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# Medicinal plants used among pregnant women in a tertiary teaching hospital in Jimma, Ethiopia: a cross-sectional study

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## Abstract

**Objective** The aim of this study was to investigate and describe the use of medicinal plants during pregnancy among women admitted in the Maternity and Gynaecology wards at Jimma University Medical Centre (JUMC) in the southwest Ethiopia.

**Design** Cross-sectional study

**Setting** Maternity and Gynaecology wards at JUMC.

**Participants** 1,117 hospitalized pregnant women or postpartum women

**Main outcome measures** our primary outcomes of interest were the prevalence of use, types of medicinal plants used and their utilization among pregnant women.

**Methods:** Data were collected through structured face-to-face interviews of pregnant women or postpartum women and review of patient medical records between February and June 2017.

**Results:** Overall, 28.6% of the women reported use of at least one medicinal plant during pregnancy. Twenty-seven different types of medicinal plants were used. The most commonly used medicinal plants were *Linum usitatissimum* L. (flaxseed– use with caution) 22.0%, *Ocimum lamiifolium* L. (*damakessi*e– safety unknown) 3.6%, and *Carica papaya* L. (papaya– use with caution) 3.1%. The most common reasons for use was preparation, induction or shortening of labour. Lack of access to health facility (mainly health posts), admission to maternity ward, *khat* chewing, and alcohol consumption were the strongest predictors of medicinal plants use during pregnancy (OR >2). Only five medicinal plants used by women had sufficient evidence to be classified as safe to use in pregnancy.

**Conclusions:** Almost a third of women at the tertiary hospital in Ethiopia reported use of medicinal plants during pregnancy, most frequently to prepare, induce, reduce the intensity or shorten duration of labour. Increased awareness about potential benefits or risks of medicinal plants use during pregnancy among health care professionals and patients, and increased access

to childbirth providing health care facilities are important in order to promote safer pregnancies and better health outcomes for women and their unborn children.

**Strengths and limitations of this study**

- It was the first study in Ethiopia that used large sample size, assessed the use of medicinal plants among pregnant women in an in-patient setting and attempted to classify the medicinal plants
- Face to face interviews permitted the women to ask clarifying questions and ensured completeness and comprehension.
- Although it was conducted in a large tertiary teaching hospital in southwest Ethiopia, it may not be representative of the entire country, nor women who access healthcare in secondary or primary care.
- Data were collected based on self-report of pregnant women and thus depended on her recall and accuracy of reporting, as well as her knowledge about these medicinal plants, therefore, medicinal plant use early in pregnancy was probably underreported.
- Among the post-partum women, there may be a risk of recall bias as women with negative pregnancy outcomes may try to recall use to a greater extent than women with a healthy infant.

## Background

Medicinal plants have been used for preventive and therapeutic purposes since time immemorial [1]. Medicinal plants refer to a variety of plants that have medicinal characteristics [2]. The World Health Organization estimates that 65–80% of the world's population in developing countries depend on medicinal plants for primary healthcare [3]. Women are recognized to be the main users of medicinal plants, and this widespread use also extends into pregnancy [4, 5].

Ethiopia is a landlocked country with a population of approximately 110 million [6]. Around 80% of the population in Ethiopia use traditional medicine, of which over 95% are of plant origin [7]. The extensive use of medicinal plants in the country is often linked to an array of unique flora [7], cultural acceptability of healers and local pharmacopoeias, the belief that medicinal plants are natural and thus safer to use and are physically accessible and economically affordable [4, 5, 8].

Maternal mortality (353 deaths per 1000,000 live births) and neonatal mortality (28 deaths per 1,000 live births) in Ethiopia are among the highest in the world [9]. In most African countries like Ethiopia, modern health care facilities and medicine are inaccessible or unaffordable [4, 10]. For this reason, many women rely on medicinal plants for their primary healthcare needs as an accessible and lower cost alternative [4] and only seek professional health services when the situation worsens [10].

Studies conducted in Ethiopia reported prevalence of medicinal plants use in pregnancy ranging from 2% to 73% [4], with ginger being the most commonly used plant, and nausea and vomiting in pregnancy (NVP) and common cold the most common reasons for use [8, 10, 11].

Many sociodemographic characteristics including residence place, marital status, family size, education level, age, and employment status were found to be strong predictors of use [4, 11-14]. Prevalence figures ranging from 4% to 100% were reported in other African countries [4]. Studies in developed countries where medicinal plant traditions may play a less strong role also reported a widespread use of medicinal plants in pregnancy, with Australia 11% - 56% [15], the US and Canada 4% - 96% [15, 16], and Europe 0.9% - 69% [15, 17].

Concerns have been raised about safety of medicinal plants during pregnancy [4, 17-20]. A recent multinational study reported that only 22% of the medicinal plants used by pregnant women were found safe to use in pregnancy [20]. Similarly, a study from Asia showed that only 39% of the most commonly used medicinal plants by expectant women were safe to use in pregnancy [18].

Although medicinal plants play a significant role in traditional medicine during pregnancy, childbirth and postpartum care [4, 19], research on their use in the management of pregnancy related illnesses is still largely limited [4, 11, 21]. The aims of this study were therefore to determine the prevalence of use and types of medicinal plants used among pregnant women admitted in the Maternity and Gynaecology wards at Jimma University Medical Centre (JUMC), Southwest Ethiopia. This included identifying women's information on the most commonly used medicinal plants, the reasons for use, and factors associated with such use. The secondary aims were to assess women safety concerns and, who recommended use of the medicinal plants during pregnancy.

## Subjects and methods

### Study design and setting

A hospital based cross-sectional study was conducted in the Maternity and Gynaecology wards at Jimma University Medical Centre (JUMC). JUMC is one of the oldest and largest public teaching University hospitals in the country located in Jimma city, 350 kilometres south-west of Addis Ababa (the capital city of Ethiopia) [22, 23]. The referral hospital provides tertiary level medical care for about 20 million people coming from the whole south-west Ethiopia [22]. Obstetrics and Gynaecology department of the medical centre has a patient load of approximately 7,600 inpatients and 11,600 outpatients each year with bed capacity of around 265 [23].

Obstetrics and Gynaecology department has two inpatient wards; Gynaecology ward and Maternity ward (which includes maternity, labor and delivery ward and maternity operation theatre) [22]. Obstetric patients with 28 weeks of pregnancy or higher as well as women in labour are admitted in the maternity ward. On the one hand, women with a gestational length of less than 28 weeks are cared for at the gynaecology ward. The gynaecology ward also manages and treats gynaecological disorders in non-pregnant women.

**Study population and sample size**

Hospitalized pregnant or postpartum women in the Maternity and Gynaecology wards at JUMC were invited to participate in the study during normal working hours. Participants were informed about the aim and procedures of the study and written informed consent was obtained from each study participant, using a random, but convenience sample. Pregnant or postpartum patients aged ≥18 years admitted in the Maternity/Labour and Gynaecology wards at the time of data collection and willing to participate were included in the study. On the other hand, women who were too ill to participate, hard of hearing, unable to speak or mentally disabled,

under 18 years of age, admitted for less than four hours, and non-pregnant women admitted in the gynaecology ward were excluded from the study.

Single population proportion Kish formula [24] was used to determine the sample size based on the following assumptions; 50% expected prevalence medicinal plant use (since there is no previous study conducted on the prevalence of medicinal plant use among hospitalized pregnant patients prior to admission), 5% level significance, 80% power, and an error margin of 3%. After adding a 5% non-response rate, a final sample size of 1,121 pregnant women was required.

**Data collection and procedures**

Hospitalized pregnant and post-partum women were consecutively interviewed from February to June 2017. A pre-tested interview guided structured questionnaire, based on interviews, and data extraction form were used for data collection. All interviews were conducted by trained data collectors, with close supervision of one of the investigators. The questionnaire contains questions about the women's background, pregnancy-related illnesses, and use of medicinal plants.

After a thorough review of the literature [8, 11, 17, 19, 21, 25-27], the survey questionnaire was developed in English and then translated into Amharic and Afan Oromo languages (the predominant local languages) to suit the target population. The questionnaires were translated back into English by other persons to confirm the validity. Lecturers fluent in English and their own local language from Jimma University with previous experience of translating questionnaires performed the translation and back translation of the study questionnaire. The data collection tool was then pilot tested on a sample of 30 participants at *Shenen Ghibe* district

hospital found in Jimma city, and based on the pre-test results, list of 25 commonly used medicinal plants and open-ended questions were included. Plant scientific names were verified with The Plant List (www.theplantlist.org). Final version of the questionnaire contained 63 items, with multiple choice, and open-ended questions (Supplementary table 1).

Treatment related characteristics, pregnancy characteristics, pregnancy outcomes and other medical information were retrieved from patients' medical record using data extraction forms. Following the pre-test, the data extraction form required minor revisions to improve understandbility and order (Supplementary table 2).

**Measures**

*Women's background characteristics*

Socio-demographic information including age, religion, residence place, occupation, family size, ethnic group, marital status, educational level, access to modern health facility and walking distance to the facility were collected.

*Maternal diseases, pregnancy-related illness and treatments*

Detailed information about the woman's obstetrics and gynaecology history, history of adverse pregnancy outcome, past medical history and medication experience, and social drug use were included. Pregnant women were specifically asked about 24 common pregnancy ailments and related symptoms: Common cold/flu, pain in back, neck, or shoulder, headache, heartburn/reflux problems, abdominal cramps/ache, preparation for labour, induction of labour, expel retained placenta, postpartum bathing, wellbeing and nourishing foetus, leg/foot swelling, gestational hypertension, gestational diabetes, gastritis/burning sensation, constipation, general wellbeing, nausea, vomiting, emergency illnesses, urinary tract infection, depression, joint pain,

sleeping problems and mental wellbeing. Participants were also asked whether they had used any treatment against ailments or pregnancy related conditions, whether they had had any other diseases or illnesses, and, if yes, the name of any treatment received.

*Use of medicinal plant*

Study participants were specifically asked about the use in pregnancy of 25 commonly used medicinal plants: *Linum usitatissimum* L., *Ocimum lamiifolium* L., *Zingiber officinale* Roscoe., *Allium sativum* L., *Trigonella foenum-graecum* L., *Nigella sativa* L., *Ruta chalepensis* L., *Eucalyptus globulus* Labill., *Cinnamomum verum* J.Presl, *Taverniera abyssinica* A. Rich, *Artemisia abyssinica* Sch.Bip. ex A.Rich., *Croton macrostachyus* Hochst., *Echinops kebericho* Mesfin, *Hagenia abyssinica* (Bruce ex Steud.) J.F.Gmel., *Vernonia amygdalina* Del., *Brassica nigra* (L.) K.Koch, *Zehneria scabra* Sond., *Artemisia afra* Jacq. ex Willd., *Lepidium sativum* L., *Carica papaya* L., *Foeniculum vulgare* Mill., *Coriandrum sativum* L., *Ocimum basilicum* L., *Datura stramonium* L., *and Securidaca longipedunculata* Fresen. The above listed medicinal plants were selected based on previous ethnopharmacological studies in Ethiopia and elsewhere in Africa [8, 11, 28, 29] and were presented to the women by mentioning the local names of the plants. The women were also asked if they had used any other medicinal plant during pregnancy, labour or breastfeeding.

Details of use of medicinal plants was assessed by a series of questions including use of medicinal plant during pregnancy, type of medicinal plant used, reason for use, and utilization (*part of plant used, method of preparation, mode of use, type of solvent, type of flavouring, dosage form, dosage, measures of formulation, route of administration, frequency of administration, duration of treatment, and episodes of use*). Women were also asked about who recommended them the use of medicinal plants in pregnancy.

Information about women's safety concerns and experiences with use of medicinal plants in pregnancy was collected, and we included questions about beliefs about harmfulness, precautions to be taken and whether she had experienced any side effects or adverse effects after use of medicinal plants in pregnancy.

Reference text books [30-32] and literature reviews [4, 18, 20] were used to evaluate safety of the medicinal plants in pregnancy, and classify them into four safety categories, namely safe to use in pregnancy, use with caution, potentially harmful and information unavailable for use in pregnancy. Information from animal studies were used if human studies were lacking. If a medicinal plant preparation was composed of two or more plants, each plant was individually evaluated and classified.

In addition to the face-to-face interview questionnaire, information about pregnancy characteristics, pregnancy outcomes and other obstetrics information including gestational age, parity, gravidity, mode of delivery and length of hospital stay were collected using a data extraction form. Moreover, maternal and perinatal outcomes of the current pregnancy were collected. Data were extracted through review of patients' medical cards.

**Statistical analysis**

The final data were checked for completeness, and responses were entered into and analysed using the Statistical Package for the Social Sciences (SPSS) software version 25.0 for Windows (IBM® SPSS® Statistics, Armonk). Respondents were categorized as users if they used at least one type of medicinal plant in their index pregnancy, whereas others were categorized as non-users. Routine meals and vitamin supplements were excluded.

Descriptive statistics were used to calculate the prevalence (%) of medicinal plants use in pregnancy, reasons for use and information sources. Univariate and multivariate logistic regression analysis was used to identify significant factors associated with medicinal plant use. Logistic regression was expressed as crude and adjusted odds ratios (ORs) with 95% confidence intervals (CIs). First, the univariate logistic regression model was fit for all explanatory variables. From this, the multivariate model was built using purposeful selection of candidate variables based on a bivariate $p \leq 0.05$. We then fit a reduced model by removing variables having no role ($p > 0.05$). A p-value of $< 0.05$ was considered statistically significant.

**Patient and public involvement**

Although there is a community representative in the Jimma University Institute of health Institutional Review Board (IRB), no patients or public were involved in the conception, design, conduct, and planning of this study.

**Results**

From 1,137 pregnant or post-partum women invited to participate, responses from four were incomplete, and 16 declined to participate in the study resulting in 1,117 participants in the final dataset (response rate 98.6%). The median age was 25 years (interquartile range 22–30 years) and slightly more than half (53.3%), lived in an urban area. The majority were married (95.5%), had access to health facility (mainly health post) (99.1%), and lived in an area within walking distance to the nearest health facility not more than 30 minutes (66.4%). A substantial number were Muslims (65.4%), from Oromo ethnic group (69.7%), and had a household size less than five (65.4%). Many study participants were illiterate (34.0%) or either attended

primary school or only able to read & write (42.3%); and were housewife (46.9%) or farmer (23.4%) by occupation (Table 1).

**Table 1.** Characteristics of women according to medicinal plant use during pregnancy at JUMC, Ethiopia.

Nearly three out of ten women had used one or more medicinal plant during their current pregnancy (28.6%), with an average of 1.5 medicinal plants per woman (range 1 to 8). The majority of women 206 (64.6%) used one, 78 (24.5%) took two, 25 (7.8%) took three, and 7 (2.2%) took four types of medicinal plants.

*L. usitatissimum* (flaxseed) (77.1%), O. *lamiifolium* (‘*damakesie’*) (12.5%) and *C. papaya* (*papaya*) (11.0%) were the three most commonly used medicinal plants (Table 2; Supplementary table 3A). The most common reasons for the use of medicinal plants were to induce labour or to reduce the intensity and shorten duration of labour (women call it ‘‘reduction of labour’’ - ‘‘ምጥ ለማምጣት ወይም የምጥ ጥንካሬንና እርዝማኔን ለመቀነስ’’ in Amharic) (60.2%) common cold/flu (20.4%) and preparation of labour (women call *‘it softens the uterus’* - ‘‘ማህጸን ያለሰልሳል ፣ ስለዚህ ምጥ አይከብድም’’ in Amharic) (15.7%), (Table 3). Flaxseed was the major plant employed to induce labour or to reduce the intensity and shorten duration of labour (93.2%) and to prepare for labour (44%). Ginger (35.4%) was the commonly used plant for common cold/flu management. Most of the medicinal plants were used during labour (32.2%) followed by third trimester (27.2%) or in the entire pregnancy (19.8%). Approximately three quarters of the medicinal plants were purchased at market places (76.5%). A significant proportion of respondents (68.3%) also collected it through family members. The large majority of women were recommended to use medicinal plants by their family members (75.2%).

**Table 2.** Pregnancy disorders treated with medicinal plants at JUMC, Ethiopia, n=319.

Seeds were the major medicinal plant parts used (57.6%), dry plant material was the most common plant condition (60.1%), sugar was the most common excipient (27.8%) and oral was the predominant route of administration (89.7%).

The most common dosages were measurements by water glass units (51.7%). The most common dosage was one water glass dose (47.5%), once per day frequency (54.8%), and "as many months as needed during pregnancy" duration of treatment (32.9%). Approximately half of the respondents reported one episode of medicinal plant use (46.0%), whereas nearly one-third reported use at several occasions during pregnancy 155 (32.0%) (Supplementary table 4).

**Table 3.** Overview of the most frequently used medicinal plants during pregnancy at JUMC, Ethiopia.

**Factors associated with medicinal plant use**

Women in the maternity wards, not having access to a nearby health facility, having secondary school education, having chronic illness, using conventional medicines and social drugs (*khat* chewers and alcohol consumers) were more likely to use medicinal plants in pregnancy (Table 1). Use of medicinal plants during pregnancy was not significantly associated with previous adverse pregnancy outcome, length of hospital stay, family size and gestational age.

**Safety classification of the medicinal plants**

From the 27 medicinal plants used by women, five were classified as safe to use, three as requiring caution to use, eight as potentially harmful to use in pregnancy and information on eleven medicinal plants was not available in the current literature (Supplementary table 3B).

**Women's safety concerns and experiences**

Table 4 presents women's self-reported safety concerns and experiences with medicinal plants in pregnancy. Safety concerns with use in pregnancy was most commonly reported for *bisana* (*C. macrostachyus*) and *etse fares* (*D. stramonium*), each by five women. Four women reported drinking milk as antidote (''ማርከሻ'' in Amharic) against adverse effects from *Z. officinale, T. abyssinica, H. abyssinica,* and *C. verum.* Two women reported ingestion of *P. anisum* soup/suspension as countermeasure for poisoning from *Z. officinale* and *C. verum.* Eight women used *L. usitatissimum* for wellbeing and nourishing of the foetus. One woman reported the use of *O. lamiifolium* to improve foetal movements and breathing. *O. lamiifolium, Z. officinale*, and *A. sativum* were also reported to be useful for general foetal wellbeing. Fear of complications to the foetus (44.5%) and religious prohibition (25.9%) were the common reasons for avoiding use of medicinal plants during pregnancy.

**Table 4.** Pregnant women's self-reported safety concerns and experiences with medicinal plants at JUMC, Ethiopia

**Discussion**

Knowledge; both lay and professional, about medicinal plants use in pregnancy is essential to provide optimal maternal/foetal care. To the best of our knowledge, this paper is the first to study medicinal plant use during pregnancy among women in hospitalised setting in Ethiopia. This study provides extensive insight into types of medicinal plants, prevalence of use and

reasons for use, as well as women's safety concerns and precautions on the medicinal plants they use in pregnancy. These findings are important to health care personnel, researchers, policy makers, and pregnant women themselves. Nearly a third of women (28.6%) reported use of at least one medicinal plant during pregnancy or at childbirth. Prior studies report prevalence of use of medicinal plants in pregnancy ranging from 0.9% to 96.0% [4, 15]. Variation in prevalence may be explained by several factors including differences in study populations and settings as well as data collection methods and definitions of medicinal plants. In some studies, all forms of herbal meal preparations and nutritional supplements were counted [4] whereas in others, like our study, a more restrictive definition of medicinal plant use was used. In addition, differences in traditional practices, cultures and beliefs about health, may contribute to important difference in prevalence of use of medicinal plants.

The most frequently used medicinal plants during pregnancy were flaxseed (use with caution), *damakessi*e (safety unknown) and papaya (use with caution, it is considered potentially unsafe in large amounts only) (Table 3, Supplementary table 3A). Our finding is inconsistent with previous studies reported in Africa in which *Z. officinale*, *A. sativum* and *C. pepo* were the commonly used plants [4]. The pattern of medicinal plant use is also divergent from latest findings from Ethiopia [12, 13]. This may be due to the fact that unlike previous studies, most participants in our study were women in their final stage of pregnancy and might most probably recall the medicinal plants they took in relation to childbirth to a better extent than plants used earlier in pregnancy. This difference in pattern of use from other corners of Ethiopia and regions elsewhere may be due to difference in climate, geographical location (which will affect the types of plants commonly grow in that area) and/or disease prevalence.

Flaxseed is by far the most commonly used medicinal plant, mainly used for induction, reduction, quickening or preparation for labour (Table 3). A recent study from Ethiopia had also found similar reason for its use [14]. In other African countries, however, seed oil from *R. communis* was the most frequently used medicinal plant product to stimulate labour [4]. The most probable reasons for the disparity in the type of medicinal plant used for labour induction may be differences in geographical distribution of plants and cultural beliefs.

In line with previous studies [33, 34], women reported side effects and safety concerns related to use of flaxseed in relation to labour (Table 4). A precautious consumption of flaxseed is recommended in pregnancy and lactation due to its side effects and adverse effects when consumed in excessive quantity [34]. In remote rural areas in Ethiopia where access to health facilities is limited, use of *L. usitatissimum* may be perceived as the best option to induce or shorten labour.

