.*7(3),1-6.
22. Adusi-Poku Y., Vanotoo L., Detoh E., Oduro J., Nsiah R., Natogmah A., 2015. Type of herbal medicines utilized by pregnant women attending ante-natal clinic in Offinso north district: Are orthodox prescribers aware? *Ghana Medical J.*49(4),227-32.
23. Alaku I., Ha A.K., 2015. Epidemiology of Malaria Parasites Infection among Pregnant Women in Some Part of Nasarawa State, Nigeria. *Epidemiology.*5(2),30-3.
24. Bello U.L., Isah J., 2015. Use of herbal medicines and aphrodisiac substances among women in Kano state, Nigeria. *IOSR J Nursing Health Sci.*4(3),41-50.
25. 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 Ethnomedicine.* 11(1), 73-83.
26. Aboyeji A.P., Ijaiya M.A., Fawole A.A., Adesina K.T., Ologe M.O., Adewara A.A., Olarinoye A.O., 2014. Pharmacological exposure of pregnant mothers in Ilorin,

- Nigeria. *Trop J Obstet Gynaecol* .31(1),17-22.
27. Emmanuel A., Achema G., Afoi B.B., Maroof R., 2014. Self Medication Practice Among Pregnant Women Attending Antenatal Clinic in Selected Hospitals In Jos, Nigeria. *Inter J Nurs Health Sci*. 1(6), 55-59.
28. Omole-Ohonsi A., Aiyedun T., 2013. Use of herbal medicines in pregnancy in Aminu Kano teaching Hospital- Myth or reality. *Trop J Obstet Gynaecol*.30(1),80-88.
29. Olowokere A., Olajide O., 2013. Women's perception of safety and utilization of herbal remedies during pregnancy in a local government area in Nigeria. *Clin Nurs Stud*.1(4),9-22.
30. 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*.13(1), 15-19.
31. Oladeinde B.H., Omoregie R., Odia I., Oladeinde O.B., 2012. Prevalence of malaria and anemia among pregnant women attending a traditional birth home in Benin City, Nigeria. *Oman med j*.27(3), 232–236.
32. Bello F.A., Morhason-Bello I.O., Olayemi O., Adekunle A.O., 2011. Patterns and predictors of self-medication amongst antenatal clients in Ibadan, Nigeria. *Niger J Med*.52(3), 153-7.
33. 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(1), 85-93.
34. Tongo O.O., Orimadegun A.E., Akinyinka O.O., 2011. Utilisation of malaria preventive measures during pregnancy and birth outcomes in Ibadan, Nigeria. *BMC Pregnancy Childbirth* .11(1), 60-67.
35. Yusuff K.B., Omarusehe L.D., 2011. Determinants of self medication practices among pregnant women in Ibadan, Nigeria. *Int J Clin Pharm*.33(5), 868-75.
36. Tamuno I., Omole-Ohonsi A., Fadare J., 2011. Use of herbal medicine among pregnant women attending a tertiary hospital in Northern Nigeria. *Internet J Gynecol Obstet*.15(2), 3-6.
37. Fakeye T.O., Adisa R., Musa I.E., 2009. Attitude and use of herbal medicines among pregnant women in Nigeria. *BMC Complem Altern M*.9(1), 53 - 60.
38. Sam-Wobo S., Akinboroye T., Anosike J., Adewale B., 2008. Knowledge and practices on malaria treatment measures among pregnant women in Aveokuta, Nigeria. *Tanzan J Health Res*.10 (4)226-31.
39. Addo V., 2007. Herbal medicines: socio-demographic characteristics and pattern of use by patients in a tertiary obstetrics and gynaecology unit. *J Sci Tech (Ghana)*.27(3),149-55.
40. Gharoro E., Igbafe A., 2000. Pattern of drug use amongst antenatal patients in Benin City, Nigeria. *Med Sci Monit*.6(1), 84-7.
41. Nyeko R., Tumwesigye N.M., Halage A.A., 2016. Prevalence and factors associated with use of herbal medicines during pregnancy among women attending postnatal clinics in Gulu district, Northern Uganda. *BMC Pregnancy Childbirth*.16(296),1-12.
42. Abeje G., Admasie C., Wasie B., 2015. Factors associated with self medication practice among pregnant mothers attending antenatal care at governmental health centers in Bahir Dar city administration, Northwest Ethiopia, a cross sectional study. *Pan Afr med j*. 20, 1–9..
43. 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 pharma prod*.9(4), e17368-e17368.