*O. lamiifolium* was the second most used medicinal plant during pregnancy in our study. It was mainly used for treatment of an illness called ‘‘*Mitch’’* alone or with other medicinal plants (Table 2). ‘‘*Mitch’’* is a culturally common illness in Ethiopia and is a local name given to a febrile illness characterized by headache, fever, rash, inflammation, joint pain, back pain, chills, sweat, loss of appetite, *Herpes labialis,* muscle spasm and in severe cases, diarrhoea [1, 35]. ‘‘*Mitch’’* develops when strong sunlight strikes a part of the body that is sweating or unclean [36], and in general after engaging in tasks that expose one to strong smells, or smoke [1, 37]. Our study found that ‘‘*Mitch’’* also affects female reproductive organs when it is exposed to excessive sunlight, which they refer it to as ‘‘*Yemahitsen Mitch’’ (*‘‘gynaecologic *mitch’’)* (Table 2). In general our result agrees with the findings of Ethiopians at home [14] and in diaspora [1] regarding ‘‘*Mitch’’* and its treatment. Studies of the leaf extract of *O.*

*lamiifolium* have shown analgesic effects in mice [38] that support its traditional use against *Mitch*. *O. lamiifolium* is considered relatively safe and has not demonstrated any sign of acute toxicity up to the dose of 2000 mg/kg body weight in experimental mice [39].

*C. papaya* and *Z. officinale* were the third and the fourth commonly used plants respectively. Several women in this study claimed that papaya softens their birth canal (''*uterus*'') making them healthy and ready for childbirth (Table 3). Moreover, they claimed that consumption of cold papaya would soothe their gastrointestinal tract relieving them from heartburn, gastritis and cramps (Table 2). Animal studies suggest that unlike its abortifacient property at larger dose, normal consumption of ripe papaya during pregnancy may not pose any developmental toxicity and teratogenicity [40].

Although previous studies, also in Ethiopia, showed that pregnant women commonly use ginger for treating NVP [1, 4, 5, 19, 28], our study found that it was mainly used for common colds and flu in pregnancy. This could be due to the fact that previous studies involved mainly women in their earlier stages of pregnancy in which NVP is common. Concerning safety, evidences suggest that ginger did not have harmful maternal or neonatal effects [1, 4]. Its side effects reported in our study were also similar with previous reports [1].

Several socio-demographic factors were associated with use of medicinal plants in pregnancy (Table 1). We found that women who did not have access to health facility (incl. health posts) were seven times more likely to use medicinal plants than their counterparts. This is in line with other studies showing that in Africa people use traditional medicine when facilities are either unavailable or unaffordable [4, 21]. Similarly, women admitted in maternity ward were three-fold as likely to use medicinal plants as their counterparts. Most women in the maternity

ward were in their final stage of pregnancy and might be using more medicinal plants for childbirth than those admitted in gynaecology ward in which hyperemesis and abortion cases predominate. Similarly, women who used *khat* or consumed alcohol as well as conventional medicine were twice or more as likely to use medicinal plants as their counterparts, and may either indicate a higher willingness to intake different substances in pregnancy and/or higher morbidity. Since interactions between medicinal plants and conventional medicines may occur and potentially may cause complications [4, 14, 41] , caution with concomitant use should be recommended. Health care personnel at the wards were often not informed; neither involved in decisions nor aware about the women's use of medicinal plants in relation to childbirth. As pregnancy is a time of particular vulnerability, cautious use of medicinal plants is necessary and health-care professionals should ask women about their use and provide them evidence-based information.

## Conclusion

Almost a third of women at the tertiary hospital in Ethiopia used medicinal plants during pregnancy, most frequently to prepare, induce, reduce the intensity or shorten duration of labour. The most important factors associated with use of medicinal plants in pregnancy were lack of access to health care facilities, hospitalization in the maternity ward and social drug use. Given that women use unsafe plants during pregnancy, increased awareness about potential benefits or risks of medicinal plants use during pregnancy among health care professionals and patients, and increased access to health care facilities are important in order to promote safer pregnancies and better health outcomes for women and their unborn babies.

## Footnotes

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**Contributors:** SMA and HN conceived the idea for the study and its design. SMA collected, analysed and interpreted data and drafted the manuscript. YAA and JS participated in study coordination. SMA and HN revised and finalized the manuscript. SMA, HN, JS and YAA critically reviewed the manuscript and contributed intellectual content. All authors read and approved the final manuscript.

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**Patient consent for publication**: Not required.

**Ethics approval:** This study was approved by Jimma University Institute of health Institutional Review Board (IRB) (ref. no. IHRPGC 7206/07) in Ethiopia, and Regional Committees for Medical and Health Research Ethics (REK Sør-Øst B) (Ref.no. 2015/2135) in Norway.

**Data availability statement**: Data are available upon reasonable request.

**Supplementary data**

Supplementary table 1: Survey questionnaire for medicinal plants used among pregnant women admitted at JUMC, Ethiopia

Supplementary table 2: Data extraction form used among pregnant women admitted at JUMC, Ethiopia

Supplementary table 3: Medicinal plants used among pregnant women admitted at JUMC, Ethiopia

Supplementary table 4: Overview of the utilization pattern of the most frequently used medicinal plants among pregnant women admitted at JUMC, Ethiopia

**Table 1.** Characteristics of women according to medicinal plant use during pregnancy at JUMC, Ethiopia

| Characteristics | No. (%) | Medicinal plant use during pregnancy | | Crude OR [95% CI] [b] | Adjusted OR [95% CI] [c] |
|---|---|---|---|---|---|
| | | Yes | No | | |
| | 1117 (100) [a] | No. (%) | No. (%) | | |
| | | 319 (28.6) | 798 (71.4) | | |
| **Place of Residence** | | | | | |
| Urban | 595 (53.3) | 165 (51.7) | 430 (53.9) | 1 | - |
| Rural | 522 (46.7) | 154 (48.3) | 368 (46.1) | 1.09 [0.84-1.41] | |
| **Age (years) [d]** | | | | | |
| ≤ 20 | 223 (20.0) | 52 (16.3) | 171 (21.4) | 1 | 1 |
| 21-25 | 388 (34.7) | 116 (36.4) | 272 (34.1) | 1.40 [0.96-2.05] | 1.30 [0.88-1.94] |
| 26-30 | 320 (28.7) | 102 (32.0) | 218 (27.3) | **1.54 [1.04-2.27]** | 1.42 [0.94-2.14] |
| ≥ 31 | 186 (16.7) | 49 (15.4) | 137 (17.2) | 1.18 [0.75-1.85] | 1.17 [0.73-1.87] |
| **Marital status** | | | | | |
| Married | 1071(95.9) | 314 (98.4) | 757 (94.9) | 1 | 1 |
| Others [e] | 46 (4.1) | 5 (1.6) | 41 (5.1) | **0.29 [0.12-0.75]** | 0.39 [0.14-1.09] |
| **Religion** | | | | | |
| Islam | 731 (65.4) | 201 (63.0) | 530 (66.4) | 1 | |
| Orthodox | 305 (27.3) | 99 (31.0) | 206 (25.8) | 1.27 [0.95-1.69] | - |
| Protestant/Others [f] | 81 (7.3) | 19 (6.0) | 62 (7.8) | 0.81 [0.47-1.39] | |
| **Educational level [g]** | | | | | |
| Illiterate | 378 (34.0) | 98 (30.7) | 280 (35.1) | 1 | 1 |
| Primary /read & write | 470 (42.3) | 138 (43.3) | 332 (41.6) | 1.19 [0.88-1.61] | 1.22 [0.88-1.68] |
| Secondary school | 162 (14.6) | 56 (17.6) | 106 (13.3) | **1.51 [1.02-2.25]** | **1.54 [1.01-2.36]** |
| Post-secondary school | 102 (9.2) | 27 (8.5) | 75 (9.4) | 1.03 [0.63-1.69] | 1.06 [0.62-1.79] |
| **Occupation** | | | | | |
| House wife | 524 (46.9) | 142 (44.5) | 382 (47.9) | 1 | - |
| Farmer | 261 (23.4) | 82 (25.7) | 179 (22.4) | 1.23 [0.89-1.71] | |
| Trader/Merchant | 163 (14.6) | 49 (15.4) | 114 (14.3) | 1.16 [0.79-1.70] | |
| Government employee | 95 (8.5) | 30 (9.4) | 65 (8.1) | 1.24 [0.77-1.99] | |
| Others [h] | 74 (6.6) | 16 (5.0) | 58 (7.3) | 0.74 [0.41-1.33] | |
| **Ethnic Group** | | | | | |
| Oromo | 779 (69.7) | 224 (70.2) | 555 (69.5) | 1 | 1 |
| Amhara | 87 (7.8) | 21 (6.6) | 66 (8.3) | 0.79 [0.47-1.32] | 0.83 [0.48-1.45] |
| Yem | 81 (7.3) | 24 (7.5) | 57 (7.1) | 1.04 [0.63-1.72] | 1.14 [0.66-1.97] |
| Dawuro | 70 (6.3) | 12 (3.8) | 58 (7.3) | **0.51 [0.27-0.97]** | 0.64 [0.33-1.25] |
| Others [i] | 100 (9.0) | 38 (11.9) | 62 (7.8) | 1.52 [0.99-2.34] | 1.57 [1.00-2.48] |
| **Access to health facility [j]** | | | | | |
| Yes | 1107 (99.1) | 313 (98.1) | 794 (99.5) | 1 | 1 |
| No | 10 (0.9) | 6 (1.9) | 4 (0.5) | **3.81 [1.07-13.58]** | **6.92 [1.77-27.10]** |
| **Walking distance to the nearest health facility** | | | | | |
| Close, ≤30 min. | 731 (66.4) | 203 (63.6) | 528 (66.2) | 1 | - |
| Somewhat far, 31-60 min. | 245 (22.3) | 67 (21.0) | 178 (22.3) | 0.98 [0.71-1.35] | |
| Far, >60 min. | 125 (11.4) | 43 (13.5) | 82 (10.3) | 1.36 [0.91-2.04] | |
| **Gravidity [k]** | | | | | |
| Primigravida | 431 (38.6) | 307 (38.5) | 124 (38.9) | 1 | - |
| Multigravida | 686 (61.4) | 491 (61.5) | 195 (61.1) | 0.98 [0.75-1.28] | |
| **Gestational age** | | | | | |
| Preterm pregnancy | 231 (20.7) | 60 (18.8) | 171 (21.4) | 1 | 1 |
| Term pregnancy | 735 (65.8) | 208 (65.2) | 527 (66.0) | 1.13 [0.81-1.57] | 0.80 [0.52-1.25] |
| Post term pregnancy | 62 (5.6) | 27 (8.5) | 35 (4.4) | **2.20 [1.23-3.93]** | 1.65 [0.85-3.20] |
| Others [l] | 89 (8.0) | 24 (7.5) | 65 (8.1) | 1.05 [0.61-1.83] | 0.72 [0.38-1.36] |
| **Patient type** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Gynaecology ward | 125 (11.2) | 22 (6.9) | 103 (12.9) | 1 | 1 |
| Maternity ward | 992 (88.8) | 297 (93.1) | 695 (87.1) | **2.00 [1.24-3.23]** | **2.80 [1.43-5.48]** |
| **Chronic illness [m]** | | | | | |
| No | 1061 (95.0) | 294 (92.2) | 767 (96.1) | 1 | 1 |
| Yes | 56 (5.0) | 25 (7.8) | 31 (3.9) | **2.10 [1.22-3.62]** | **1.83 [1.04-3.24]** |
| **Conventional medicine use [n]** | | | | | |
| No | 817 (73.1) | 209 (65.5) | 608 (76.2) | 1 | 1 |
| Yes | 300 (26.9) | 110 (34.5) | 190 (23.8) | **1.68 [1.27-2.23]** | **1.83 [1.36-2.46]** |
| **Chew Khat (*Catha edulis*) [o]** | | | | | |
| No | 1052 (94.2) | 289 (90.6) | 763 (95.6) | 1 | 1 |
| Yes | 65 (5.8) | 30 (9.4) | 35 (4.4) | **2.26 [1.36- 3.75]** | **2.53 [1.46-4.39]** |
| **Alcohol consumption** | | | | | |
| No | 1071 (95.9) | 297 (93.1) | 774 (97.0) | 1 | 1 |
| Yes | 46 (4.1) | 22 (6.9) | 24 (3.0) | **2.39 [1.32-4.33]** | **2.43 [1.28-4.62]** |
| **Past adverse pregnancy outcome** | | | | | |
| No/not applicable | 994 (89.0) | 275 (86.2) | 719 (90.1) | 1 | - |
| Yes | 123 (11.0) | 44 (13.8) | 79 (9.9) | 1.51 [1.00-2.28] | |

[a]Numbers may not add up to 1117 due to missing values, [b]CI, confidence interval, OR, odds ratio; Significant findings are in bold (P<0.05); [c]Adjusted for age, marital status, educational level, ethnic group, access to health facility, gestational age, patient type, chronic illness, conventional medicine use, chew *khat*, alcohol consumption; [d]Median age 25 years, interquartile range 22–30 years; [e]Others includes single 41(3.7%), divorced 4(0.4%), widowed 1(0.1%); [f]Protestant/Others includes Protestant 74(6.6), Catholic 2(0.2%), Waqqefeta 1(0.1%), missing 4(0.4); [g]Read & write: no formal education but can read and write due to literacy campaigns, traditional religious institution and informal peer learning, Primary school: Grade 1–8, Secondary school: Grade 9–12; Post-secondary school: Technical and vocational school, college or university; [h]Others includes daily labourers 24(2.1), students 22(2.0), private institution workers 18(1.6), other sectors 10(0.9%); [i]Others includes Gurage 41(3.7), Silte 30(2.7), Kaffa 16(1.4), Tigre 3(0.3), Wolayita 3(0.3), mixed ethnic backgrounds 7(0.6); [j]Access to health facility means access to either primary, secondary or tertiary levels of healthcare; it mainly represents access to health posts; [k]Gravidity includes the current pregnancy; [l]Women are in the first, second or third trimester of pregnancy but exact week of pregnancy is not known ; [m]Includes hypertension, diabetes mellitus, asthma, cardiac diseases, chronic gastritis/peptic ulcer, HIV, chronic renal failure, chronic liver disease, etc.; [n]Refers to self-medication with conventional medicine before hospitalization; [o]*Khat* (*Catha edulis*) plant leaves are chewed by people for their stimulant action

492 **Table 2.** Pregnancy disorders treated with medicinal plants at JUMC, Ethiopia, n=319

| Variables | Number (%) [a] | Most common medicinal plants (number of citations) |
|---|---|---|
| Induction and "reduction'' of labour [b] | 192 (60.2) | *Linum usitatissimum* (Flaxseed) (179)<br>*Trigonella foenum-graecum* (Fenugreek) (6)<br>*Carica papaya* (Papaya) (4) |
| Common cold/flu | 65 (20.4) | *Zingiber officinale* (Ginger) (23)<br>*Allium sativum* (Garlic) (13)<br>*Eucalyptus globulus* (*Nech-bahir zaf*) (12) |
| Preparation for labour | 50 (15.7) | *Linum usitatissimum* (Flaxseed) (22)<br>*Carica papaya* (Papaya) (17)<br>*Trigonella foenum-graecum* (Fenugreek) (11) |
| Abdominal cramps/ache | 30 (9.4) | *Nigella sativa* (Black seed) (10)<br>*Allium sativum* (Garlic) (5)<br>*Carica papaya* (Papaya) (4) |
| Headache/Migraine | 27 (8.5) | *Nigella sativa* (Black seed) (10)<br>*Ocimum lamiifolium* (*Damakessie*) (8)<br>*Allium sativum* (Garlic) (3) |
| Heartburn/reflux problems | 27 (8.5) | *Linum usitatissimum* (Flaxseed) (16)<br>*Carica papaya* (Papaya) (5) |
| Mitch [c] | 24 (7.5) | *Ocimum lamiifolium* (*Damakessie*) (18) |
| Gastritis/burning sensation | 22 (6.9) | *Linum usitatissimum* (Flaxseed) (19) |
| Constipation/obstipation | 17 (5.3) | *Linum usitatissimum* (Flaxseed) (16) |
| General wellbeing | 15 (4.7) | *Allium sativum* (Garlic) (5)<br>*Ruta chalepensis* (Fringed rue) (3) |
| Nausea | 11 (3.4) | *Zingiber officinale* (Ginger) (4)<br>*Ruta chalepensis* (Fringed rue) (4) |
| Helminths | 6 (1.9) | *Carica papaya* (Papaya) (2)<br>*Hagenia abyssinica* (*Kosso*) (2) |
| Leg/foot Swelling | 5 (1.6) | *Linum usitatissimum* (Flaxseed) (1)<br>*Cinnamomum verum* (Cinnamon) (1)<br>*Croton macrostachyus* (Bisena) (1)<br>*Veronia amygdalina* (Grawa) (1)<br>B'auu (1) |
| Prevent bad smell | 5 (1.6) | *Ocimum lamiifolium* (*Damakessie*) (5) |
| Strong craving | 5 (1.6) | *Linum usitatissimum* (Flaxseed) (1)<br>*Carica papaya* (Papaya) (1)<br>*Nigella sativa* (Black seed) (1)<br>*Ruta chalepensis* (Fringed rue) (1)<br>*Zingiber officinale* (Ginger) (1) |
| Emergency illnesses | 4 (1.3) | *Ocimum lamiifolium* (Damakessie) (3) |
| Postpartum bathing | 4 (1.3) | *Eucalyptus globulus* (*Nech-bahir zaf*) (3) |
| Vomiting | 3 (0.9) | *Zingiber officinale* (Ginger) (2) |
| *Yemahitsen mitch* [c] ('gynaecologic *mitch')* | 3 (0.9) | *Croton macrostachyus* (Bisena) (1)<br>*Ocimum lamiifolium* (Damakessie) (1)<br>*Pycnostachys abyssinica* (*Yeroo*) (1) |
| Depression | 3 (0.9) | *Echinops kebericho* (Kebericho) (1)<br>*Ruta chalepensis* (Fringed rue) (1)<br>*Cinnamomum verum* (Cinnamon) (1) |
| Wellbeing and nourishing the foetus | 3 (0.9) | *Linum usitatissimum* (Flaxseed) (2)<br>*Trigonella foenum-graecum* (Fenugreek) (1) |
| Cough | 2 (0.6) | *Nigella sativa* (Black seed) (1)<br>*Saccharum officinarum* (Sugar crystals) (1) |
| *Birdd* [d] | 2 (0.6) | *Allium sativum* (Garlic) (1)<br>*Nigella sativa* (Black seed) (1) |
| Diarrhoea | 2 (0.6) | *Ocimum lamiifolium* (Damakessie) (1)<br>*Taverniera abyssinica* (Dingetegn) (1) |

| Variables | Number (%) [a] | Most common medicinal plants (number of citations) |
|---|---|---|
| Joint pain *(kurtimatt)* | 2 (0.6) | *Allium sativum* (Garlic) (1)<br>*Nigella sativa* (Black seed) (1) |
| Sleeping problems | 2 (0.6) | *Artemisia abyssinica* (*Chikugn*) (2) |
| Mental wellbeing | 2 (0.6) | *Ruta chalepensis* (Fringed rue) (2) |
| Evil eye | 2 (0.6) | *Artemisia afra* (*Ariti*) (1)<br>*Veronia amygdalina* (*Grawa*) (1) |
| Others [e] | 15 (4.7) | *Linum usitatissimum* (Flaxseed) (3)<br>*Allium sativum* (Garlic) (3)<br>*Ocimum lamiifolium* (*Damakessie*) (3) |

[a]Total percentage may exceed 100% due to multiple responses
[b]***Reduction of labour***: Includes reduced intensity and shortened duration of labour.
[c]***'Mitch':*** A febrile illness believed to develop when strong sunlight strikes a part of the body that is sweating or unclean.
[d]'***Birdd***': An illness typified by a feeling of chills, arthralgia, myalgia, generalized body weakness, pain (particularly chest pain) and coughing. In general, it is characterized by pneumonia/flu-like symptoms.
[e]Others includes make labour simple, stomach rambling, quicken labour, prevent '*megagna'*, fever, facilitation of digestion, tonsillitis, pregnancy associated body/physical illnesses, skin rashes ('*Shifta*'), abdominal distension/bloating, throat congestion ('*Guroroyen siyafinegn'*), malaria , appetizer, upper extremity fatigability, for any illness, each with a frequency of one.

**Table 3.** Overview of the most frequently used medicinal plants during pregnancy at JUMC, Ethiopia

| Medicinal plant (English name) (local name) Preparation method | Number of users (n = 319), n (28.6%) | Most common indications (No. of citations) |
|---|---|---|
| *Linum usitatissimum* L. (Flaxseed or Linseed) (*Telba*)<br>Flax seeds are roasted, pounded, thoroughly mixed with water and consumed in soup form. | 246 (77.1) | Induction or ''reduction'' of labour (179) [a]<br>Prepare for labour (22)<br>Heartburn/reflux problems (19)<br>Constipation/obstipation (16)<br>Gastritis/burning sensation (14)<br>Abdominal cramps or ache (2) |
| *Ocimum lamiifolium* L. (No common English name) (*Damakessie*)<br>Adding minced fresh leaves or steeping in leaves in tea, coffee, milk or decoction or maceration of minced root are drunk, or fresh leaves are put in nostrils and sniffed | 40 (12.5) | Mitch (19) [b]<br>Common cold/flu (10)<br>Headaches/Migraine (8)<br>Prevent bad smell (5)<br>Emergency cases/illnesses (3)<br>Nausea (2) |
| *Carica papaya* L. (Papaya) (*Papaya*)<br>Ripened fresh fruit is eaten or its juice is extracted and then drunk | 35 (11.0) | Prepare for labour (17)<br>Heartburn/reflux problems (5)<br>Induce labour (4)<br>Abdominal cramps or ache (4)<br>Gastritis/burning sensation (3)<br>Helminths (2) |
| *Zingiber officinale* Roscoe. (Ginger) (*Zingibil*)<br>Drinking aqueous decoction or maceration, or drinking minced root with water or tea | 29 (9.1) | Common cold/flu (23)<br>Nausea (4)<br>Vomiting (2)<br>Abdominal cramps (2) |
| *Allium sativum* L. (Garlic) (*Nech shinkrut*)<br>Drinking minced cloves with tea, coffee, milk or eating raw cloves with Ethiopian bread, '*Injera*' | 28 (8.8) | Common cold/flu (13)<br>General wellbeing (5)<br>Abdominal cramps (5)<br>Headaches/Migraine (3)<br>*Birdd* (2) [c] |
| *Trigonella foenum-graecum* L. (Fenugreek) (*Abish*)<br>Drink aqueous maceration of seeds or consume roasted and powdered seeds in soup form | 24 (7.5) | Prepare for labour (11)<br>Induce labour (6)<br>Gastritis/burning sensation (4) |
| *Nigella sativa* L (Black seed) (*Tikur Azmud*)<br>Drinking few drops of the seed oil with tea, coffee, milk or sniffing the oil drops | 21 (6.4) | Headaches/Migraine (10)<br>Abdominal cramps or ache (7)<br>Common cold/flu (6) |
| *Ruta chalepensis* L. (Fringed rue) (*Tenadam*)<br>Adding minced fresh leaves or steeping in leaves in tea, coffee, or milk and then drunk or fresh leaves squeezed, and then drunk | 15 (4.7) | Nausea (4)<br>General wellbeing (3)<br>Headaches/Migraine (2)<br>Mental wellbeing (2)<br>Abdominal cramps (2) |
| *Eucalyptus globulus* Labill. (''Eucalyptus'') (*Nech-bahir zaf)*<br>Leaves are boiled in water, patient fumigated and the vapour is inhaled | 13 (4.1) | Common cold/flu (12)<br>Postpartum bathing (3)<br>Mitch (2) |

[a]''**Reduction of labour**'': Includes reduced intensity and shortened duration of labour; [b]'***Mitch***': A febrile illness believed to develop when strong sunlight strikes a part of the body that is sweating or unclean; [c]''***Birdd***': An illness typified by a feeling of chills, arthralgia, myalgia, generalized body weakness, pain (particularly chest pain) and coughing. In general, it is characterized by pneumonia/flu-like symptoms

**Table 4.** Pregnant women's self-reported safety concerns and experiences with medicinal plants at JUMC, Ethiopia, n=319

| **Medicinal plants (MPs), reported reasons for contraindication (No. of citations)** | **MPs, reported precautions (No. of citations)** | **MPs, reported Side effects (No. of citations)** | **MPs, reported adverse drug reactions (No. of citations)** |
|---|---|---|---|
| Flaxseed: Cause uterine contractions, miscarriage or premature labour (2), Dries up breastmilk (1) | Flaxseed [a]: Aloe vera is bitter and makes flaxseed preparation unpalatable (1), the woman should stay away from sunlight while /after taking flaxseed preparation (1) | Flaxseed: Nausea (4), Postpartum shivering (1), Diarrhoea (1), Vomiting (1), Loss of appetite (1), | Flaxseed: Severe postpartum shivering (1), Loss of consciousness (1), Uterine rupture (1), Still birth (1) |
| *Kosso* [b]: Causes uterine stimulation (4) | *Kosso*: Kosso protects the mother from outside person's *'tila'* as it may kill her (1), After taking Kosso, the woman should stay at home for 2 days protected from outside person's *'tila'* (1) [c] | *Kosso*: Diarrhoea (2) | *Kosso*: Severe diarrhoea (2) |
| *Dingetegna*: harmful during pregnancy, reason unknown (1) [d] | *Dingetegna* [e]: the woman who took *dingetegna* should stay at home, outsiders should not be allowed to get in for fear of their *'tila'* (1) | *Dingetegna*: Diarrhoea (2), Vomiting (1) | *Dingetegna*: Severe diarrhoea (2) |
| *Damakessie*: Causes uterine stimulation (1) | *Damakessie* [f]: After applying MPs stay at home, going outside is forbidden (1) [g] | *Damakessie*: Loss of appetite (1), Bitter (after) taste (1), Sneezing (1) | Chikugn [h]: Anencephaly: giving birth to a headless neonate (1) |
| *Tej Sar* [i]: Causes uterine stimulation (1), harmful during pregnancy, reason unknown (1) [d] | Cinnamon [j]: inflammatory to the stomach, thus eat food before taking cinnamon (1) | Cinnamon: Heart burn (1) | Cinnamon: Severe heart burn (1) |
| Ensilal [k]: Causes uterine stimulation (1), harmful during pregnancy, reason unknown (1) [d] | Garlic: larger dose of garlic is irritant, thus eat food before taking it (1) | Garlic: Discomfort to foetus (1), Gastric irritation (1), Loss of appetite (1) | Garlic: Harm to the foetus (1), Bad mouth smell (1), Severe heart burn (1) |
| Grawa [l]: Causes uterine stimulation (2) harmful during pregnancy, reason unknown (1) [d] | Ginger: stomach irritant, thus eat food before taking ginger (1), beware since ginger decreases appetite (1) and induces fever (1) | Ginger: Gastric irritation (2), Heart burn (2), Discomfort to foetus (1) | Ginger: Harm to foetus (1), Severe heart burn (1) |
| Black seed: Generally not good for the woman and the foetus, thus better not to take it during pregnancy (1) | Yeroo [m]: After applying MPs stay at home, going outside is forbidden (1) [g] | Black seed: Gastric irritation (3), Loss of appetite (1) | ------ |
| Bisana [n]: causes uterine stimulation (2), harmful to the foetus (1), generally not good for the foetus (1), its smell deteriorates health of pregnant women (1) | Bisana [o]: After applying MPs stay at home, going outside is forbidden (1) [g] | ''Eucalyptus'' [p]: Decrease in appetite (1) | ------ |
| Kebericho: Generally not good for the foetus(1) | Kebericho [q]: Kebericho interacts with *damakessie* and worsen the *Mitch* [r] disease (1) | Sugar [s]: Eye irritation (1) | ------ |
| *Etse Fares* [t]: Harmful to the foetus (1), Causes uterine stimulation (3), Generally not good for pregnant woman and the foetus (1) | Fringed rue: Kebericho should not be taken with rue because it will worsen the nausea (1), beware since it induces fever (1), There is a plant interacting with rue, but forgot its name (1) | Fringed rue: Loss of appetite (1) | ------ |
| 'Baruda' plant [u]: Causes uterine stimulation (1) | ------ | ------ | ------ |

| | | | |
|---|---|---|---|
| *Endod* [v]: Causes uterine stimulation (1) | ------ | ------ | ------ |
| *Metere* [w]: Harmful to the foetus (1) | ------ | ------ | ------ |
| *Feto* [x]: Causes uterine stimulation (1) | ------ | ------ | ------ |

[a]After consuming Flaxseed *(L. usitatissimum)* preparation the woman should stay at home, exposure to sunlight results in *Mitch* disease, [b]*H. abyssinica*, [c]'*Tila*', loosely translated means the shade of a person that is believed to have pernicious effect, [d]The plant is harmful during pregnancy, but the woman does not know the reason for contraindication, [e]*T. abyssinica*, [g]Stay at home after applying the [f] Damakessie (*O. lamiifolium)* / [m]Yeroo (*P. abyssinica*) / [o]Bisana (*C. macrostachyus*) mixture formulation, going outside is forbidden; Otherwise there is relapse of the disease; [h]*A. abyssinica*, [i]*Cymbopogon citratus* (DC.) Stapf, [j]*C. verum*, [k]*F. vulgare*, [l]*V. amygdalina*, [n]*C. macrostachyus, [p]E.globulus,* [q]*E. kebericho*, [r]*Mitch*: A febrile illness believed to develop when strong sunlight strikes a part of the body that is sweating or unclean; [s]*Saccharum officinarum* L., [t]*Datura stramonium L.*, [u]inserting the root in to the vagina and/or drink its juice, [v]*Phytolacca dodecandra* L'Hér., [w]*Glinus lotoides* L., [x]*L. sativum,* [b, x](particularly use of *Kosso* with *Feto* causes severe uterine stimulation).

## References

1. Hailemeskel B, Fullas F, Habte A, Al-Matari RA, Brewer D. A review of natural remedies commonly used by Ethiopian immigrants in the USA. Curr Res Integr Med. 2017; 2: 31-36.

2. Jamshidi-Kia F, Lorigooini Z, Amini-Khoei H. Medicinal plants: Past history and future perspective. J Herbmed Pharmacol. 2018; 7: 1-7.

3. Mazzari ALDA, Prieto JM. Herbal medicines in Brazil: pharmacokinetic profile and potential herb-drug interactions. Front Pharmacol. 2014; 5: 162.

4. Ahmed SM, Nordeng H, Sundby J, Aragaw YA, de Boer HJ. The use of medicinal plants by pregnant women in Africa: A systematic review. J Ethnopharmacol. 2018; 224: 297-313.

5. Shewamene Z, Dune T, Smith CA. The use of traditional medicine in maternity care among African women in Africa and the diaspora: a systematic review. BMC Complement Altern Med. 2017; 17: 382.

6. United States Central Intellingence Agency (CIA). The World Fact Book, Africa: Ethiopia. https://www.cia.gov/library/publications/the-world-factbook/geos/et.html (2018). Accessed 13 Feb 2019.

7. Ethiopian Public Health Institute (EPHI).Traditional and Modern Medicine Research. http://www.ephi.gov.et/index.php/research/traditional-modern-medicine (2018). Accessed 25 Feb 2019.

8. Laelago T, Yohannes T, Lemango F. Prevalence of herbal medicine use and associated factors among pregnant women attending antenatal care at public health facilities in Hossana town, southern Ethiopia: facility based cross sectional study. Arch Public Health. 2016; 74: 7.

9. United Nations Children's Fund (UNICEF). Maternal and Newborn Health Disparities country profiles. https://data.unicef.org/resources/maternal-newborn-health-disparities-country-profiles/ (2018). Accessed 05 Sept 2019.

10. Ahmed SM, Sundby J, Aragaw YA, Abebe F. Self-Medication and Safety Profile of Medicines Used among Pregnant Women in a Tertiary Teaching Hospital in Jimma, Ethiopia: A Cross-Sectional Study. Int J Environ Res Public Health. 2020; 17:3993.

11. Bayisa B, Tatiparthi R, Mulisa E. Use of herbal medicine among pregnant women on antenatal care at Nekemte Hospital, Western Ethiopia. Jundishapur J Nat Pharm Prod. 2014; 9: e17368.

12. Jambo A, Mengistu G, Sisay M, Amare F, Edessa D. Self-Medication and Contributing Factors Among Pregnant Women Attending Antenatal Care at Public Hospitals of Harar Town, Ethiopia. Front Pharmacol. 2018; 9: 1063.

13. Mekuria AB, Erku DA, Gebresillassie BM, Birru EM, Tizazu B, Ahmedin A. 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 Complement Altern Med. 2017; 17: 86.

14. Nega SS, Bekele HM, Meles GG, Nordeng H. Medicinal Plants and Concomitant Use with Pharmaceutical Drugs Among Pregnant Women. J Altern Complement Med. 2019; 25: 427-434.

15. Hall HG, Griffiths DL, McKenna LG. The use of complementary and alternative medicine by pregnant women: A literature review. Midwifery. 2011, 27: 817-824.

16. Westfall RE. Herbal healing in pregnancy: women's experiences. J Herb Pharmacother. 2003; 3: 17-39.

17. Kennedy DA, Lupattelli A, Koren G, Nordeng H. Herbal medicine use in pregnancy: results of a multinational study. BMC Complement Altern Med. 2013; 13:355.

18. Ahmed M, Hwang JH, Choi S, Han D. Safety classification of herbal medicines used among pregnant women in Asian countries: a systematic review. BMC Complement Altern Med. 2017; 17: 489.

19. Ahmed M, Hwang JH, Hasan MA, Han D. Herbal medicine use by pregnant women in Bangladesh: a cross-sectional study. BMC Complement Altern Med. 2018; 18: 333.

20. Kennedy DA, Lupattelli A, Koren G, Nordeng H. Safety classification of herbal medicines used in pregnancy in a multinational study. BMC Complement Altern Med. 2016; 16: 102.

21. Godlove MJ: Prevalence of herbal medicine use and associated factors among pregnant women attending antenatal clinic at Mbeya Refferal Hospital in 2010 (M.Sc. Thesis). Muhimbili University of Health and Allied Sciences, Dar es salaam, Tanzania. http://hdl.handle.net/123456789/41 (2011). Accessed 03 Oct 2018.

22. Segni H, Ayana D, Jarso H. Prevalence of Hyperemesis Gravidarum and Associated Factors Among Pregnant Women at Jimma University Medical Center, South West Ethiopia: A Cross-Sectional Study. EC Gynaecology. 2016, 3: 376-387.

23. Jimma University: Jimma University Specialized hospital. http://www.ju.edu.et/jimma-university-specialized-hospital-jush (2017). Accessed 13 Sept 2018.

24. Kish L. Survey Sampling. New York, NY, USA: John Wiley & Sons, Inc.; 1965.

25. Mureyi DD, Monera TG, Maponga CC. Prevalence and patterns of prenatal use of traditional medicine among women at selected harare clinics: a cross-sectional study. BMC Complement Altern Med. 2012; 12: 164.

26. Mkize GT: An Assessment of Use of Traditional Medicine in Pregnancy & Associated Factors Among Black South African Women Delivering in Bertha Gxowa Hospital (M.Sc. Thesis). University of the Witwatersrand, Johannesburg, South Africa. http://wiredspace.wits.ac.za/handle/10539/17340?show=full (2015). Accessed 25 Apr, 2019.

27. Onyiapat JLE: Complementary and Alternative Medicine Use among Pregnant Women in Udi Local Government Area of Enugu State, Nigeria (M.Sc. thesis). University of Nigeria, Enugu Campus, Nigeria. http://repository.unn.edu.ng/handle/123456789/5641 (2014). Accessed 25 Apr 2019.

28. Gall A, Shenkute Z. Ethiopian Traditional and Herbal Medications and Their Interactions with Conventional Drugs. https://ethnomed.org/clinical/pharmacy/ethiopian-herb-drug-interactions (2009). Accessed 17 Oct 2018.

29. Gedif T, Hahn H-J. The use of medicinal plants in self-care in rural central Ethiopia. J Ethnopharmacol. 2003; 87: 155-161.

30. Mills E, Duguoa J-J, Perri D, Koren G. Herbal medicines in pregnancy and lactation: An evidence-based approach. London ; New York: Taylor & Francis; 2006.

31. Mills SY, Bone K. The Essential Guide to Herbal Safety. St. Louis, Mo: Elsevier Churchill Livingstone; 2005.

32. Gardner ZE, McGuffin M. American herbal products association's botanical safety handbook. 2nd ed. Boca Raton, FL: American Herbal Products Association, CRC Press; 2013.

33. Zamawe C, King C, Jennings HM, Mandiwa C, Fottrell E. Effectiveness and safety of herbal medicines for induction of labour: a systematic review and meta-analysis. BMJ Open. 2018; 8 :e022499.

34. Gokhale S, Sahu AN. Pharmacological properties of flaxseed, *Linum usitatissimum* Linn., as a potential medicinal plant: An overview. World J Pharm Sci. 2016, 4: 207-215.

35. Hodes RM, Teferedegne B. Traditional beliefs and disease practices of Ethiopian Jews. Isr J Med Sci. 1996; 32: 561-7.

36. Hodes R. Cross-cultural medicine and diverse health beliefs. Ethiopians abroad. West J Med. 1997; 166: 29-36.

37. Kifle H, Seyoum A, Asres K, Mazumder A, Bucar F. Composition, antimicrobial and free-radical scavenging properties of the essential oil of Damakese (*Ocimum lamiifolium*): A popular home remedy in Ethiopia. Int J Essen Oil Ther. 2007; 1: 110 - 116.

38. Debella A, Makonnen E, Abebe D, Teka F, Kidanemariam AT. Pain management in mice using the aqueous and ethanol extracts of four medicinal plants. East Afr Med J. 2003; 80: 435-439.

39. Kefe A, Giday M, Mamo H, Erko B. Antimalarial properties of crude extracts of seeds of Brucea antidysenterica and leaves of *Ocimum lamiifolium*. BMC Complement Altern Med. 2016; 16: 118.

40. Oderinde O, Noronha C, Oremosu A, Kusemiju T, Okanlawon OA. Abortifacient properties of aqueous extract of *Carica papaya* (Linn) seeds on female Sprague-Dawley rats. Niger Postgrad Med J. 2002; 9: 95-8.

41. El Hajj M, Holst L. Herbal Medicine Use During Pregnancy: A Review of the Literature With a Special Focus on Sub-Saharan Africa. Front Pharmacol. 2020, 11: 866.

# Interviewer administered questionnaire

## Medicinal plants used among pregnant women admitted in Jimma University Medical Center maternity and gynaecology wards in Jimma city, Ethiopia

### Background and purpose

This is an invitation for you to participate in a research conducted with the objective of assessing medicinal plants used among pregnant women admitted in Jimma University Medical Center (JUMC) maternity and gynecology wards in Jimma city, Ethiopia. Although medicinal plants play a significant role in traditional medicine during pregnancy, childbirth and postpartum care, little is known about the extent and types of medicinal plants used during pregnancy in Ethiopia. The aim of this study is therefore to investigate and describe medicinal plants used during pregnancy, the reasons for use and the utilization pattern among women admitted at the maternity and gynecology wards. As the study is directly related to women seeking care in the maternity and gynaecology ward of this hospital, you are one of the candidates who can participate in the study. Thus, you are kindly requested to participate in the present research and provide the information required from you.

### What does the study involve?

Concerning the study process, first we will ask you questions about your background including questions about your age, religion, residence place, occupation, family size, ethnic group, marital status, educational level, access to modern health facility and walking distance to the facility. Next, we will ask you about maternal diseases, pregnancy-related illness and treatments, use of medicinal plant, information about women's safety concerns and experiences with use of medicinal plants in pregnancy. We will further collect data about your chronic illness and medication history, self-medication with conventional drugs, and social drug use during pregnancy.

### Potential advantages and disadvantages

The results obtained from this study are useful in order to develop better strategies to minimize medicinal plant use related problems and reduce maternal morbidity and mortality. There is no any disadvantage in participating in this study, except the time that it takes to answer the study questions.

**What will happen to your personal information?**

The data that are registered about you will only be used in accordance with the purpose of the study as described above. All the data will be processed without name, personal identification number or other directly recognisable type of information. A code number links you to your data and only the authorized study staff will have access to this list. There will be no way of linking your individual responses to the final result of the study findings. For documentation and follow-up purposes, the data will be kept until 14.01.2024. The data will be stored as de-identified data, i.e. a file with key identifiable information stored separately from the file containing other data. The data will be anonymized within 6 months after this date. It will not be possible to identify you in the results of the study when these are published.

**Voluntary participation**

Participation in this study is voluntary. You can withdraw your consent to participate in the study at any time and without stating any particular reason. This will not have any consequences for your further treatment. If you wish to participate, please sign the declaration of consent at the bottom of this page. In case if you are not able to give written consent (i.e. due to literacy and /or cultural reasons), your oral consent will be sought and documented as equal to a written consent. There are no consequences for women who decide not to participate in this study. The patient's decision to participate or not will have no impact on the treatment(s) that she receives.

If you have questions concerning the study, you may contact the research team:

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**Right to access and material storage**

If you agree to participate in the study, you are entitled to have access to the information registered about you. You are further entitled to correct any mistakes in the information we have registered. If you withdraw from the study, no further information or material will be collected about you. Data that have already been collected will not be deleted.

**Funding**

Mr. Seid Mussa is a PhD student in the University of Oslo. He is a recipient of scholarship from the Norwegian Loan Fund (Lånekassen).

**Information about the outcome of the study**

You, as a participant in this study, are entitled to receive information about the outcome/result of the study.