44. Gebremedhin G.L., Gomathi P., 2014. Assessment of drug use and effect in pregnant women attending antenatal care in hospitals of Mekelle, Tigray, Ethiopia. *J Drug Deliv Ther*. 4(6),75-82.
45. 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 Complem Altern M*. 14(432), 1–8.
46. Rasch V., Sørensen P.H., Wang A.R., Tibazarwa F., Jäger A.K., 2014. Unsafe abortion in rural Tanzania—the use of traditional medicine from a patient and a provider perspective. *BMC pregnancy childbirth*.14(1),355-419.
47. Kaingu C.K., Oduma J.A., Kanui T.I., 2011. Practices of traditional birth attendants in Machakos District, Kenya. *J ethnopharmacol*.137(1),495-502.
48. Kebede B., Gedif T., Getachew A., 2009. Assessment

- of drug use among pregnant women in Addis Ababa, Ethiopia. *Pharmacoepidemiol Drug Saf.* 18(6),462-8.
49. Kamatenesi-Mugisha M., Oryem-Origa H., 2007. Medicinal plants used to induce labour during childbirth in western Uganda. *J Ethnopharmacol.* 109(1),1-9.
50. Chatanga P., Maibvise C., Mugomeri E., Seliane K., 2015. Identifying promoters and reasons for medicinal herb usage during pregnancy in Maseru, Lesotho. *Afr J Nurs Midwifery* .17(1),4-16.
51. Hanafy S., Sallam S., Kharboush I., Wahdan I., 2016. Drug utilization pattern during pregnancy in Alexandria, Egypt. *Eur J Pharm Med Res.* 3(2),19-29.
52. Mbarambara P.M., Songa P.B., Wansubi L.M., Mututa P.M., Minga B.B., Bisangamo C.K., 2016. Self-medication practice among pregnant women attending antenatal care at health centers in Bukavu, Eastern DR Congo. *Inter J Innovation Applied Studies.* 16(1), 38–45.
53. Tang L., Lee A.H., Binns C.W., Van Hui Y., 2016. Yau K.K., Consumption of Chinese herbal medicines during pregnancy and postpartum: A prospective cohort study in China. *Midwifery.* 34,205-10.
54. Kennedy D., Lupattelli A., Koren G., Nordeng H., 2016. Safety classification of herbal medicines used in pregnancy in a multinational study. *BMC Complem Altern M.* 16(1),102-110.
55. Jaradat N., Adawi D., 2013. Use of herbal medicines during pregnancy in a group of Palestinian women. *J Ethnopharmacol.* 150(1),79-84.
56. Kim Sooi L., Lean Keng S., 2013. Herbal medicines: Malaysian women's knowledge and practice. *Evid Based Complementary Altern Med.* 2013(2), 1-10.
57. Bishop J.L., Northstone K., Green J., Thompson E.A., 2011. The use of complementary and alternative medicine in pregnancy: data from the Avon Longitudinal Study of Parents and Children (ALSPAC). *Complement Ther Med.* 19(6),303-10.
58. Nordeng H., Bayne K., Havnen G.C., Paulsen B.S., 2011. Use of herbal drugs during pregnancy among 600 Norwegian women in relation to concurrent use of conventional drugs and pregnancy outcome. *Complement Ther Clin Pract.* 17(3),147-51.
59. Al-Riyami I.M., Al-Busaidy I.Q., Al-Zakwani I.S., 2011. Medication use during pregnancy in Omani women. *Int J Clin Pharm.* 33(4),634-41.
60. Tabatabaee M., 2011. Use of herbal medicine among pregnant women referring to Valiasr Hospital in Kazeroon, Fars, South of Iran. *J Med Plant Res.* 1(37),96-108.
61. Cuzzolin L., Francini-Pesenti F., Verlato G., Joppi M., Baldelli P., Benoni G., 2010. Use of herbal products among 392 Italian pregnant women: focus on pregnancy outcome. *Pharmacoepidemiol Drug Saf.* 19(11),1151-8.
62. Lapi F., Vannacci A., Moschini M., Cipollini F., Morsuillo M., Gallo E., Banchelli G., Cecchi E., Di Pirro M., Giovannini M.G., Cariglia M.T., Gori L., Firenzuoli F., Mugelli A., 2010. Use, attitudes and knowledge of complementary and alternative drugs (CADs) among pregnant women: a preliminary survey in Tuscany. *Evid Based Complementary Altern Med.* 7(4),477-86.
63. Nordeng H., Havnen G.C., 2004. Use of herbal drugs in pregnancy: a survey among 400 Norwegian women. *Pharmacoepidemiol Drug Saf.* 13(6),371-80.