**Consent for participation in the study**

I am willing to participate in the study._____
(Signed by the study participant, date)

Third party consent when this is warranted, either in addition to or in place of the participant's consent._____
(Signed by a close relative/partner/friend, date)

I confirm that I have given information about the study._____
(Signed, role in the study, date)

**Instructions for enumerators**

- Many questions allow multiple answers. Unless specifically instructed in the question, do not prompt and simply encircle the answers that the woman mentions
- For open ended questions please write down the pregnant woman's response legibly

## Part I. Socio-demographics characteristics of respondents

**1.1. Study ID code**_____

**1.2. What is your age?** _____

**1.3. What is your place of residence?**

**A.** Urban

**B.** Rural

**1.4. What is your educational level?**

**A.** Illiterate

**B.** Only read and write

**C.** Primary 1st cycle (1-4)

**D.** Primary 2nd cycle (5-8)

**E.** Secondary school (9-12)

**F.** Post-secondary school

**G.** Others, specify _____

**1.5. What is your marital status?**

**A.** Married

**B.** Single

**C.** Divorced

**D.** Widowed

**1.6. What is your ethnic group?**

**A.** Oromo

**B.** Amhara

**C.** Gurage

**D.** Dawuro

**E.** Silte

**F.** Yem

**G.** Tigre

**H.** Others, specify _____

**1.7**. **What is your religion?**

**A.** Islam

**B.** Orthodox

**C.** Protestant

**D.** Catholic

**E.** Others, specify _____

**1.8**. **What is your occupation**?

**A.** Farmer

**B.** Daily labourer

**C.** Trader/Merchant

**D.** Government employee

**E.** House wife

**F.** Student

**G.** Private institution worker

**H.** Others, specify _____

**1.9. How many family members do you have** (including yourself)? _____

**1.10. Do you have access to any modern health facility (especially in 5 to 10 km distance from your residence)? (If no skip to Q 2.1)** **A**. Yes **B**. No

**1.11. How many minutes walking distance is it to your nearest health facility?** _____

**Part II. <u>Maternal diseases, pregnancy-related illness and treatments</u>**

**2.1. Are you pregnant**? **A**.Yes **B**. No

2.1.1. If yes, in which week of pregnancy (gestation age) are you? _____

2.1.2. If no, how many days has passed since delivery? _____

**2.2. How many children do you have from before the current pregnancy?**_____

**2.3. How many times have you been pregnant (i.e. Gravida)?** _____

**2.4. The number of times your pregnancies reaching viable gestational age (including live births and stillbirths, i.e. parity)**_____

**2.5. For how many days did you stay in the hospital?**_____

**2.6. History of any adverse pregnancy outcome**? **(If no skip to Q 3.1)**

**A**. Yes **B.** No

**2.7. What type (s) of adverse pregnancy outcome?**

**A.** Down syndrome
**B.** Cleft lip/ palate
**C.** Neural tube defect
**D.** Cardiac defect
**E.** More than one/ mixed [please explain] _____
**F.** Others, specify _____

**Part III. Chronic illness and medication**

**3.1. Do you have chronic illness? (If no skip to Q 4.1)** **A.** Yes **B.** No

**3.2. What is the chronic illness?**_____

**A.** Hypertension
**B.** Diabetus mellitus
**C.** Asthma
**D.** Cardiac diseases
**E.** Liver disease
**F.** Chronic renal failure
**G.** Tuberculosis (TB)
**H.** Human immunodeficiency viruses (HIV)
**I.** Others, specify_____

**3.3. Do you take drugs for the management of chronic illness? (If no skip to Q 3.5)**

**A**.Yes **B**. No

**3.4. What type of drugs are you taking?** _____

**3.5. Are you currently attending chronic illness follow-up clinic? A.** Yes **B.** No

**Part IV. Self-medication with conventional medicines**

**4.1. Have you ever-employed self-medication with conventional medicines during pregnancy? (If no skip to Q 5.1)** **A.** Yes **B**. No

**4.2. Which drugs did you use for self-medication?**

**A.** NSAIDs (write drug name (s))_____
**B.** Dermatologicals (write drug name (s))_____
**C.** Antibiotics (write drug name (s))_____
**D.** Others, Specify_____

**4.3. If you use antibiotics for self-medication, which antibiotics do you use? (Please write down all the antibiotics medications the pregnant woman mentions)**

_____

_____

_____

**4.4. Had you received any advice /counselling on self-medications drugs? (If no skip to Q 5.1)**

**A.** Yes **B.** No

**4.5. For which of the following points you had received advice?**

**A.** Tolerable side effects of drugs

**B.** Adverse drug reactions which requires prescribers visit

**C.** Management of missed dose

**D.** How to take the medication

**E.** Others specify_____

**Part V. Social drug use during pregnancy**

**5.1**. Do you smoke cigarette? (If no skip to Q 5.2.) **A.** Yes **B.** No

5.1.1. How many cigarettes do you smoke per day? _____

5.1.2. For how many years have you smoked? _____

**5.2**. Do you drink alcohol? (If no skip to Q 5.3.) **A.** Yes **B.** No

5.2.1. Which type of alcohol do you drink?_____

5.2.2. What millilitre per day do you drink? _____

5.2.3. For how many years have you drunk? _____

**5.3.** Do you chew *Khat*? (If no skip to Q 6.1.) **A.** Yes **B.** No

5.3.1. What is the average weight in grams that you chew daily? _____

5.3.2. For how many years have you chewed? _____

**5.4.** Any other social drug you used?_____

**Part VI. General questions about medicinal plants used during pregnancy**

**6.1. Have you used any medicinal plants to manage your current pregnancy illness? (If no skip to Q. 6.8, and after that thank the woman and stop the interview)**

**A.** Yes **B**. No

**6.2. What is your source of medicinal plants**? _____

A. Market places

B. Traditional healers (herbalist)

C. Garden

D. Shop

E. Neighbor

F. Others, specify_____

**6.3. Who helps you in the collection of the medicinal plants**?

A. Family members (mother, father, husband, grandmother, etc.)

B. Neighbours

C. Friends

D. My-self

E. Others, specify_____

**6.4. Who recommended you to use medicinal plants during pregnancy**?

A. Family members (mother, father, husband, grandmother, etc.)

B. Neighbours

C. Friends

D. My-self

E. Others, specify_____

**6.5. If anyone recommended you, did you get information how to use medicinal plants**?

**A.** Yes

**B.** No

**C.** Others, specify_____

**6.6. Were you satisfied with medicinal plant treatment outcomes**? **(If YES, skip to Q. 6.8)**

**A**. Yes **B**. No

**6.7. Why you were not satisfied?**

| | | |
|---|---|---|
| 6.7.1. Got abortion | **A.** Yes | **B.** No |
| 6.7.2. Uterine hyper-stimulation | **A.** Yes | **B.** No |
| 6.7.3. Fetal distress | **A.** Yes | **B.** No |
| 6.7.4. Stillbirth | **A.** Yes | **B.** No |
| 6.7.5. Uterine rupture | **A.** Yes | **B.** No |

6.7.6. Any other reason, specify _____

**6.8. Will you use medicinal plants in your future pregnancy**? **A**. Yes **B**. No

**6.9. If your answer is No to Q 6.1, why didn't you use medicinal plants in pregnancy?**

**A.** Fear of complications to the baby

**B.** Religious belief

**C.** Not aware of their use in pregnancy

**D.** Counseled by the health worker

**E.** Others, specify_____

**6.10. Outcomes of previous pregnancy for non-users of medicinal plants?**

A. Alive

B. Neonatal death

C. Stillbirth

D. Abortion

E. Others, specify_____

## Part VII. Details of medicinal plants used among pregnant women

**Instructions for enumerators**: please interview and fill the following table carefully for those women who claimed that they are using medicinal plants during pregnancy, (that is those who said "yes" to question number 6.1)

| | **Questions on medicinal plants and medicinal plant utilization**<br><br>***(Please write the appropriate response accordingly or letters of the corresponding variable option or the variable option itself under each medicinal plant the woman mentions in the ''Information about medicinal plants used by the woman'' column on the right side of this page)***<br>**NB:** ***Multiple responses are possible throughout this part*** | **Information about medicinal plants used by the woman**<br>***(If the woman mentions more types of medicinal plants, please use additional questionnaire and record the same code number to the second questionnaire)*** | | | | | |
|---|---|---|---|---|---|---|---|
| 7.1 | **Could you tell me any medicinal plant that you have used in your pregnancy, for the management of your pregnancy illnesses or for the benefit of the foetus or for any other related purpose?**<br><br>**NB:** *Please read the following medicinal plants for the interviewee and write down any Name of the plant(s)* ***(local name and the language used)*** *from the below list or other medicinal plants that she mentions*<br>1. Damakessie 8. Dingetegna 14. Ariti 20. Qarafa<br>2. Zingibil 9. Chikugn 15. Feto 21. Temenhie<br>3. Nech shinkrut 10. Bisena/Misana 16. Papaya 22. Etsefaris/astenagr<br>4. Abish 17. Ensilal 23. Areg Riesa<br>5. Tikur Azmud 11. Kebericho 18. Dimbelal 24. Senafitch<br>6. Tena-Adam 12. Kosso 19. Telba 25. Besobila<br>7. Nech-bahr zaf 13. Grawa | 1. | 2. | 3. | 4. | 5 | 6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7.2 | **For which type of pregnancy illness, do you use the medicinal plant?**<br><br>**NB:** *please read the following pregnancy related illnesses to the woman and write down any from the below list or other ailments that she mentions*<br><br>1. Pain (in back, neck or shoulder)<br>2. Headaches/Migraine<br>3. Heartburn/reflux problems<br>4. Gastritis/burning sensation<br>5. Urinary tract infection<br>6. Nausea<br>7. Vomiting<br>8. Induction of labour<br>9. Joint pain<br>10. Common cold/flu<br>11. Constipation/obstipation<br>12. Gestational hypertension (Preeclampsia)<br>13. Gestational diabetes<br>14. Abdominal cramps/ache<br>15. Postpartum bathing<br>16. Insomnia/Sleeping problems<br>17. Expel retained placenta<br>18. Prepare for labour<br>19. Leg/foot swelling<br>20. Wellbeing and nourishing foetus<br>21. General wellbeing<br>22. Mental wellbeing<br>23. Emergency illnesses<br>24. Depression | | | | | | |
| 7.3 | **In which trimester of pregnancy do you use it?** | | | | | | |
| | A. First trimester | | | | | | |
| | B. Second trimester | | | | | | |
| | C. Third trimester | | | | | | |
| | D. Throughout pregnancy | | | | | | |
| | E. Others, specify_____ | | | | | | |
| 7.4 | **For how many episodes (how many times) do you take it during your pregnancy?** | | | | | | |
| | A. Once | | | | | | |
| | B. Twice | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | C. Trice | | | | | | |
| | D. Every time when I feel sick | | | | | | |
| | E. Others, specify_____ | | | | | | |
| 7.5 | **What part of the plant do you use?** | | | | | | |
| | A. Flower | | | | | | |
| | B. Fruit | | | | | | |
| | C. Seed | | | | | | |
| | D. Leaf | | | | | | |
| | E. Root | | | | | | |
| | F. Stem | | | | | | |
| | G. Bark: which one?<br>i) Root bark<br>ii) Stem bark<br>iii) Both types of barks | | | | | | |
| | H. Others, specify_____ | | | | | | |
| 7.6 | **What is the Mode of use?** | | | | | | |
| | A. Dried | | | | | | |
| | B. Fresh | | | | | | |
| | C. Both Fresh and Dried | | | | | | |
| 7.7 | 7.7.1. **What dosage forms of the medicinal plant do you use?** | | | | | | |
| | A. Solid (powder, granules, etc.) | | | | | | |
| | B. Liquid (suspension, emulsion, solution, etc.) | | | | | | |
| | C. Semisolid (ointment, cream, etc.) | | | | | | |
| | D. Gaseous (smoking, inhalation, etc.) | | | | | | |
| | E. Others, specify_____ | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 7.7.2. What preparation methods do you use for each medicinal plant (please ask the woman and write down details of preparation procedures for each medicinal plant) | | | | | | |
| | A. Maceration | | | | | | |
| | B. Decoction | | | | | | |
| | C. Infusion (tea form) | | | | | | |
| | D. Squeezing | | | | | | |
| | E. Powdering | | | | | | |
| | F. Others, specify_____ | | | | | | |
| 7.8 | 7.8.1. **Is there any drug or medicinal plant or other additive mixed with this medicinal plant during formulation?**<br>A. Yes<br>B. No | | | | | | |
| | 7.8.2. If Yes, please mention it with the importance of its incorporation _____ | | | | | | |
| 7.9 | **What is the route of administration, with a brief explanation if possible?** | | | | | | |
| | A. Oral | | | | | | |
| | B. Topical | | | | | | |
| | C. Nasal | | | | | | |
| | D. Inhalation | | | | | | |
| | E. Others, specify_____ | | | | | | |
| 7.10 | **Medicinal plants formulation related questions:** | | | | | | |
| | 7.10.1. What is the dosage? (please write details)_____ | | | | | | |
| | 7.10.2. What is the frequency of administration per day? (please write details)__ | | | | | | |
| | 7.10.3. What is the duration of treatment? (please write details)_____ | | | | | | |
| 7.11 | **What is the solvent you used for the preparation?** | | | | | | |
| | A. Water | | | | | | |
| | B. Oil | | | | | | |
| | C. Coffee | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | D. Tea | | | | | | |
| | E. Milk | | | | | | |
| | F. Soup | | | | | | |
| | G. Others, specify_____ | | | | | | |
| 7.12 | **7.12.1. Is there any contraindications or any dietary restriction imposed during medicinal plants treatment?**<br>A. Yes<br>B. No | | | | | | |
| | **7.12.2. If yes, please tell me details**_____ | | | | | | |
| 7.13 | **7.13.1. Do you have any information about precautions to be taken during treatment?**<br>A. Yes<br>B. No | | | | | | |
| | **7.13.2. If yes, please tell me details**_____ | | | | | | |
| 7.14 | **7.14.1. Have you encountered/experienced any side effects during treatment?**<br>A. Yes<br>B. No | | | | | | |
| | **7.14.2. If yes, please tell me details**_____ | | | | | | |
| 7.15 | **7.15.1. Have you encountered/experienced any adverse effects during treatment?**<br>A. Yes<br>B. No | | | | | | |
| | **7.15.2. If yes, please tell me details**_____ | | | | | | |
| 7.16 | **7.16.1. Is there any antidotes to the adverse (unwanted) effects of the medicinal plant?**<br>A. Yes<br>B. No | | | | | | |
| | **7.16.2. If yes, please tell me details**_____ | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7.17 | **7.17.1. Is there any interactions (medicinal plants -conventional medicine and/ or medicinal plants - medicinal plants interaction) you experienced/expected during treatment?** | | | | | | |
| | **7.17.2. If yes, please tell me details_____** | | | | | | |
| 7.18 | **7.18.1. Have you ever used medicinal plant for foetal advantage purpose?**<br>A. Yes<br>B. No | | | | | | |
| | **7.18.2. If yes, which medicinal plant?** | | | | | | |
| | **7.18.3. What is the proposed advantage of the medicinal plant for the foetus?___** | | | | | | |
| 7.19 | **7.19.1. Is there any medicinal plants contraindicated during pregnancy?**<br>A. Yes<br>B. No | | | | | | |
| | **7.19.2. If yes, why? please tell me details_____** | | | | | | |
| 7.20 | **7.20.1. Is there any medicinal plants contraindicated during lactation?**<br>A. Yes<br>B. No | | | | | | |
| | **7.20.2. If yes, why? please tell me details_____** | | | | | | |
| 7.21 | **Anything you want to tell us before we conclude the interview?_____** | | | | | | |



**I thank you for your time and cooperation!**

**Data collector: Name _____ Signature _____ date_____**

**Additional table 2: Data extraction form for patient medical record review**

Basic admission details and patient characteristics:

- Study Id ☐; Admission ward: Maternity/labour ☐; Gynaecology ☐
- Age ☐; Weight ☐; Height ☐
- Admission date ☐ Discharge date ☐ Duration of hospitalization ☐
- Gestational age (in weeks) ☐
- Gravidity: ☐; Parity ☐
- Type of patient: Antenatal ☐ Postnatal ☐
- Type of delivery: Vaginal delivery ☐ Cesarean delivery ☐
- Breast feeding :Yes ☐ No ☐
- Known drug allergies: Yes ☐ No ☐; Type of drug allergy ☐

| |
|---|
| Details of admission (including vital signs): |

| |
|---|
| Pregnancy outcomes and other obstetrics data (live birth, stillbirth, twin birth, postpartum haemorrhage, congenital abnormalities/birth defects, hypertension/eclampsia/HELLP, diabetes, placental abruption, etc.): |

| |
|---|
| Any other maternal and perinatal outcomes: |

| |
|---|
| Relevant laboratory results and investigations (Renal function test, Liver function test, Complete Blood Count (CBC), Echocardiography, Lipid Profile, Cardiac function, Electrolyte test, Glycaemic level, etc.): |

**Data collector: Name** _____ **Signature** _____

**Supplementary table 3A**: Safety classification of medicinal plants used among pregnant women admitted in JUMC, Ethiopia

| Type of medicinal plant used | Safety class* | Number of users (N=319) | Percentage # |
|---|---|---|---|
| *Linum usitatissimum* L. (*Telba*) | Caution | 246 | 77.1 |
| *Ocimum lamiifolium* L. (*Damakessie*) | Unavailable | 40 | 12.5 |
| *Carica papaya* L. (*Papaya*) | Caution | 35 | 11.0 |
| *Zingiber officinale* Roscoe. (*Zingibil*) | Safe | 29 | 9.1 |
| *Allium sativum* L. (*Nech shinkrut*) | Safe | 28 | 8.8 |
| *Trigonella foenum-graecum* L. (*Abish*) | Harmful | 24 | 7.5 |
| *Nigella sativa* L. (*Tikur Azmud*) | Unavailable | 21 | 6.4 |
| *Ruta chalepensis* L. (*Tenadam*) | Harmful | 15 | 4.7 |
| *Eucalyptus globulus* Labill. (*Nech-bier zaf*) | Safe | 13 | 4.1 |
| *Cinnamomum verum* J.Presl (*Qarafa*) | Harmful | 4 | 1.3 |
| *Taverniera abyssinica* A. Rich. *(Dingetegna)* | Unavailable | 3 | 0.9 |
| *Artemisia abyssinica* Sch.Bip. ex A.Rich. (*Chikugn*) | Harmful | 3 | 0.9 |
| *Croton macrostachyus* Hochst. (*Bisena/Misana*) | Harmful | 3 | 0.9 |
| *Echinops kebericho* Mesfin (*Kebericho*) | Harmful | 3 | 0.9 |
| *Hagenia abyssinica* (Bruce ex Steud.) J.F.Gmel. (*Kosso*) | Harmful | 2 | 0.6 |
| *Vernonia amygdalina* Del. (*Grawa*) | Unavailable | 2 | 0.6 |
| *Saccharum officinarum* L. (*Sugar cane*) | Safe | 2 | 0.6 |
| *Brassica nigra* (L.) K.Koch (Senafitch) | Unavailable | 1 | 0.3 |
| *Zehneria scabra* Sond. (*Areg Riesa*) | Unavailable | 1 | 0.3 |
| *Artemisia afra* Jacq. ex Willd. (*Ariti*) | Harmful | 1 | 0.3 |
| *Lepidium sativum* L. (*feto*) | Unavailable | 1 | 0.3 |
| *Guizotia abyssinica* (L.f.) Cass. (*Nug*) | Unavailable | 1 | 0.3 |
| *Vicia faba* L. (*faba Beans*) | Unavailable | 1 | 0.3 |
| *Ananas comosus* (L.) Merr. (*Annanas*) | Caution | 1 | 0.3 |
| *Phoenix dactylifera* L. (*Temir*) | Safe | 1 | 0.3 |
| *Pycnostachys abyssinica* Fresen. (*Yeroo*) | Unavailable | 1 | 0.3 |
| Bahuu/B'auu (Oromiffa language name) | Unavailable | 1 | 0.3 |

***Safe**: safe to use in pregnancy; **Caution**: requires cautious to use in pregnancy; **Unavailable**; information on safety to use in pregnancy was not available in the current literature; **Harmful**: potentially harmful to use in pregnancy [Contraindicated]; #Total percentage may exceed 100% due to multiple responses

**Supplementary table 3B**: Description of Safety classification of the used medicinal plants

| Classification | Description |
|---|---|
| Safe to use in pregnancy | Available human evidence suggests the medicinal plant can be safely used in pregnancy |
| Use with Caution | Available human evidence for the medicinal plant is limited so it should not be used without consulting a qualified health care practitioner |
| Potentially harmful to use in pregnancy | Available evidence has shown adverse impacts on pregnancy or fetus following the use of the medicinal plant |
| Information unavailable | No reference was found regarding use of the medicinal plant in pregnancy |

Source [adapted from]: Kennedy DA, Lupattelli A, Koren G, Nordeng H. Safety classification of herbal medicines used in pregnancy in a multinational study. BMC Complement Altern Med. 2016; 16: 102.

**Supplementary table 4: Overview of the utilization pattern of the most frequently used medicinal plants during pregnancy in JUMC, Ethiopia**

| | Utilization properties (No. of citations) * | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Scientific name, English name, Number of users, (n = 319) | Part of plant | Plant condition | Solvent | Excipients and reason for addition** | Routes of administration | Dose and measure of formulation | Frequency*** | Duration of treatment*** | Number of occasions of use in pregnancy**** |
| *L. usitatissimum* (Flaxseed) (N=246) | Seed (244) | Dried (234)<br>Fresh or dried (10)<br>Fresh (2) | Water (192)<br>Soup (53) | Sugar (86), sweetener<br>Salt (6), flavourant<br>Butter (2), flavourant<br>Yogurt (1), flavourant<br>Sugar or Salt (1), sweetener/flavourant/ | Oral (245)<br>Topical (1) | 1 WGJC (176)<br>1 CC (38)<br>ANSA (7)<br>2 WGJC (7)<br>1 TSP (4) | Once (151)<br>Twice (60)<br>Every time (20)<br>Trice (9)<br>1 to 2 times (3) | During labour (92)<br>Every time (40)<br>Two months (39)<br>Three months (19)<br>Two days (17) | Once (138)<br>Twice (44)<br>Many times (38)<br>Trice (19) |
| *O. lamifolium (No common English name)* (N=40) | Leaf (39) | Fresh (30)<br>Fresh or dried (8) | Water (27)<br>NSD (8) | - | Oral (18)<br>Nasal/Inhalation (13) | ANSA (13)<br>1 CC (11)<br>1 to 2 CC (4) | Once (19)<br>Every time (16) | Every time (22)<br>One day (8) | Many times (17)<br>Once (16) |
| *C. papaya* (Papaya) (N=35) | Fruit (32)<br>Stem or Root Bark (2) | Fresh (32)<br>Fresh or dried (2) | Water (6)<br>NSD (29) | Sugar (8), sweetener<br>Annans (1), for better effect | Oral (35) | 1 WGJC (22)<br>ANSA (9) | Once (24)<br>Twice (5)<br>Every time (3) | During labour (17)<br>Two months (6)<br>Every time (5) | Once (22)<br>Many times (8) |
| *Z. officinale* (Ginger) (N=29) | Root or tuber (27) | Fresh or dried (14)<br>Dried (9)<br>Fresh (6) | Water (17)<br>Tea (6) | Garlic (1), for better effect | Oral (27)<br>Nasal/Inhalation (2) | 1 CC (11)<br>ANSA (7)<br>1 WGJC (4) | Once (11)<br>Every time (9)<br>Twice (5) | Every time (19)<br>One day (5) | Many times (21)<br>Once (4) |
| *A. sativum* (Garlic) (N=28) | Root or tuber (28) | Fresh or dried (16)<br>Dried (7)<br>Fresh (5) | Water (14)<br>NSD (7) | Honey (2), sweetener<br>Ginger (1), for better effect | Oral (27) | ANSA (9)<br>1 CC (5)<br>1 head of garlic (3) | Every time (11)<br>Once (9)<br>Twice (5) | Every time (18)<br>One day (3) | Many times (22) |
| *T. foenum-graecum* (Fenugreek) (N=24) | Seed (21) | Dried (22) | Water (19)<br>Soup (5) | Sugar (2), sweetener | Oral (23) | 1 WGJC (16)<br>1 CC (5)<br>ANSA (2) | Once (13)<br>Twice (8)<br>Every time (3) | During labour (14)<br>3 months (4)<br>Every time (3) | Once (19)<br>Many times (4) |
| *N. sativa* (Black seed) (N=21) | Oil (11)<br>Seed (9) | Oil (11)<br>Dried (7) | Water (7)<br>NSD (8) | Cheese (1), flavourant | Oral (16) | ANSA (4)<br>1 TSP (3) | Every time (10)<br>Once (6) | Every time (17)<br>One day (3) | Many times (13) |
| *R. chalepensis* (Fringed rue) (N=15) | Leaf (15) | Fresh (12)<br>Fresh or dried (3) | Water (11)<br>Coffee (4) | Garlic (1), for better effect | Oral (15) | 1 WGJC (6)<br>1 CC (4)<br>ANSA (4) | Once (9)<br>Every time (5) | Every time (10)<br>Two days (2) | Many times (9)<br>Once (4) |
| *E. globulus* (''Eucalyptus''/ blue gum) (N=13) | Leaf (12) | Fresh (12) | Water (11) | *O. lamifolium* and *Leucas martinicensis* (Jacq.) R.Br. (1), for better effect<br>*O. lamifolium* (1), for better effect | Nasal/Inhalation (10) | ANSA (12) | Every time (9)<br>Once (4) | Every time (7)<br>One day (5) | Many times (9)<br>Once (3) |

**Abbreviations**: WGJC: water glass/water jug cup (≈250mL), 1WGJC: One water glass/water jug cup, CC: Coffee cup, ANSA: take as 'needed in safe amount' using any appropriate measuring device for the appropriate duration the woman believes, SSp: Soup Spoon, NSD: No solvent needed, TSP: Teaspoon full. *Numbers may not add up due to missing values. **For better effect: Added to produce either synergistic or additive effect. ***Every time: a duration or frequency of treatment whereby the pregnant woman takes the MP for many frequencies per day that she believes is appropriate for a period of time until she feels cured. ****use for a given duration is taken as one occasion, for example use of the medicinal plant for a week, one month, two months, three months or more duration is taken as one occasion. On the other hand, if a woman uses for 2 weeks in the first month of pregnancy, and in the 2nd, 3rd, 4th and 5th months of pregnancy, each for one-week duration then the number of occasions will be five.

# Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

## Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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| | | Reporting Item | Page Number |
|---|---|---|---|
| **Title and abstract** | | | |
| Title | #1a | Indicate the study's design with a commonly used term in the title or the abstract | 1 |

| | | | |
|---|---|---|---|
| Abstract | #1b | Provide in the abstract an informative and balanced summary of what was done and what was found | 2 |
| **Introduction** | | | |
| Background / rationale | #2 | Explain the scientific background and rationale for the investigation being reported | 5 |
| Objectives | #3 | State specific objectives, including any prespecified hypotheses | 5 |
| **Methods** | | | |
| Study design | #4 | Present key elements of study design early in the paper | 5, 6 |
| Setting | #5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 5, 6 |
| Eligibility criteria | #6a | Give the eligibility criteria, and the sources and methods of selection of participants. | 6, 7 |
| | #7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 7-10 |
| 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. Give information separately for for exposed and unexposed groups if applicable. | 8-10 |

| | | | |
|---|---|---|---|
| Bias | #9 | Describe any efforts to address potential sources of bias | 7, 10 |
| Study size | #10 | Explain how the study size was arrived at | 7 |
| Quantitative variables | #11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why | 10, 11 |
| Statistical methods | #12a | Describe all statistical methods, including those used to control for confounding | 10, 11 |
| Statistical methods | #12b | Describe any methods used to examine subgroups and interactions | 10, 11 |
| Statistical methods | #12c | Explain how missing data were addressed | n/a |
| Statistical methods | #12d | If applicable, describe analytical methods taking account of sampling strategy | 10, 11 |
| Statistical methods | #12e | Describe any sensitivity analyses | n/a |
| **Results** | | | |
| Participants | #13a | 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. Give information separately for for exposed and unexposed groups if applicable. | 11 |
| Participants | #13b | Give reasons for non-participation at each stage | 11 |

| | | | |
|---|---|---|---|
| Participants | #13c | Consider use of a flow diagram | n/a |
| Descriptive data | #14a | Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable. | n/a |
| Descriptive data | #14b | Indicate number of participants with missing data for each variable of interest | 11 |
| Outcome data | #15 | Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable. | 21 |
| Main results | #16a | 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 | 21 |
| Main results | #16b | Report category boundaries when continuous variables were categorized | 21 |
| Main results | #16c | If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | n/a |
| Other analyses | #17 | Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses | n/a |
| **Discussion** | | | |
| Key results | #18 | Summarise key results with reference to study objectives | 15 |

| | | | |
|---|---|---|---|
| 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. | 3 |
| Interpretation | #20 | Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence. | 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 | 19 |

BMJ Open

# Medicinal plants used among pregnant women in a tertiary teaching hospital in Jimma, Ethiopia: a cross-sectional study

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# Medicinal plants used among pregnant women in a tertiary teaching hospital in Jimma, Ethiopia: a cross-sectional study

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## Abstract

**Objective** The aim of this study was to investigate and describe the use of medicinal plants during pregnancy among women admitted in the Maternity and Gynaecology wards at Jimma University Medical Centre (JUMC) in the southwest Ethiopia.

**Design** Cross-sectional study

**Setting** Maternity and Gynaecology wards at JUMC.

**Participants** 1,117 hospitalized pregnant women or postpartum women

**Main outcome measures** our primary outcomes of interest were the prevalence of use, types of medicinal plants used and their utilization among pregnant women.

**Methods:** Data were collected through structured face-to-face interviews of pregnant women or postpartum women and review of patient medical records between February and June 2017.

**Results:** Overall, 28.6% of the women reported use of at least one medicinal plant during pregnancy. Twenty-seven different types of medicinal plants were used. The most commonly used medicinal plants were *Linum usitatissimum* L. (flaxseed– use with caution) 22.0%, *Ocimum lamiifolium* L. (*damakessi*e– safety unknown) 3.6%, and *Carica papaya* L. (papaya– use with caution) 3.1%. The most common reasons for use was preparation, induction or shortening of labour. Lack of access to health facility (mainly health posts), admission to maternity ward, *khat* chewing, and alcohol consumption were the strongest predictors of medicinal plants use during pregnancy (OR >2). Only five medicinal plants used by women had sufficient evidence to be classified as safe to use in pregnancy.

**Conclusions:** Almost a third of women at the tertiary hospital in Ethiopia reported use of medicinal plants during pregnancy, most frequently to prepare, induce, reduce the intensity or shorten duration of labour. Increased awareness about potential benefits or risks of medicinal plants use during pregnancy among health care professionals and patients, and increased access

to childbirth providing health care facilities are important in order to promote safer pregnancies and better health outcomes for women and their unborn children.

**Strengths and limitations of this study**

- It was the first study in Ethiopia that used large sample size, assessed the use of medicinal plants among pregnant women in an in-patient setting and attempted to classify the medicinal plants
- The data collectors, pharmacists and nurses, were from the study area with previous data collection experience. Their knowledge about the healthcare system, culture, local languages, and medicinal plants was vital for the face-to-face interviews with the women and clearly contributed to improving the response rate and the quality of collected data.
- Although it was conducted in a large tertiary teaching hospital in southwest Ethiopia, it may not be representative of the entire country, nor women who access healthcare in secondary or primary care.
- Data were collected based on self-report of pregnant women and thus depended on her recall and accuracy of reporting, as well as her knowledge about these medicinal plants, therefore, medicinal plant use early in pregnancy was probably underreported.
- Among the post-partum women, there may be a risk of recall bias as women with negative pregnancy outcomes may try to recall use to a greater extent than women with a healthy infant.

## Background

Medicinal plants have been used for preventive and therapeutic purposes since time immemorial [1]. Medicinal plants refer to a variety of plants that have medicinal characteristics [2]. The World Health Organization estimates that 65–80% of the world's population in developing countries depend on medicinal plants for primary healthcare [3]. Women are recognized to be the main users of medicinal plants, and this widespread use also extends into pregnancy [4, 5].

Ethiopia is a landlocked country with a population of approximately 110 million [6]. It is a multi-ethnic, multicultural and multi-religious nation where Christians predominate in the northern highlands and central Ethiopia and Muslims predominate in the north-east, east, south-east and southwest [7]. More than 80% of the population lives in rural areas and 70% of the population are employed in agriculture [6]. The birth rate is 31 births per 1000 inhabitants and infant mortality rate is 35 deaths per 1000 live births [6]. Maternal mortality rate is high with 4 deaths per 1000 live births (world ranking 26th) [6]. Total fertility rate is 4 children born per woman, and mother's mean age at first birth is 20 years [6]. Physician density is only one per 12,500 inhabitants [6]. Around 80% of the population in Ethiopia use traditional medicine, of which over 95% are of plant origin [8]. The extensive use of medicinal plants in the country is often linked to an array of unique flora [8], cultural acceptability of healers and local pharmacopoeias, the belief that medicinal plants are natural and thus safer to use and are physically accessible and economically affordable [4, 5, 9].

Maternal mortality (353 deaths per 1000,000 live births) and neonatal mortality (28 deaths per 1,000 live births) in Ethiopia are among the highest in the world and are associated with a range of factors [10]. In most African countries like Ethiopia, modern healthcare facilities and

medicine are inaccessible or unaffordable [4, 11]. For this reason, many women rely on medicinal plants for their primary healthcare needs as an accessible and lower cost alternative [4] and only seek professional health services when the situation worsens [11].

Studies conducted in Ethiopia reported prevalence of medicinal plants use in pregnancy ranging from 2% to 73% [4], with ginger being the most commonly used plant, and nausea and vomiting in pregnancy (NVP) and common cold the most common reasons for use [9, 11, 12]. Many sociodemographic characteristics including residence place, marital status, family size, education level, age, and employment status were found to be strong predictors of use [4, 12-15]. Prevalence figures ranging from 4% to 100% were reported in other African countries [4]. Studies in developed countries where medicinal plant traditions may play a less strong role also reported a widespread use of medicinal plants in pregnancy, with Australia 11% - 56% [16], the US and Canada 4% - 96% [16, 17], and Europe 0.9% - 69% [16, 18].

Concerns have been raised about safety of medicinal plants during pregnancy [4, 18-21]. A recent multinational study reported that only 22% of the medicinal plants used by pregnant women were found safe to use in pregnancy [21]. Similarly, a study from Asia showed that only 39% of the most commonly used medicinal plants by expectant women were safe to use in pregnancy [19].

Although medicinal plants play a significant role in traditional medicine during pregnancy, childbirth and postpartum care [4, 20], research on their use in the management of pregnancy related illnesses is still largely limited [4, 12, 22]. The aims of this study were therefore to determine the prevalence of use and types of medicinal plants used among pregnant women admitted in the Maternity and Gynaecology wards at Jimma University Medical Centre

(JUMC), Southwest Ethiopia. This included identifying women's information on the most commonly used medicinal plants, the reasons for use, and factors associated with such use. The secondary aims were to assess women safety concerns and, who recommended use of the medicinal plants during pregnancy.

## Subjects and methods

### Study design and setting

A hospital based cross-sectional study was conducted in the Maternity and Gynaecology wards at Jimma University Medical Centre (JUMC). JUMC is one of the oldest and largest public teaching University hospitals in the country located in Jimma city, 350 kilometres south-west of Addis Ababa (the capital city of Ethiopia) [23, 24]. The referral hospital provides tertiary level medical care for about 20 million people coming from the whole south-west Ethiopia [23]. Obstetrics and Gynaecology department of the medical center has a patient load of approximately 7,600 inpatients and 11,600 outpatients each year with bed capacity of around 265 [24].

Obstetrics and Gynaecology department has two inpatient wards; Gynaecology ward and Maternity ward (which includes maternity, labour and delivery ward and maternity operation theatre) [23]. Obstetric patients with 28 weeks of pregnancy or higher as well as women in labour are admitted in the maternity ward. On the one hand, women with a gestational length of less than 28 weeks are cared for at the gynaecology ward. The gynaecology ward also manages and treats gynaecological disorders in non-pregnant women.

### Study population and sample size

Hospitalized pregnant or postpartum women in the Maternity and Gynaecology wards at JUMC were invited to participate in the study during normal working hours. Participants were consecutively informed about the aim and procedures of the study and written informed consent was obtained from each study participant. Pregnant or postpartum patients aged ≥18 years admitted in the Maternity/Labour and Gynaecology wards at the time of data collection and willing to participate were included in the study. On the other hand, women who were too ill to participate, hard of hearing, unable to speak or mentally disabled, under 18 years of age, admitted for less than four hours, and non-pregnant women admitted in the gynaecology ward were excluded from the study.

Single population proportion Kish formula [25] was used to determine the sample size based on the following assumptions; 50% expected prevalence medicinal plant use (since there is no previous study conducted on the prevalence of medicinal plant use among hospitalized pregnant patients prior to admission), 5% level significance, 80% power, and an error margin of 3%. After adding a 5% non-response rate, a final sample size of 1,121 pregnant women was required.

**Data collection and procedures**

Hospitalized pregnant and post-partum women were consecutively interviewed from February to June 2017. A pre-tested interview guided structured questionnaire, based on interviews, and data extraction form were used for data collection. Nine trained pharmacists and nurses from the study area, with close supervision of one of the investigators, conducted all interviews and data extractions. The questionnaire contains questions about the women's background, pregnancy-related illnesses, and use of medicinal plants.

After a thorough review of the literature [9, 12, 22, 26, 27], with special focus on prior studies in African countries, the authors developed the survey questionnaire. It was developed in English and then translated into Amharic and Afan Oromo languages (the predominant local languages) to suit the target population. The questionnaires were translated back into English by other persons to confirm the validity. Lecturers fluent in English and their own local language from Jimma University with previous experience of translating questionnaires performed the translation and back translation of the study questionnaire. The data collection tool was then piloted on a sample of 30 hospitalized pregnant or lactating women at *Shenen Ghibe* district hospital found in Jimma city, and based on the results from the pilot, list of 25 commonly used medicinal plants and open-ended questions were included. Plant scientific names were verified with The Plant List (www.theplantlist.org). Final version of the questionnaire contained 77 items, with multiple choice, and open-ended questions (Supplementary table 1).

Treatment related characteristics, pregnancy characteristics, pregnancy outcomes and other medical information were retrieved from patients' medical record using data extraction forms. Following the pre-test, the data extraction form required minor revisions to improve comprehension and order (Supplementary table 2).

**Measures**

*Use of medicinal plant*

Study participants were specifically asked about the use in pregnancy of 25 commonly used medicinal plants: *Linum usitatissimum* L., *Ocimum lamiifolium* L., *Zingiber officinale* Roscoe., *Allium sativum* L., *Trigonella foenum-graecum* L., *Nigella sativa* L., *Ruta chalepensis* L., *Eucalyptus globulus* Labill., *Cinnamomum verum* J.Presl, *Taverniera abyssinica* A. Rich,

*Artemisia abyssinica* Sch.Bip. ex A.Rich., *Croton macrostachyus* Hochst., *Echinops kebericho* Mesfin, *Hagenia abyssinica* (Bruce ex Steud.) J.F.Gmel., *Vernonia amygdalina* Del., *Brassica nigra* (L.) K.Koch, *Zehneria scabra* Sond., *Artemisia afra* Jacq. ex Willd., *Lepidium sativum* L., *Carica papaya* L., *Foeniculum vulgare* Mill., *Coriandrum sativum* L., *Ocimum basilicum* L., *Datura stramonium* L., *and Securidaca longipedunculata* Fresen. The above listed medicinal plants were selected based on previous ethnopharmacological studies in Ethiopia and elsewhere in Africa [9, 12, 28, 29] and were presented to the women by mentioning the local names of the plants. The women were also asked if they had used any other medicinal plant during pregnancy, labour or breastfeeding.

Details of use of medicinal plants was assessed by a series of questions including use of medicinal plant during pregnancy, type of medicinal plant used, reason for use, and utilization (*part of plant used, method of preparation, mode of use, type of solvent, type of flavouring, dosage form, dosage, measures of formulation, route of administration, frequency of administration, duration of treatment, and episodes of use*). Women were also asked about who recommended them the use of medicinal plants in pregnancy.

Information about women's safety concerns and experiences with use of medicinal plants in pregnancy was collected, and we included questions about beliefs about harmfulness, precautions to be taken and whether she had experienced any side effects or adverse effects after use of medicinal plants in pregnancy.

Reference text books [30-32] and literature reviews [4, 19, 21] were used to evaluate safety of the medicinal plants in pregnancy, and classify them into four safety categories, namely safe to use in pregnancy, use with caution, potentially harmful and information unavailable for use

in pregnancy (Supplementary table 3). Information from animal studies were used if human studies were lacking. If a medicinal plant preparation was composed of two or more plants, each plant was individually evaluated and classified.

*Women's background characteristics*

Socio-demographic information including age, religion, residence place, occupation, family size, ethnic group, marital status, educational level, access to modern health facility and walking distance to the facility were collected.

*Maternal diseases, pregnancy-related illness and treatments*

Detailed information about the woman's obstetrics and gynaecology history, history of adverse pregnancy outcome, past medical history and medication experience, and social drug use were included. Pregnant women were specifically asked about 24 common pregnancy ailments and related symptoms: Common cold/flu, pain in back, neck, or shoulder, headache, heartburn/reflux problems, abdominal cramps/ache, preparation for labour, induction of labour, expel retained placenta, postpartum bathing, wellbeing and nourishing foetus, leg/foot swelling, gestational hypertension, gestational diabetes, gastritis/burning sensation, constipation, general wellbeing, nausea, vomiting, emergency illnesses, urinary tract infection, depression, joint pain, sleeping problems and mental wellbeing. Participants were also asked whether they had used any treatment against ailments or pregnancy related conditions, whether they had had any other diseases or illnesses, and, if yes, the name of any treatment received.

In addition to the face-to-face interview questionnaire, information about pregnancy characteristics, pregnancy outcomes and other obstetrics information including gestational age, parity, gravidity, mode of delivery and length of hospital stay were collected using a data

extraction form. Moreover, maternal and perinatal outcomes of the current pregnancy were collected. Data were extracted through review of patients' medical cards.

**Statistical analysis**

The final data were checked for completeness, and responses were entered into and analysed using the Statistical Package for the Social Sciences (SPSS) software version 25.0 for Windows (IBM® SPSS® Statistics, Armonk). Respondents were categorized as users if they used at least one type of medicinal plant in their index pregnancy, whereas others were categorized as non-users. Routine meals and vitamin supplements were excluded.

Descriptive statistics were used to calculate the prevalence (%) of medicinal plants use in pregnancy, reasons for use and information sources. Univariate and multivariate logistic regression analysis was used to identify significant factors associated with medicinal plant use. Logistic regression was expressed as crude and adjusted odds ratios (ORs) with 95% confidence intervals (CIs). First, the univariate logistic regression model was fit for all explanatory variables. From this, the multivariate model was built using purposeful selection of candidate variables based on a bivariate $p \leq 0.05$. We then fit a reduced model by removing variables having no role ($p > 0.05$). A p-value of $< 0.05$ was considered statistically significant. Robustness of the multivariable model was checked using the Hosmer–Lemeshow test.

**Patient and public involvement**

Although there is a community representative in the Jimma University Institute of health Institutional Review Board (IRB), no patients or public were involved in the conception, design, conduct, and planning of this study.

## Results

From 1,137 pregnant or post-partum women invited to participate, responses from four were incomplete, and 16 declined to participate in the study resulting in 1,117 participants in the final dataset (response rate 98.6%). The median age was 25 years (interquartile range 22–30 years) and slightly more than half (53.3%), lived in an urban area. The majority were married (95.5%), had access to health facility (mainly health post) (99.1%), and lived in an area within walking distance to the nearest health facility not more than 30 minutes (66.4%). A substantial number were Muslims (65.4%), from Oromo ethnic group (69.7%), and had a household size less than five (65.4%). Many study participants were illiterate (34.0%) or either attended primary school or only able to read & write (42.3%); and were housewife (46.9%) or farmer (23.4%) by occupation (Table 1).

**Table 1.** Characteristics of women according to medicinal plant use during pregnancy at JUMC, Ethiopia.

In total, 28.6% women had used one or more medicinal plant during their current pregnancy, with an average of 1.5 medicinal plants per woman (range 1 to 8). The majority of women 206 (64.6%) used one, 78 (24.5%) took two, 25 (7.8%) took three, and 7 (2.2%) took four types of medicinal plants.