64. Bercaw J., Maheshwari B., Sangi-Haghepeykar H., 2010. The use during pregnancy of prescription, over-the-counter, and alternative medications among Hispanic women. *Birth.* 37(3),211-8.
65. Broussard C.S., Louik C., Honein M.A., Mitchell A.A., 2010. Study NBDP. Herbal use before and during pregnancy. *Am J Obstet Gynecol.* 202(5),443. e1- e6.
66. Zhu X., Qi X., Hao J., Huang Z., Zhang Z., Xing X., 2010. Pattern of drug use during the first trimester among Chinese women: data from a population-based cohort study. *Eur J Clin Pharmacol.* 66(5),511-8.
67. Holst L., Wright D., Haavik S., Nordeng H., 2009. The use and the user of herbal remedies during pregnancy. *J Altern Complement Med.* 15(7),787-92.
68. Chuang C.H., Chang P.J., Hsieh W.S., Tsai Y.J., Lin S.J., Chen P.C., 2009. Chinese herbal medicine use in Taiwan during pregnancy and the postpartum period: a population-based cohort study. *Int J Nurs.* 46(6),787-95.
69. Yeh H.Y., Chen Y.C., Chen F.P., Chou L.F., Chen T.J., Hwang S.J., 2009. Use of traditional Chinese medicine among pregnant women in Taiwan. *Int J Gynecol Obstet.* 107(2),147-50.
70. Chuang C.H., Hsieh W.S., Guo Y.L., Tsai Y.J., Chang

- P.J., Lin S.J., Chen P.C., 2007. Chinese herbal medicines used in pregnancy: a population-based survey in Taiwan. *Pharmacoepidemiol Drug Saf.*16(4),464-8.
71. Forster D.A., Denning A., Wills G., Bolger M., McCarthy E., 2006. Herbal medicine use during pregnancy in a group of Australian women. *BMC Pregnancy Childbirth.*6(1), 10-21.
72. Nordeng H., Havnen G.C., 2005. Impact of socio-demographic factors, knowledge and attitude on the use of herbal drugs in pregnancy. *Acta Obstet Gynecol Scand.* 84(1),26-33.
73. Tsui B., Dennehy C.E., Tsourounis C., 2001. A survey of dietary supplement use during pregnancy at an academic medical center. *Am J Obstet Gynecol.*185(2),433-7.
74. Sattari M., Dilmaghanizadeh M., Hamishehkar H., Mashayekhi S.O., 2012. Self-reported use and attitudes regarding herbal medicine safety during pregnancy in Iran. *Jundishapur J nat pharma prod.*7(2), 45-49.
75. Sawalha A.F., 2007. Consumption of prescription and non-prescription medications by pregnant women: a cross sectional study in Palestine. *IUG J Natural Studies.*15(2) ,41-57.
76. Hashim M., Johina A., Deyaa K., Fareed M., Mohamed H., Faten A., 2005. Knowledge attitude and practice of complementary and alternative medicine (CAM) among pregnant women: a preliminary survey in Qatar. *Middle East J Fam Med.* 7(10),6-14.
77. Khadivzadeh T., Ghabel M., 2012. Complementary and alternative medicine use in pregnancy in Mashhad, Iran, 2007-8. *Iran J Nurs Midwifery res.* 17(4),263-9.
78. Adawi D.H., 2012. Prevalence and Predictors of Herb Use during Pregnancy (A study at Rafidia Governmental Hospital/Palestine).p.5-7. Available at [http://scholar.najah.edu/sites/default/files/all-thesis/deema\\_adawi.pdf](http://scholar.najah.edu/sites/default/files/all-thesis/deema_adawi.pdf). Accessed February 3, 2018.
79. Ahmed S.M., Nordeng H., Sundby J., Aragaw Y.A., de Boer H.J., 2018. The use of medicinal plants by pregnant women in Africa :A systematic review. *J Ethnopharmacol.* 224,297-313.
80. Louik C., Gardiner P., Kelley K., Mitchell A.A., 2010. Use of herbal treatments in pregnancy. *Am J of obstet gynecol.*202(5),439. e1-e10.
81. Holst L., Nordeng H., Haavik S., 2008. Use of herbal drugs during early pregnancy in relation to maternal characteristics and pregnancy outcome. *pharmacoepidemiology and drug safety.*17(2),151-9.
82. Hall H.G., Griffiths D.L., McKenna LG., 2011. The use of complementary and alternative medicine by pregnant women: a literature review. *Midwifery.*27(6),817-24.