*L. usitatissimum* (flaxseed) (77.1%), O. *lamiifolium* (‘*damakesie’*) (12.5%) and *C. papaya* (*papaya*) (11.0%) were the three most commonly used medicinal plants (Table 2; Supplementary table 4). The most common reasons for the use of medicinal plants were to induce labour or to reduce the intensity and shorten duration of labour (women call it ‘‘reduction of labour’’ - ‘‘ምጥ ለማምጣት ወይም የምጥ ጥንካሬንና እርዝማኔን ለመቀነስ’’ in Amharic) (60.2%) common cold/flu (20.4%) and preparation of labour (women call *‘it softens the uterus’*

- ‘‘ማህጸን ያለሰልሳል ፣ ስለዚህ ምጥ አይከብድም’’ in Amharic) (15.7%), (Table 3). Flaxseed was the major plant employed to induce labour or to reduce the intensity and shorten duration of labour (93.2%) and to prepare for labour (44%). Ginger (35.4%) was the commonly used plant for common cold/flu management. Most of the medicinal plants were used during labour (32.2%) followed by third trimester (27.2%) or in the entire pregnancy (19.8%).

Among the 125 women admitted to the gynaecology wards, 106 (84.8%) were admitted due to elective terminations and/or miscarriages and 19 (15.2%) were admitted due to various pregnancy-related illnesses. Among the women with elective terminations and / or miscarriages, 19 (17.9%) women used one or more medicinal plants during pregnancy (range 1-3): 16 used safe, 9 used medicinal plants requiring cautious, 5 potentially harmful and 11 safety unknown medicinal plants. The 5 women who used potentially unsafe medicinal plants used *Trigonella foenum-graecum* (potential risk of uterine contraction and hypoglycemia), *Ruta chalepensis* (potential risk of uterine contraction and emmenagogue), *Cinnamomum verum* (potential risk of foetal malformation and uterine contraction), *Artemisia abyssinica* (potential risk of toxicity, uterine contraction and emmenagogue), *Croton macrostachyus* (potential risk of toxicity and uterine contraction), *Echinops kebericho* (potential risk of cytotoxicity) and *Hagenia abyssinica* (potential risk of toxicity and uterine contraction) (Supplementary table 4).

Approximately three quarters of the medicinal plants were purchased at market places (76.5%). A significant proportion of respondents (68.3%) also collected it through family members. The large majority of women were recommended to use medicinal plants by their family members (75.2%).

**Table 2.** Pregnancy disorders treated with medicinal plants at JUMC, Ethiopia, n=319.

Seeds were the major medicinal plant parts used (57.6%), dry plant material was the most common plant condition (60.1%), sugar was the most common excipient (27.8%) and oral was the predominant route of administration (89.7%).

The most common dosages were measurements by water glass units (51.7%). The most common dosage was one water glass dose (47.5%), once per day frequency (54.8%), and "as many months as needed during pregnancy" duration of treatment (32.9%). Approximately half of the respondents reported one episode of medicinal plant use (46.0%), whereas nearly one-third reported use at several occasions during pregnancy 155 (32.0%) (Supplementary table 5).

**Table 3.** Overview of the most frequently used medicinal plants during pregnancy according to number of users and the most common indications at JUMC, Ethiopia.

**Factors associated with medicinal plant use**

Women in the maternity wards, not having access to a nearby health facility, having secondary school education, having chronic illness, using conventional medicines and social drugs (*khat* chewers and alcohol consumers) were more likely to use medicinal plants in pregnancy (Table 1). Use of medicinal plants during pregnancy was not significantly associated with previous adverse pregnancy outcome, length of hospital stay, family size and gestational age.

**Safety classification of the medicinal plants**

From the 27 medicinal plants used by women, five were classified as safe to use, three as requiring caution to use, eight as potentially harmful to use in pregnancy and information on

eleven medicinal plants was not available in the current literature. The names and safety classification of the 27 individual medicinal plants are presented in Supplementary table 4.

Of those pregnant women who used medicinal plants, 14.4% used safe, 12.2% harmful, 3.4% both safe and harmful and 69.9% used one or more medicinal plants that requires cautious use or safety information unavailable. Many women who used safe or harmful medicinal plants have also used one or more plants that requires cautious use or safety information unavailable.

**Women's safety concerns and experiences**

Table 4 presents women's self-reported safety concerns and experiences with medicinal plants in pregnancy. Safety concerns with use in pregnancy was most commonly reported for *bisana* (*C. macrostachyus*) and *astenagir* (*D. stramonium*), each by five women. Four women reported drinking milk as antidote (''ማርከሻ'' in Amharic) against adverse effects from *Z. officinale, T. abyssinica, H. abyssinica,* and *C. verum.* Two women reported ingestion of *P. anisum* soup/suspension as countermeasure for poisoning from Z. *officinale* and *C. verum.* Eight women used *L. usitatissimum* for wellbeing and nourishing of the foetus. One woman reported the use of *O. lamiifolium* to improve foetal movements and breathing. *O. lamiifolium, Z. officinale*, and *A. sativum* were also reported to be useful for general foetal wellbeing. Fear of complications to the foetus (44.5%) and religious prohibition (25.9%) were the common reasons for avoiding use of medicinal plants during pregnancy.

**Table 4.** Pregnant women's self-reported safety concerns and experiences with medicinal plants at JUMC, Ethiopia

**Discussion**

Knowledge; both lay and professional, about medicinal plants use in pregnancy is essential to provide optimal maternal/foetal care. To the best of our knowledge, this paper is the first to study medicinal plant use during pregnancy among women in an inpatient setting in Ethiopia. This study provides extensive insight into types of medicinal plants, prevalence of use and reasons for use, as well as women's safety concerns and precautions on the medicinal plants they use in pregnancy. These findings are important to health care personnel, researchers, policy makers, and pregnant women themselves. Nearly a third of women (28.6%) reported use of at least one medicinal plant during pregnancy or at childbirth. Prior studies report global prevalence of use of medicinal plants in pregnancy ranging from 0.9% to 96.0% [4, 16]. Studies from Africa, however, report prevalence of medicinal plant use in pregnancy ranging from 2% (Ethiopia) to 100% (Kenya) [4]. Variation in prevalence may be explained by several factors including differences in study populations and settings, study inclusion and exclusion criteria as well as data collection methods and definitions of medicinal plants. In some studies, all forms of herbal meal preparations and nutritional supplements were counted [4] whereas in others, like our study, a more restrictive definition of medicinal plant use was used. In addition, differences in traditional practices, cultures and beliefs about health, may contribute to important difference in prevalence of use of medicinal plants.

The most frequently used medicinal plants during pregnancy were flaxseed (use with caution), *damakessi*e (safety unknown) and papaya (use with caution, it is considered potentially unsafe in large amounts only) (Table 3, Supplementary table 4). Our finding is inconsistent with previous studies reported in Africa in which *Z. officinale*, *A. sativum* and *C. pepo* were the commonly used plants [4]. The pattern of medicinal plant use is also divergent from latest findings from Ethiopia [13, 14]. This may be due to the fact that unlike previous studies, most participants in our study were women in their final stage of pregnancy and might most probably

recall the medicinal plants they took in relation to childbirth to a better extent than plants used earlier in pregnancy. This difference in pattern of use from other corners of Ethiopia and regions elsewhere may be due to difference in climate, geographical location (which will affect the types of plants commonly grow in that area) and/or disease prevalence.

Flaxseed is by far the most commonly used medicinal plant, mainly used for induction, reduction, quickening or preparation for labour (Table 3). A recent study from Ethiopia had also found similar reason for its use [15]. In other African countries, however, seed oil from *R. communis* was the most frequently used medicinal plant product to stimulate labour [4]. The most probable reasons for the disparity in the type of medicinal plant used for labour induction may be differences in geographical distribution of plants and cultural beliefs.

In line with previous studies [33, 34], women reported side effects and safety concerns related to use of flaxseed in relation to labour (Table 4). A precautious consumption of flaxseed is recommended in pregnancy and lactation due to its side effects and adverse effects when consumed in excessive quantity [34]. In remote rural areas in Ethiopia where access to health facilities is limited, use of *L. usitatissimum* may be perceived as the best option to induce or shorten labour.

*O. lamiifolium* was the second most used medicinal plant during pregnancy in our study. It was mainly used for treatment of an illness called ‘‘*Mitch’’* alone or with other medicinal plants (Table 2). ‘‘*Mitch’’* is a culturally common illness in Ethiopia and is a local name given to a febrile illness characterized by headache, fever, rash, inflammation, joint pain, back pain, chills, sweat, loss of appetite, *Herpes labialis,* muscle spasm and in severe cases, diarrhoea [1, 35]. ‘‘*Mitch’’* develops when strong sunlight strikes a part of the body that is sweating or

unclean [36], and in general after engaging in tasks that expose one to strong smells, or smoke [1, 37]. Our study found that ‘‘*Mitch’’* also affects female reproductive organs when it is exposed to excessive sunlight, which they refer it to as ‘‘*Yemahitsen Mitch’’ (*‘‘gynaecologic *mitch’’)* (Table 2). In general our result agrees with the findings of Ethiopians at home [15] and in diaspora [1] regarding ‘‘*Mitch’’* and its treatment. Studies of the leaf extract of *O. lamiifolium* have shown analgesic effects in mice [38] that support its traditional use against *Mitch*. *O. lamiifolium* is considered relatively safe and has not demonstrated any sign of acute toxicity up to the dose of 2000 mg/kg body weight in experimental mice [39].

*C. papaya* and *Z. officinale* were the third and the fourth commonly used plants respectively. Several women in this study claimed that papaya softens their birth canal (‘‘*uterus*’’) making them healthy and ready for childbirth (Table 3). Moreover, they claimed that consumption of cold papaya would soothe their gastrointestinal tract relieving them from heartburn, gastritis and cramps (Table 2). Animal studies suggest that unlike its abortifacient property at larger dose, normal consumption of ripe papaya during pregnancy may not pose any developmental toxicity and teratogenicity [40].

Although previous studies, also in Ethiopia, showed that pregnant women commonly use ginger for treating NVP [1, 4, 5, 20, 28], our study found that it was mainly used for common colds and flu in pregnancy. This could be due to the fact that previous studies involved mainly women in their earlier stages of pregnancy in which NVP is common. Concerning safety, evidences suggest that ginger did not have harmful maternal or neonatal effects [1, 4]. Its side effects reported in our study were also similar with previous reports [1].

Several socio-demographic factors were associated with use of medicinal plants in pregnancy (Table 1). We found that women who did not have access to health facility (incl. health posts) were seven times more likely to use medicinal plants than their counterparts. This is in line with other studies showing that in Africa people use traditional medicine when facilities are either unavailable or unaffordable [4, 22]. Similarly, women admitted in maternity ward were three-fold as likely to use medicinal plants as their counterparts. Most women in the maternity ward were in their final stage of pregnancy and might be using more medicinal plants for childbirth than those admitted in gynaecology ward in which hyperemesis and abortions predominate. Similarly, women who used *khat* or consumed alcohol as well as conventional medicine were twice or more as likely to use medicinal plants as their counterparts, and may either indicate a higher willingness to intake different substances in pregnancy and/or higher morbidity. Since interactions between medicinal plants and conventional medicines may occur and potentially may cause complications [4, 15, 41] , caution with concomitant use should be recommended. Health care personnel at the wards were often not informed; neither involved in decisions nor aware about the women's use of medicinal plants in relation to childbirth. As pregnancy is a time of particular vulnerability, cautious use of medicinal plants is necessary and health-care professionals should ask women about their use and provide them evidence-based information.

Despite the size and extensive data collection, this study has several limitations that should be taken into consideration. Firstly, JUMC is a tertiary referral hospital with a larger proportion of women with pregnancy complications. Our findings may not be representative of women in secondary or primary care. Secondly, as this study was based in southwest Ethiopia, participants were mostly Muslims and from the Oromo ethnic group. These groups had a lower use of medicinal plants in pregnancy compared to participants who were Orthodox and from

the Dawuro ethnic group. Our results will consequently not be generalizable to the entire country. This finding underpins the importance of including ethnic and religious background information in studies on medical plants, as it will have large impacts on utilization and reporting patterns. Thirdly, data were collected based on pregnant women's self-report and thus depended on their accuracy of recall and reporting as well as willingness to disclose utilization. It may well be that the use of medicinal plants is underestimated due to poor recall or underreporting. This may be especially important during face-to-face interviews for certain medicinal herbs, recreational or illicit drugs that are culturally unacceptable. Actual medicinal plant use in pregnancy may therefore be higher in real life, and/or different in other populations and regions in Ethiopia.

## Conclusion

Almost a third of women at the tertiary hospital in Ethiopia used medicinal plants during pregnancy, most frequently to prepare, induce, reduce the intensity or shorten duration of labour. Seeds and dry plant material was mostly used, sugar the most common excipient and oral route of administration was predominant. The most frequently used medicinal plants were *Linum usitatissimum* L. (flaxseed– use with caution) (22.0%), *Ocimum lamiifolium* L. (damakessie– safety unknown) (3.6%), and *Carica papaya* L. (papaya– use with caution) (3.1%). *O. lamiifolium* was mainly used for treatment of an illness a culturally common illness in Ethiopia called ‘‘Mitch’’, a febrile illness believed to develop after exposure to excessive sunlight. Few women reported safety concerns regarding medicinal plant use in pregnancy. The most important factors associated with use of medicinal plants in pregnancy were lack of access to health care facilities, hospitalization in the maternity ward and social drug use.

Given that women use unsafe plants during pregnancy, increased awareness about potential benefits or risks of medicinal plants use during pregnancy among health care professionals and

patients, and increased access to health care facilities are important in order to promote safer pregnancies and better health outcomes for women and their unborn children.

## Footnotes

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**Contributors:** SMA and HN conceived the idea for the study and its design. SMA collected, analysed and interpreted data and drafted the manuscript. YAA and JS participated in study coordination. SMA and HN revised and finalized the manuscript. SMA, HN, JS and YAA critically reviewed the manuscript and contributed intellectual content. All authors read and approved the final manuscript.

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**Competing interests:** None declared.

**Patient consent for publication**: Not required.

**Ethics approval:** This study was approved by Jimma University Institute of health Institutional Review Board (IRB) (ref. no. IHRPGC 7206/07) in Ethiopia, and Regional Committees for Medical and Health Research Ethics (REK Sør-Øst B) (Ref.no. 2015/2135) in Norway.

**Data availability statement**: Data are available upon reasonable request.

**Supplementary data**

Supplementary table 1: Consent form and questionnaire for medicinal plants used during pregnancy at JUMC, Ethiopia

Supplementary table 2: Data extraction form for pregnancy characteristics and admission details at JUMC, Ethiopia

Supplementary table 3: Definitions of safety categories of medicinal plants used during pregnancy at JUMC, Ethiopia

Supplementary table 4: Overview of medicinal plants used during pregnancy according to safety classification and number of users at JUMC, Ethiopia

Supplementary table 5: Overview of the utilization pattern of the most frequently used medicinal plants during pregnancy at JUMC, Ethiopia

**Table 1.** Characteristics of women according to medicinal plant use during pregnancy at JUMC, Ethiopia

| Characteristics | No. (%) | Medicinal plant use during pregnancy | | Crude OR [95% CI] [b] | Adjusted OR [95% CI] [c] |
|---|---|---|---|---|---|
| | | Yes | No | | |
| | 1117 (100) [a] | No. (%) | No. (%) | | |
| | | 319 (28.6) | 798 (71.4) | | |
| **Place of Residence** | | | | | |
| Urban | 595 (53.3) | 165 (51.7) | 430 (53.9) | 1 | - |
| Rural | 522 (46.7) | 154 (48.3) | 368 (46.1) | 1.09 [0.84-1.41] | |
| **Age (years) [d]** | | | | | |
| ≤ 20 | 223 (20.0) | 52 (16.3) | 171 (21.4) | 1 | 1 |
| 21-25 | 388 (34.7) | 116 (36.4) | 272 (34.1) | 1.40 [0.96-2.05] | 1.30 [0.88-1.94] |
| 26-30 | 320 (28.7) | 102 (32.0) | 218 (27.3) | **1.54 [1.04-2.27]** | 1.42 [0.94-2.14] |
| ≥ 31 | 186 (16.7) | 49 (15.4) | 137 (17.2) | 1.18 [0.75-1.85] | 1.17 [0.73-1.87] |
| **Marital status** | | | | | |
| Married | 1071(95.9) | 314 (98.4) | 757 (94.9) | 1 | 1 |
| Others [e] | 46 (4.1) | 5 (1.6) | 41 (5.1) | **0.29 [0.12-0.75]** | 0.39 [0.14-1.09] |
| **Religion** | | | | | |
| Islam | 731 (65.4) | 201 (63.0) | 530 (66.4) | 1 | |
| Orthodox | 305 (27.3) | 99 (31.0) | 206 (25.8) | 1.27 [0.95-1.69] | - |
| Protestant/Others [f] | 81 (7.3) | 19 (6.0) | 62 (7.8) | 0.81 [0.47-1.39] | |
| **Educational level [g]** | | | | | |
| Illiterate | 378 (34.0) | 98 (30.7) | 280 (35.1) | 1 | 1 |
| Primary /read & write | 470 (42.3) | 138 (43.3) | 332 (41.6) | 1.19 [0.88-1.61] | 1.22 [0.88-1.68] |
| Secondary school | 162 (14.6) | 56 (17.6) | 106 (13.3) | **1.51 [1.02-2.25]** | **1.54 [1.01-2.36]** |
| Post-secondary school | 102 (9.2) | 27 (8.5) | 75 (9.4) | 1.03 [0.63-1.69] | 1.06 [0.62-1.79] |
| **Occupation** | | | | | |
| House wife | 524 (46.9) | 142 (44.5) | 382 (47.9) | 1 | - |
| Farmer | 261 (23.4) | 82 (25.7) | 179 (22.4) | 1.23 [0.89-1.71] | |
| Trader/Merchant | 163 (14.6) | 49 (15.4) | 114 (14.3) | 1.16 [0.79-1.70] | |
| Government employee | 95 (8.5) | 30 (9.4) | 65 (8.1) | 1.24 [0.77-1.99] | |
| Others [h] | 74 (6.6) | 16 (5.0) | 58 (7.3) | 0.74 [0.41-1.33] | |
| **Ethnic Group** | | | | | |
| Oromo | 779 (69.7) | 224 (70.2) | 555 (69.5) | 1 | 1 |
| Amhara | 87 (7.8) | 21 (6.6) | 66 (8.3) | 0.79 [0.47-1.32] | 0.83 [0.48-1.45] |
| Yem | 81 (7.3) | 24 (7.5) | 57 (7.1) | 1.04 [0.63-1.72] | 1.14 [0.66-1.97] |
| Dawuro | 70 (6.3) | 12 (3.8) | 58 (7.3) | **0.51 [0.27-0.97]** | 0.64 [0.33-1.25] |
| Others [i] | 100 (9.0) | 38 (11.9) | 62 (7.8) | 1.52 [0.99-2.34] | 1.57 [1.00-2.48] |
| **Access to health facility [j]** | | | | | |
| Yes | 1107 (99.1) | 313 (98.1) | 794 (99.5) | 1 | 1 |
| No | 10 (0.9) | 6 (1.9) | 4 (0.5) | **3.81 [1.07-13.58]** | **6.92 [1.77-27.10]** |
| **Walking distance to the nearest health facility** | | | | | |
| Close, ≤30 min. | 731 (66.4) | 203 (63.6) | 528 (66.2) | 1 | - |
| Somewhat far, 31-60 min. | 245 (22.3) | 67 (21.0) | 178 (22.3) | 0.98 [0.71-1.35] | |
| Far, >60 min. | 125 (11.4) | 43 (13.5) | 82 (10.3) | 1.36 [0.91-2.04] | |
| **Gravidity [k]** | | | | | |
| Primigravida | 431 (38.6) | 307 (38.5) | 124 (38.9) | 1 | - |
| Multigravida | 686 (61.4) | 491 (61.5) | 195 (61.1) | 0.98 [0.75-1.28] | |
| **Gestational age** | | | | | |
| Preterm pregnancy | 231 (20.7) | 60 (18.8) | 171 (21.4) | 1 | 1 |
| Term pregnancy | 735 (65.8) | 208 (65.2) | 527 (66.0) | 1.13 [0.81-1.57] | 0.80 [0.52-1.25] |
| Post term pregnancy | 62 (5.6) | 27 (8.5) | 35 (4.4) | **2.20 [1.23-3.93]** | 1.65 [0.85-3.20] |
| Others [l] | 89 (8.0) | 24 (7.5) | 65 (8.1) | 1.05 [0.61-1.83] | 0.72 [0.38-1.36] |
| **Patient type** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Gynaecology ward | 125 (11.2) | 22 (6.9) | 103 (12.9) | 1 | 1 |
| Maternity ward | 992 (88.8) | 297 (93.1) | 695 (87.1) | **2.00 [1.24-3.23]** | **2.80 [1.43-5.48]** |
| **Chronic illness [m]** | | | | | |
| No | 1061 (95.0) | 294 (92.2) | 767 (96.1) | 1 | 1 |
| Yes | 56 (5.0) | 25 (7.8) | 31 (3.9) | **2.10 [1.22-3.62]** | **1.83 [1.04-3.24]** |
| **Conventional medicine use [n]** | | | | | |
| No | 817 (73.1) | 209 (65.5) | 608 (76.2) | 1 | 1 |
| Yes | 300 (26.9) | 110 (34.5) | 190 (23.8) | **1.68 [1.27-2.23]** | **1.83 [1.36-2.46]** |
| **Chew Khat (*Catha edulis*) [o]** | | | | | |
| No | 1052 (94.2) | 289 (90.6) | 763 (95.6) | 1 | 1 |
| Yes | 65 (5.8) | 30 (9.4) | 35 (4.4) | **2.26 [1.36- 3.75]** | **2.53 [1.46-4.39]** |
| **Alcohol consumption** | | | | | |
| No | 1071 (95.9) | 297 (93.1) | 774 (97.0) | 1 | 1 |
| Yes | 46 (4.1) | 22 (6.9) | 24 (3.0) | **2.39 [1.32-4.33]** | **2.43 [1.28-4.62]** |
| **Past adverse pregnancy outcome** | | | | | |
| No/not applicable | 994 (89.0) | 275 (86.2) | 719 (90.1) | 1 | - |
| Yes | 123 (11.0) | 44 (13.8) | 79 (9.9) | 1.51 [1.00-2.28] | |

[a]Numbers may not add up to 1117 due to missing values, [b]CI, confidence interval, OR, odds ratio; Significant findings are in bold (P<0.05); [c]Adjusted for age, marital status, educational level, ethnic group, access to health facility, gestational age, patient type, chronic illness, conventional medicine use, chew *khat*, alcohol consumption; [d]Median age 25 years, interquartile range 22–30 years; [e]Others includes single 41(3.7%), divorced 4(0.4%), widowed 1(0.1%); [f]Protestant/Others includes Protestant 74(6.6), Catholic 2(0.2%), Waqqefeta 1(0.1%), missing 4(0.4); [g]Read & write: no formal education but can read and write due to literacy campaigns, traditional religious institution and informal peer learning, Primary school: Grade 1–8, Secondary school: Grade 9–12; Post-secondary school: Technical and vocational school, college or university; [h]Others includes daily labourers 24(2.1), students 22(2.0), private institution workers 18(1.6), other sectors 10(0.9%); [i]Others includes Gurage 41(3.7), Silte 30(2.7), Kaffa 16(1.4), Tigre 3(0.3), Wolayita 3(0.3), mixed ethnic backgrounds 7(0.6); [j]Access to health facility means access to either primary, secondary or tertiary levels of healthcare; it mainly represents access to health posts; [k]Gravidity includes the current pregnancy; [l]Women are in the first, second or third trimester of pregnancy but exact week of pregnancy is not known ; [m]Includes hypertension, diabetes mellitus, asthma, cardiac diseases, chronic gastritis/peptic ulcer, HIV, chronic renal failure, chronic liver disease, etc.; [n]Refers to self-medication with conventional medicine before hospitalization; [o]*Khat* (*Catha edulis*) plant leaves are chewed by people for their stimulant action

552 **Table 2.** Pregnancy disorders treated with medicinal plants at JUMC, Ethiopia, n=319

| Variables | Number (%) [a] | Most common medicinal plants (number of users) |
|---|---|---|
| Induction and "reduction'' of labour [b] | 192 (60.2) | *Linum usitatissimum* (Flaxseed) (179)<br>*Trigonella foenum-graecum* (Fenugreek) (6)<br>*Carica papaya* (Papaya) (4) |
| Common cold/flu | 65 (20.4) | *Zingiber officinale* (Ginger) (23)<br>*Allium sativum* (Garlic) (13)<br>*Eucalyptus globulus* (*Nech-bahir zaf* ) (12) |
| Preparation for labour | 50 (15.7) | *Linum usitatissimum* (Flaxseed) (22)<br>*Carica papaya* (Papaya) (17)<br>*Trigonella foenum-graecum* (Fenugreek) (11) |
| Abdominal cramps/ache | 30 (9.4) | *Nigella sativa* (Black seed) (10)<br>*Allium sativum* (Garlic) (5)<br>*Carica papaya* (Papaya) (4) |
| Headache/Migraine | 27 (8.5) | *Nigella sativa* (Black seed) (10)<br>*Ocimum lamiifolium* (*Damakessie*) (8)<br>*Allium sativum* (Garlic) (3) |
| Heartburn/reflux problems | 27 (8.5) | *Linum usitatissimum* (Flaxseed) (16)<br>*Carica papaya* (Papaya) (5) |
| *Mitch* [c] | 24 (7.5) | *Ocimum lamiifolium* (*Damakessie*) (18) |
| Gastritis/burning sensation | 22 (6.9) | *Linum usitatissimum* (Flaxseed) (19) |
| Constipation/obstipation | 17 (5.3) | *Linum usitatissimum* (Flaxseed) (16) |
| General wellbeing | 15 (4.7) | *Allium sativum* (Garlic) (5)<br>*Ruta chalepensis* (Fringed rue) (3) |
| Nausea | 11 (3.4) | *Zingiber officinale* (Ginger) (4)<br>*Ruta chalepensis* (Fringed rue) (4) |
| Helminths | 6 (1.9) | *Carica papaya* (Papaya) (2)<br>*Hagenia abyssinica* (*Kosso*) (2) |
| Leg/foot Swelling | 5 (1.6) | *Linum usitatissimum* (Flaxseed) (1)<br>*Cinnamomum verum* (Cinnamon) (1)<br>*Croton macrostachyus* (Bisena) (1)<br>*Veronia amygdalina* (Grawa) (1)<br>B'auu (1) |
| Prevent bad smell | 5 (1.6) | *Ocimum lamiifolium* (*Damakessie*) (5) |
| Strong craving | 5 (1.6) | *Linum usitatissimum* (Flaxseed) (1)<br>*Carica papaya* (Papaya) (1)<br>*Nigella sativa* (Black seed) (1)<br>*Ruta chalepensis* (Fringed rue) (1)<br>*Zingiber officinale* (Ginger) (1) |
| Emergency illnesses | 4 (1.3) | *Ocimum lamiifolium* (Damakessie) (3) |
| Postpartum bathing | 4 (1.3) | *Eucalyptus globulus* (*Nech-bahir zaf*) (3) |
| Vomiting | 3 (0.9) | *Zingiber officinale* (Ginger) (2) |
| *Yemahitsen mitch* [c] ('gynaecologic *mitch')* | 3 (0.9) | *Croton macrostachyus* (Bisena) (1)<br>*Ocimum lamiifolium* (Damakessie) (1)<br>*Pycnostachys abyssinica* (*Yeroo*) (1) |
| Depression | 3 (0.9) | *Echinops kebericho* (Kebericho) (1)<br>*Ruta chalepensis* (Fringed rue) (1)<br>*Cinnamomum verum* (Cinnamon) (1) |
| Wellbeing and nourishing the foetus | 3 (0.9) | *Linum usitatissimum* (Flaxseed) (2)<br>*Trigonella foenum-graecum* (Fenugreek) (1) |
| Cough | 2 (0.6) | *Nigella sativa* (Black seed) (1)<br>*Saccharum officinarum* (Sugar crystals) (1) |
| *Birdd* [d] | 2 (0.6) | *Allium sativum* (Garlic) (1)<br>*Nigella sativa* (Black seed) (1) |
| Diarrhoea | 2 (0.6) | *Ocimum lamiifolium* (Damakessie) (1)<br>*Taverniera abyssinica* (Dingetegn) (1) |
| Joint pain *(kurtimatt)* | 2 (0.6) | *Allium sativum* (Garlic) (1) |

| Variables | Number (%) [a] | Most common medicinal plants (number of users) |
|---|---|---|
| | | *Nigella sativa* (Black seed) (1) |
| Sleeping problems | 2 (0.6) | *Artemisia abyssinica* (*Chikugn*) (2) |
| Mental wellbeing | 2 (0.6) | *Ruta chalepensis* (Fringed rue) (2) |
| Evil eye | 2 (0.6) | *Artemisia afra* (*Ariti*) (1)<br>*Veronia amygdalina* (*Grawa*) (1) |
| Others [e] | 15 (4.7) | *Linum usitatissimum* (Flaxseed) (3)<br>*Allium sativum* (Garlic) (3)<br>*Ocimum lamiifolium* (*Damakessie*) (3) |

[a]Total percentage may exceed 100% due to multiple responses
[b]***Reduction of labour***: Includes reduced intensity and shortened duration of labour.
[c]***'Mitch':*** A febrile illness believed to develop when strong sunlight strikes a part of the body that is sweating or unclean.
[d]'***Birdd***': An illness typified by a feeling of chills, arthralgia, myalgia, generalized body weakness, pain (particularly chest pain) and coughing. In general, it is characterized by pneumonia/flu-like symptoms.
[e]Others includes make labour simple, stomach rambling, quicken labour, prevent '*megagna'*, fever, facilitation of digestion, tonsillitis, pregnancy associated body/physical illnesses, skin rashes ('*Shifta*'), abdominal distension/bloating, throat congestion ('*Guroroyen siyafinegn'*), malaria , appetizer, upper extremity fatigability, for any illness, each with a frequency of one.

**Table 3.** Overview of the most frequently used medicinal plants during pregnancy according to number of users and the most common indications at JUMC, Ethiopia

| Medicinal plant (English name) (local name) Preparation method | Number of users (n = 319), n (28.6%) | Most common indications (No. of citations) |
|---|---|---|
| *Linum usitatissimum* L. (Flaxseed or Linseed) (*Telba*)<br>Flax seeds are roasted, pounded, thoroughly mixed with water and consumed in soup form. | 246 (77.1) | Induction or ‘‘reduction’’ of labour (179) [a]<br>Prepare for labour (22)<br>Heartburn/reflux problems (19)<br>Constipation/obstipation (16)<br>Gastritis/burning sensation (14)<br>Abdominal cramps or ache (2) |
| *Ocimum lamiifolium* L. (No common English name) (*Damakessie*)<br>Adding minced fresh leaves or steeping in leaves in tea, coffee, milk or decoction or maceration of minced root are drunk, or fresh leaves are put in nostrils and sniffed | 40 (12.5) | Mitch (19) [b]<br>Common cold/flu (10)<br>Headaches/Migraine (8)<br>Prevent bad smell (5)<br>Emergency cases/illnesses (3)<br>Nausea (2) |
| *Carica papaya* L. (Papaya) (*Papaya*)<br>Ripened fresh fruit is eaten or its juice is extracted and then drunk | 35 (11.0) | Prepare for labour (17)<br>Heartburn/reflux problems (5)<br>Induce labour (4)<br>Abdominal cramps or ache (4)<br>Gastritis/burning sensation (3)<br>Helminths (2) |
| *Zingiber officinale* Roscoe. (Ginger) (*Zingibil*)<br>Drinking aqueous decoction or maceration, or drinking minced root with water or tea | 29 (9.1) | Common cold/flu (23)<br>Nausea (4)<br>Vomiting (2)<br>Abdominal cramps (2) |
| *Allium sativum* L. (Garlic) (*Nech shinkrut*)<br>Drinking minced cloves with tea, coffee, milk or eating raw cloves with Ethiopian bread, ‘*Injera*’ | 28 (8.8) | Common cold/flu (13)<br>General wellbeing (5)<br>Abdominal cramps (5)<br>Headaches/Migraine (3)<br>*Birdd* (2) [c] |
| *Trigonella foenum-graecum* L. (Fenugreek) (*Abish*)<br>Drink aqueous maceration of seeds or consume roasted and powdered seeds in soup form | 24 (7.5) | Prepare for labour (11)<br>Induce labour (6)<br>Gastritis/burning sensation (4) |
| *Nigella sativa* L (Black seed) (*Tikur Azmud*)<br>Drinking few drops of the seed oil with tea, coffee, milk or sniffing the oil drops | 21 (6.4) | Headaches/Migraine (10)<br>Abdominal cramps or ache (7)<br>Common cold/flu (6) |
| *Ruta chalepensis* L. (Fringed rue) (*Tenadam*)<br>Adding minced fresh leaves or steeping in leaves in tea, coffee, or milk and then drunk or fresh leaves squeezed, and then drunk | 15 (4.7) | Nausea (4)<br>General wellbeing (3)<br>Headaches/Migraine (2)<br>Mental wellbeing (2)<br>Abdominal cramps (2) |
| *Eucalyptus globulus* Labill. (‘‘Eucalyptus’’) (*Nech-bahir zaf)*<br>Leaves are boiled in water, patient fumigated and the vapour is inhaled | 13 (4.1) | Common cold/flu (12)<br>Postpartum bathing (3)<br>Mitch (2) |

[a]‘‘**Reduction of labour**’’: Includes reduced intensity and shortened duration of labour; [b]‘***Mitch***’: A febrile illness believed to develop when strong sunlight strikes a part of the body that is sweating or unclean; [c]‘‘***Birdd***’: An illness typified by a feeling of chills, arthralgia, myalgia, generalized body weakness, pain (particularly chest pain) and coughing. In general, it is characterized by pneumonia/flu-like symptoms

**Table 4.** Pregnant women's self-reported safety concerns and experiences with medicinal plants at JUMC, Ethiopia, n=319

| Medicinal plants (MPs), reported reasons for contraindication (No. of citations) | MPs, reported precautions (No. of citations) | MPs, reported Side effects (No. of citations) | MPs, reported adverse drug reactions (No. of citations) |
|---|---|---|---|
| Flaxseed: Cause uterine contractions, miscarriage or premature labour (2), Dries up breastmilk (1) | Flaxseed [a]: Aloe vera is bitter and makes flaxseed preparation unpalatable (1), the woman should stay away from sunlight while /after taking flaxseed preparation (1) | Flaxseed: Nausea (4), Postpartum shivering (1), Diarrhoea (1), Vomiting (1), Loss of appetite (1), | Flaxseed: Severe postpartum shivering (1), Loss of consciousness (1), Uterine rupture (1), Still birth (1) |
| *Kosso* [b]: Causes uterine stimulation (4) | *Kosso*: Kosso protects the mother from outside person's *'tila'* as it may kill her (1), After taking Kosso, the woman should stay at home for 2 days protected from outside person's *'tila'* (1) [c] | *Kosso*: Diarrhoea (2) | *Kosso*: Severe diarrhoea (2) |
| *Dingetegna*: harmful during pregnancy, reason unknown (1) [d] | *Dingetegna* [e]: the woman who took *dingetegna* should stay at home, outsiders should not be allowed to get in for fear of their *'tila'* (1) | *Dingetegna*: Diarrhoea (2), Vomiting (1) | *Dingetegna*: Severe diarrhoea (2) |
| *Damakessie*: Causes uterine stimulation (1) | *Damakessie* [f]: After applying MPs stay at home, going outside is forbidden (1) [g] | *Damakessie*: Loss of appetite (1), Bitter (after) taste (1), Sneezing (1) | Chikugn [h]: Anencephaly: giving birth to a headless neonate (1) |
| *Tej Sar* [i]: Causes uterine stimulation (1), harmful during pregnancy, reason unknown (1) [d] | Cinnamon [j]: inflammatory to the stomach, thus eat food before taking cinnamon (1) | Cinnamon: Heart burn (1) | Cinnamon: Severe heart burn (1) |
| Ensilal [k]: Causes uterine stimulation (1), harmful during pregnancy, reason unknown (1) [d] | Garlic: larger dose of garlic is irritant, thus eat food before taking it (1) | Garlic: Discomfort to foetus (1), Gastric irritation (1), Loss of appetite (1) | Garlic: Harm to the foetus (1), Bad mouth smell (1), Severe heart burn (1) |
| Grawa [l]: Causes uterine stimulation (2) harmful during pregnancy, reason unknown (1) [d] | Ginger: stomach irritant, thus eat food before taking ginger (1), beware since ginger decreases appetite (1) and induces fever (1) | Ginger: Gastric irritation (2), Heart burn (2), Discomfort to foetus (1) | Ginger: Harm to foetus (1), Severe heart burn (1) |
| Black seed: Generally not good for the woman and the foetus, thus better not to take it during pregnancy (1) | Yeroo [m]: After applying MPs stay at home, going outside is forbidden (1) [g] | Black seed: Gastric irritation (3), Loss of appetite (1) | ------ |
| Bisana [n]: causes uterine stimulation (2), harmful to the foetus (1), generally not good for the foetus (1), its smell deteriorates health of pregnant women (1) | Bisana [o]: After applying MPs stay at home, going outside is forbidden (1) [g] | ''Eucalyptus'' [p]: Decrease in appetite (1) | ------ |
| Kebericho: Generally not good for the foetus(1) | Kebericho [q]: Kebericho interacts with *damakessie* and worsen the *Mitch* [r] disease (1) | Sugar [s]: Eye irritation (1) | ------ |
| *Etse Fares* [t]: Harmful to the foetus (1), Causes uterine stimulation (3), Generally not good for pregnant woman and the foetus (1) | Fringed rue: Kebericho should not be taken with rue because it will worsen the nausea (1), beware since it induces fever (1), There is a plant interacting with rue, but forgot its name (1) | Fringed rue: Loss of appetite (1) | ------ |
| 'Baruda' plant [u]: Causes uterine stimulation (1) | ------ | ------ | ------ |

| | | | |
|---|---|---|---|
| *Endod* [v]: Causes uterine stimulation (1) | ------ | ------ | ------ |
| *Metere* [w]: Harmful to the foetus (1) | ------ | ------ | ------ |
| *Feto* [x]: Causes uterine stimulation (1) | ------ | ------ | ------ |

[a]After consuming Flaxseed *(L. usitatissimum*) preparation the woman should stay at home, exposure to sunlight results in *Mitch* disease, [b]*H. abyssinica*, [c]'*Tila*', loosely translated means the shade of a person that is believed to have pernicious effect, [d]The plant is harmful during pregnancy, but the woman does not know the reason for contraindication, [e]*T. abyssinica*, [g]Stay at home after applying the [f] Damakessie (*O. lamiifolium)* / [m]Yeroo (*P. abyssinica*) / [o]Bisana (*C. macrostachyus*) mixture formulation, going outside is forbidden; Otherwise there is relapse of the disease; [h]*A. abyssinica*, [i]*Cymbopogon citratus* (DC.) Stapf, [j]*C. verum*, [k]*F. vulgare*, [l]*V. amygdalina*, [n]*C. macrostachyus, [p]E.globulus,* [q]*E. kebericho*, [r]*Mitch*: A febrile illness believed to develop when strong sunlight strikes a part of the body that is sweating or unclean; [s]*Saccharum officinarum* L., [t]*Datura stramonium L.*, [u]inserting the root in to the vagina and/or drink its juice, [v]*Phytolacca dodecandra* L'Hér., [w]*Glinus lotoides* L., [x]*L. sativum,* [b, x](particularly use of *Kosso* with *Feto* causes severe uterine stimulation).

## References

1. Hailemeskel B, Fullas F, Habte A, Al-Matari R, Brewer D. A review of natural remedies commonly used by Ethiopian immigrants in the USA. Curr Res Integr Med. 2017; 2: 31-36.

2. Jamshidi-Kia F, Lorigooini Z, Amini-Khoei H: Medicinal plants: Past history and future perspective. J Herbmed Pharmacol. 2018; 7:1-7.

3. Mazzari ALDA, Prieto JM: Herbal medicines in Brazil: pharmacokinetic profile and potential herb-drug interactions. Front Pharmacol. 2014; 5: 162.

4. Ahmed SM, Nordeng H, Sundby J, Aragaw YA, de Boer HJ: The use of medicinal plants by pregnant women in Africa: A systematic review. J Ethnopharmacol. 2018; 224:297-313.

5. Shewamene Z, Dune T, Smith CA: The use of traditional medicine in maternity care among African women in Africa and the diaspora: a systematic review. BMC Complement Altern Med. 2017; 17: 382.

6. United States Central Intellingence Agency (CIA). The World Fact Book, Africa: Ethiopia. https://www.cia.gov/the-world-factbook/countries/ethiopia/#people-and-society. (2018). Accessed 13 Feb 2019.

7. Ficquet E. Interfaith Relations between Christianity and Islam in Ethiopia https://www.sciencespo.fr/ceri/fr/oir/interfaith-relations-between-christianity-and-islam-ethiopia. (2019). Accessed 20 Feb 2021.

8. Ethiopian Public Health Institute (EPHI). Traditional and Modern Medicine Research http://www.ephi.gov.et/index.php/research/traditional-modern-medicine. (2019). Accessed 25 Feb 2019.

9. Laelago T, Yohannes T, Lemango F: Prevalence of herbal medicine use and associated factors among pregnant women attending antenatal care at public health facilities in Hossana town, southern Ethiopia: facility based cross sectional study. Arch Public Health. 2016; 74 : 7.

10. United Nations Children's Fund (UNICEF). Maternal and Newborn Health Disparities country profiles. https://data.unicef.org/resources/maternal-newborn-health-disparities-country-profiles/ (2018). Accessed 05 Sept 2019.

11. Ahmed SM, Sundby J, Aragaw YA, Abebe F. Self-Medication and Safety Profile of Medicines Used among Pregnant Women in a Tertiary Teaching Hospital in Jimma, Ethiopia: A Cross-Sectional Study. Int J Environ Res Public Health. 2020; 17: 3993.

12. Bayisa B, Tatiparthi R, Mulisa E: Use of herbal medicine among pregnant women on antenatal care at Nekemte Hospital, Western Ethiopia. Jundishapur J Nat Pharm Prod. 2014; 9: e17368.

13. Jambo A, Mengistu G, Sisay M, Amare F, Edessa D: Self-Medication and Contributing Factors Among Pregnant Women Attending Antenatal Care at Public Hospitals of Harar Town, Ethiopia. Front Pharmacol. 2018; 9: 1063.

14. Mekuria AB, Erku DA, Gebresillassie BM, Birru EM, Tizazu B, Ahmedin A: 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 Complement Altern Med. 2017; 17: 86.

15. Nega SS, Bekele HM, Meles GG, Nordeng H: Medicinal Plants and Concomitant Use with Pharmaceutical Drugs Among Pregnant Women. J Altern Complement Med. 2019; 25: 427-434.

16. Hall HG, Griffiths DL, McKenna LG: The use of complementary and alternative medicine by pregnant women: A literature review. Midwifery. 2011; 27: 817-824.

17. Westfall RE: Herbal healing in pregnancy: women's experiences. J Herb Pharmacother. 2003, 3: 17-39.

18. Kennedy DA, Lupattelli A, Koren G, Nordeng H: Herbal medicine use in pregnancy: results of a multinational study. BMC Complement Altern Med. 2013; 13: 355.

19. Ahmed M, Hwang JH, Choi S, Han D: Safety classification of herbal medicines used among pregnant women in Asian countries: a systematic review. BMC Complement Altern Med. 2017; 17: 489.

20. Ahmed M, Hwang JH, Hasan MA, Han D: Herbal medicine use by pregnant women in Bangladesh: a cross-sectional study. BMC Complement Altern Med. 2018; 18: 333.

21. Kennedy DA, Lupattelli A, Koren G, Nordeng H: Safety classification of herbal medicines used in pregnancy in a multinational study. BMC Complement Altern Med. 2016; 16: 102.

22. Godlove M: Prevalence of herbal medicine use and associated factors among pregnant women attending antenatal clinic at Mbeya Refferal Hospital in 2010 (M.Sc. Thesis) http://hdl.handle.net/123456789/41. Muhimbili University of Health and Allied Sciences, Dar es salaam, Tanzania. (2011). Accessed 03 Oct 2018.

23. Segni H, Ayana D, Jarso H: Prevalence of Hyperemesis Gravidarum and Associated Factors Among Pregnant Women at Jimma University Medical Center, South West Ethiopia: A Cross-Sectional Study. EC Gynaecol. 2016; 3: 376-387.

24. Jimma University Specialized hospital. http://www.ju.edu.et/jimma-university-specialized-hospital-jush (2017). Accessed 13 Sept 2018.

25. Kish L: Survey Sampling. New York, NY,USA: John Wiley & Sons, Inc.; 1965.

26. Mureyi DD, Monera TG, Maponga CC: Prevalence and patterns of prenatal use of traditional medicine among women at selected harare clinics: a cross-sectional study. BMC Complement Altern Med. 2012; 12: 164.

27. Mkize GT: An Assessment of Use of Traditional Medicine in Pregnancy & Associated Factors Among Black South African Women Delivering in Bertha Gxowa Hospital (M.Sc. Thesis). University of the Witwatersrand, Johannesburg, South Africa. http://wiredspace.wits.ac.za/handle/10539/17340?show=full (2015). Accessed 25 Apr, 2019.

28. Gall A, Shenkute Z. Ethiopian Traditional and Herbal Medications and Their Interactions with Conventional Drugs. https://ethnomed.org/clinical/pharmacy/ethiopian-herb-drug-interactions. Accessed 17 Oct 2018.

29. Gedif T, Hahn H-J: The use of medicinal plants in self-care in rural central Ethiopia. J Ethnopharmacol. 2003; 87:155-161.

30. Mills E, Duguoa J-J, Perri D, Koren G: Herbal medicines in pregnancy and lactation: An evidence-based approach. London ; New York: Taylor & Francis; 2006.

31. Mills S, Bone K: The Essential Guide to Herbal Safety. St. Louis, Mo: Elsevier Churchill Livingstone; 2005.

32. Gardner Z, McGuffin M: American Herbal Products Association. American herbal products association's botanical safety handbook, 2nd edn. Boca Raton, FL: CRC Press; 2013.

33. Zamawe C, King C, Jennings HM, Mandiwa C, Fottrell E: Effectiveness and safety of herbal medicines for induction of labour: a systematic review and meta-analysis. BMJ Open. 2018; 8: e022499.

34. Gokhale S, Sahu A: Pharmacological properties of flaxseed, *Linum usitatissimum* Linn., as a potential medicinal plant: An overview. World J Pharm Sci. 2016; 4: 207-215.

35. Hodes RM, Teferedegne B: Traditional beliefs and disease practices of Ethiopian Jews. Isr J Med Sci. 1996; 32: 561-7.

36. Hodes R: Cross-cultural medicine and diverse health beliefs. Ethiopians abroad. West J Med. 1997; 166: 29-36.

37. Kifle H, Woldu AM, Asres K, Mazumder A, Bucar F: Composition, antimicrobial and free-radical scavenging properties of the essential oil of Damakese (*Ocimum lamiifolium*): A popular home remedy in Ethiopia. Int J Essen Oil Ther. 2007; 1: 110 - 116.

38. Debella A, Makonnen E, Abebe D, Teka F, Kidanemariam AT: Pain management in mice using the aqueous and ethanol extracts of four medicinal plants. East Afr Med J. 2003; 80: 435-439.

39. Kefe A, Giday M, Mamo H, Erko B: Antimalarial properties of crude extracts of seeds of Brucea antidysenterica and leaves of *Ocimum lamiifolium*. BMC Complement Altern Med. 2016; 16:118.

40. Oderinde O, Noronha C, Oremosu A, Kusemiju T, Okanlawon OA: Abortifacient properties of aqueous extract of Carica papaya (Linn) seeds on female Sprague-Dawley rats. Niger Postgrad Med J. 2002; 9: 95-8.

41. El Hajj M, Holst L: Herbal Medicine Use During Pregnancy: A Review of the Literature With a Special Focus on Sub-Saharan Africa. Front Pharmacol. 2020; 11:866.

# Consent form and Interviewer administered questionnaire

**Medicinal plants used among pregnant women admitted in Jimma University Medical Center maternity and gynaecology wards in Jimma city, Ethiopia**

## Consent form

### Background and purpose

This is an invitation for you to participate in a research conducted with the objective of assessing medicinal plants and pharmaceutical medicines used among pregnant women admitted in Jimma University Medical Center (JUMC) maternity and gynecology wards in Jimma city, Ethiopia. Although medicinal plants play a significant role in traditional medicine during pregnancy, childbirth and postpartum care, little is known about the extent and types of medicinal plants used during pregnancy in Ethiopia. The aim of this study is therefore to investigate and describe medicinal plants and pharmaceutical medicines used during pregnancy, the reasons for use and the utilization pattern among inpatient pregnant and lactating women. As the study is directly related to women seeking care in the maternity and gynaecology ward of this hospital, you are one of the candidates who can participate in the study. Thus, you are kindly requested to participate in the present research and provide the information required from you.

### What does the study involve?

Concerning the study process, first we will ask you questions about your background including questions about your age, religion, residence place, occupation, family size, ethnic group, marital status, educational level, access to modern health facility and walking distance to the facility. Next, we will ask you about maternal diseases, pregnancy-related illness and treatments, use of medicinal plants, information about women's safety concerns and experiences with use of medicinal plants in pregnancy. We will further collect data about your chronic diseases and medication history, self-medication with conventional medicines, and social drug use during pregnancy.

### Potential advantages and disadvantages

The results obtained from this study are useful in order to develop better strategies to appropriately use medicinal plants, minimize medicinal plant use related problems and reduce maternal morbidity and mortality. There is not any disadvantage in participating in this study, except the time that it takes to answer the study questions.

**What will happen to your personal information?**

The data registered about you will only be used in accordance with the purpose of the study as described above. All the data will be processed without name, personal identification number or other directly recognisable type of information. A code number links you to your data and only the authorized study staff will have access to this list. There will be no way of linking your individual responses to the final result of the study findings. For documentation and follow-up purposes, the data will be kept until 14.01.2024. The data will be stored as de-identified data, i.e. a file with key identifiable information stored separately from the file containing other data. The data will be anonymized within 6 months after this date. It will not be possible to identify you in the results of the study when these are published.

**Voluntary participation**

Participation in this study is voluntary. You can withdraw your consent to participate in the study at any time and without stating any particular reason. This will not have any consequences for your further treatment. If you wish to participate, please sign the declaration of consent at the bottom of this page. In case if you are not able to give written consent (i.e. due to literacy and /or cultural reasons), your oral consent will be sought and documented as equal to a written consent. There are no consequences for women who decide not to participate in this study. The patient's decision to participate or not will have no impact on the treatment(s) that she receives.

**Right to access and material storage**

If you agree to participate in the study, you are entitled to have access to the information registered about you. You are further entitled to correct any mistakes in the information we have registered. If you withdraw from the study, no further information or material will be collected about you. Data that have already been collected will not be deleted.

**Information about the outcome of the study**

You, as a participant in this study, are entitled to receive information about the outcome/result of the study.

**Funding**

Mr. Seid Mussa is a PhD student in the University of Oslo. He is a recipient of scholarship from the Norwegian Loan Fund (Lånekassen).

If you have questions concerning the study, you may contact the research team:

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**Consent for participation in the study**

I consent to participate in the study._____

(Signed by the study participant, date)

Third party consent when this is warranted, either in addition to or in place of the participant's consent._____

(Signed by a close relative/partner/friend, date)

I confirm that I have given information about the study._____

(Signed by the data collector, date)

## Questionnaire

**Instructions for enumerators:**

- Many questions allow multiple answers. Unless specifically instructed in the question, do not prompt and simply encircle the answers that the woman mentions
- For open ended questions please write down the pregnant woman's response legibly

## Part I. Socio-demographics characteristics of respondents

**1.1. Study ID code**_____

**1.2. What is your age?** _____

**1.3. What is your place of residence?**

**A.** Urban

**B.** Rural

**1.4. What is your educational level?**

**A.** Illiterate

**B.** Read and write but no formal education

**C.** Primary 1st cycle (1-4)

**D.** Primary 2nd cycle (5-8)

**E.** Secondary school (9-12)

**F.** Post-secondary school

**G.** Others, specify _____

**1.5. What is your marital status?**

**A.** Married

**B.** Single

**C.** Divorced

**D.** Widowed

**1.6. What is your ethnic group?**

**A.** Oromo

**B.** Amhara

**C.** Gurage

**D.** Dawuro

**E.** Silte

**F.** Yem

**G.** Tigre

**H.** Others, specify _____

**1.7. What is your religion?**

**A.** Islam

**B.** Orthodox Christian

**C.** Protestant Christian

**D.** Catholic Christian

**E.** Others, specify _____

**1.8. What is your occupation**?

**A.** Farmer

**B.** House wife

**C.** Trader/Merchant

**D.** Government employee

**E.** Private employee

**F.** Daily labourer

**G.** Others, specify _____

**1.9. How many family members do you have** (including yourself)? _____

**1.10. Do you have access to any modern health facility (especially in 5 to 10 km walking distance from your residence)? (If no skip to Q 2.1)**

**A**. Yes

**B**. No

**1.11. How many minutes walking distance is it to your nearest health facility? _____**

**Part II. <u>Pregnancy-related questions</u>**

**2.1.Are you pregnant**? **(If no skip to Q 2.3)**

**A**.Yes

**B**. No

**2.2. In which week of pregnancy (gestation age) are you**? _____

**2.3. How many days have passed since delivery**? _____

**2.4. How many children do you have from before the current pregnancy?_____**

**2.5. How many times have you been pregnant (i.e. Gravida)? _____**

**2.6. The number of times your pregnancies reaching viable gestational age (including live births and stillbirths, i.e. parity)_____**

**2.7. History of any adverse pregnancy outcome**? **(If no skip to Q 3.1)**

**A**. Yes

**B.** No

**2.8. What type (s) of adverse pregnancy outcome?**

**A.** Down syndrome

**B.** Cleft lip/ palate

**C.** Neural tube defect

**D.** Cardiac defect

**E.** More than one/ mixed [please explain] _____

**F.** Others, specify _____

**2.9. Have you used iron sulphate during pregnancy? (If no skip to Q 3.1)**

**A. Yes**

**B. No**

**2.10. When did you use?**

**A.** First trimester (first three months of pregnancy)

**B.** Throughout the entire pregnancy

**C.** Before and during pregnancy

**D.** Others, specify_____

**Part III. <u>Chronic disease and medication</u>**

**3.1. Do you have chronic disease? (If no skip to Q 4.1)**

**A.** Yes

**B.** No

**3.2. What is the chronic disease?**_____

**A.** Hypertension

**B.** Diabetes mellitus

**C.** Asthma

**D.** Cardiac diseases

**E.** Liver disease

**F.** Chronic renal failure

**G.** Gastritis/peptic ulcer

**H.** HIV/AIDS

**I.** Others, specify_____

**3.3. Do you take drugs for the management of chronic illness? (If no skip to Q 3.5)**

**A**.Yes

**B**. No

**3.4. What type of drugs are you taking [names of drugs]? _____**

**3.5. Are you currently attending chronic disease follow-up clinic**?

**A.** Yes

**B.** No

**Part IV. Self-medication with conventional medicines**

**4.1. Have you ever practiced self-medication (to treat self-diagnosed disorders or symptoms) with conventional medicines during pregnancy? (If no skip to Q 5.1)**

**A.** Yes

**B**. No

**4.2. Which drugs did you use for self-medication?**

**A.** NSAIDs (write drug name (s))_____

**B.** Dermatologicals (write drug name (s))_____

**C.** Antimicrobials (write drug name (s))_____

**D.** Others, Specify_____

**4.4. Had you received any advice /counselling on self-medications drugs? (If no skip to Q 5.1)**

**A.** Yes

**B.** No

**4.5. For which of the following points you had received advice?**

**A.** Tolerable side effects of drugs

**B.** Adverse drug reactions which requires prescribers visit

**C.** Management of missed dose

**D.** How to take the medication

**E.** Others specify_____

**Part V. Social drug use during pregnancy**

**5.1**. Do you smoke cigarette? (If no skip to Q 5.2.)

**A.** Yes

**B.** No

**5.2.** How many cigarettes do you smoke per day? _____

**5.3.** For how many years have you smoked? _____

**5.4**. Do you drink alcohol? (If no skip to Q 5.3.)

**A.** Yes

**B.** No

**5.5.** Which type of alcohol do you drink?_____

**A.** Tella (Local beer)

**B.** Katikala ('Ethiopian vodka')

**C.** Beer

**D.** Wine

**E.** Others, specify_____

**5.6.** What millilitre per day do you drink? _____

**5.7.** For how many years have you drunk? _____

**5.8.** Do you chew *Khat*? (If no skip to Q 6.1.)

**A.** Yes

**B.** No

**5.9.** What is the average weight in ‘‘zurba’’ that you chew daily? _____

**5.10.** For how many years have you chewed? _____

**5.11.** Any other social drug you used?_____

**Part VI. General questions about medicinal plants used during pregnancy**

**6.1. Have you used any medicinal plants to manage your current pregnancy illness?**

**(If yes skip to Q. 6.4; if no skip to Q. 6.2 and Q. 6.3, and after that thank the woman and stop the interview)**

**A.** Yes

**B**. No

**6.2. Why didn’t you use medicinal plants in pregnancy?**

**A.** Fear of complications to the baby

**B.** Religious belief

**C.** Not aware of their use in pregnancy

**D.** Counseled by the health worker

**E.** Others, specify_____

**6.3. Outcomes of previous pregnancy for non-users of medicinal plants?**

A. Alive

B. Neonatal death

C. Stillbirth

D. Abortion

E. Others, specify_____

**Instructions for enumerators**:

- Please interview the woman and fill the following table carefully for those women who claimed that they have used medicinal plants during pregnancy
- Please write the appropriate response accordingly or letters of the corresponding variable option or the variable option itself under each medicinal plant the woman mentions in the ‘‘Information about medicinal plants used by the woman’’ column on the right side of this page)
- If the woman mentions more types of medicinal plants, please use additional questionnaire and record the same code number to the additional questionnaire

| **Ser. no.** | **Questions on medicinal plants and medicinal plant utilization**<br>**NB: Multiple responses are possible throughout this part** | **Name of the medicinal plant used & Information about its utilization** | | |
|---|---|---|---|---|
| | | 1. | 2. | 3. |
| 6.4. | Could you tell me any medicinal plant that you have used in your pregnancy, for the management of your pregnancy illnesses or for the benefit of the foetus or for any other related purpose?<br><br>**NB:** *Please read the following medicinal plants for the interviewee and write down any Name of the plant(s) (**local name and the language used**) from the below list or other medicinal plants that she mentions*<br>• Damakessie • Dingetegna • Ariti • Qarafa<br>• Zingibil • Chikugn • Feto • Yeroo<br>• Nech shinkrut • Bisena/Misana • Papaya • Astenagr /Atse-faris<br>• Abish • Kebericho • Ensilal • Areg Riesa<br>• Tikur Azmud • Kosso • Dimbelal • Senafitch<br>• Tena-Adam • Grawa • Telba • Besobila<br>• Nech-bahr zaf | | | |

| Ser. no. | Questions on medicinal plants and medicinal plant utilization<br>NB: Multiple responses are possible throughout this part | Name of the medicinal plant used & Information about its utilization | | |
|---|---|---|---|---|
| | | 1. | 2. | 3. |
| 6.5. | For which type of pregnancy illness, do you use the medicinal plant?<br><br>**NB**: *please read the following pregnancy related illnesses to the woman and write down any from the below list or other ailments that she mentions*<br><br>• Pain (in back, neck or shoulder)<br>• Headaches/Migraine<br>• Heartburn/reflux problems<br>• Gastritis/burning sensation<br>• Urinary tract infection<br>• Nausea<br>• Vomiting<br>• Induction of labour<br>• Joint pain<br>• Common cold/flu<br>• Constipation/obstipation<br>• Gestational hypertension (Preeclampsia)<br>• Gestational diabetes<br>• Abdominal cramps/ache<br>• Postpartum bathing<br>• Insomnia/Sleeping problems<br>• Expel retained placenta<br>• Prepare for labour<br>• Leg/foot swelling<br>• Wellbeing and nourishing foetus<br>• General wellbeing<br>• Mental wellbeing<br>• Emergency illnesses<br>• Depression | | | |
| 6.6. | In which trimester of pregnancy do you use it? | | | |
| | A. First trimester | | | |
| | B. Second trimester | | | |
| | C. Third trimester | | | |
| | D. Throughout pregnancy | | | |
| | E. Others, specify_____ | | | |
| 6.7. | For how many episodes do you take it during your pregnancy? | | | |
| | A. Once | | | |

| Ser. no. | Questions on medicinal plants and medicinal plant utilization<br>NB: Multiple responses are possible throughout this part | Name of the medicinal plant used & Information about its utilization | | |
|---|---|---|---|---|
| | | 1. | 2. | 3. |
| | B. Twice | | | |
| | C. Trice | | | |
| | D. Every time when I feel sick | | | |
| | E. Others, specify_____ | | | |
| 6.8. | What part of the plant do you use? | | | |
| | A. Flower | | | |
| | B. Fruit | | | |
| | C. Seed | | | |
| | D. Leaf | | | |
| | E. Root | | | |
| | F. Stem | | | |
| | G. Bark: which one?<br>i) Root bark<br>ii) Stem bark<br>iii) Both types of barks | | | |
| | H. Others, specify_____ | | | |
| 6.9. | What is the Mode of use? | | | |
| | A. Dried | | | |
| | B. Fresh | | | |
| | C. Both Fresh and Dried | | | |
| 6.10. | What preparation methods do you use for each medicinal plant (please ask the woman and write down details of preparation procedures for each medicinal plant) | | | |
| | A. Maceration | | | |
| | B. Decoction | | | |

| Ser. no. | Questions on medicinal plants and medicinal plant utilization<br>NB: Multiple responses are possible throughout this part | Name of the medicinal plant used & Information about its utilization | | |
|---|---|---|---|---|
| | | 1. | 2. | 3. |
| | C. Infusion (tea form) | | | |
| | D. Squeezing | | | |
| | E. Powdering | | | |
| | F. Others, specify_____ | | | |
| 6.11. | 6.11.1. Is there any medicinal plant or other additive mixed with this Medicinal plant during preparation? (If no skip to Q 6.12)<br>A. Yes<br>B. No | | | |
| | 6.11.2. If Yes, please mention it with the importance of its incorporation _____ | | | |
| 6.12. | What is the route of administration, with a brief explanation if possible? | | | |
| | A. Oral | | | |
| | B. Topical | | | |
| | C. Nasal | | | |
| | D. Inhalation | | | |
| | E. Others, specify_____ | | | |
| 6.13. | What is the measure of medicinal plant preparation? (please write details)___ | | | |
| 6.14. | What is the dosage? (please write details)_____ | | | |
| 6.15. | What is the frequency of administration per day? (please write details)__ | | | |
| 6.16. | What is the duration of treatment? (please write details)_____ | | | |
| 6.17. | What is the solvent you used for the preparation? | | | |
| | A. Water | | | |
| | B. Oil | | | |
| | C. Coffee | | | |
| | D. Tea | | | |

| Ser. no. | Questions on medicinal plants and medicinal plant utilization<br>NB: Multiple responses are possible throughout this part | Name of the medicinal plant used & Information about its utilization | | |
|---|---|---|---|---|
| | | 1. | 2. | 3. |
| | E. Milk | | | |
| | F. Soup | | | |
| | G. Others, specify_____ | | | |
| 6.18. | 6.18.1. Is there any contraindications or any dietary restriction imposed during medicinal plants use? (If no skip to Q 6.19)<br>A. Yes<br>B. No | | | |
| | 6.18.2. If yes, please tell me details_____ | | | |
| 6.19. | 6.19.1. Do you have any information about precautions to be taken during medicinal plants use? (If no skip to Q 6.20)<br>A. Yes<br>B. No | | | |
| | 6.19.2. If yes, please tell me details_____ | | | |
| 6.20. | 6.20.1. Have you encountered/experienced any side effects during treatment? (If no skip to Q 6.21**)**<br>A. Yes<br>B. No | | | |
| | 6.20.2. If yes, please tell me details_____ | | | |
| 6.21. | 6.19.1. Have you encountered/experienced any adverse effects during treatment? (If no skip to Q 6.22)<br>A. Yes<br>B. No | | | |
| | 6.21.2. If yes, please tell me details_____ | | | |

| Ser. no. | Questions on medicinal plants and medicinal plant utilization<br>NB: Multiple responses are possible throughout this part | Name of the medicinal plant used & Information about its utilization | | |
|---|---|---|---|---|
| | | 1. | 2. | 3. |
| 6.22. | 6.22.1. Is there any antidotes to the adverse (unwanted) effects of the medicinal plant? (If no skip to Q 6.23)<br>A. Yes<br>B. No | | | |
| | 6.22.2. If yes, please tell me details_____ | | | |
| 6.23. | 6.23.1. Have you used any conventional medicine with the medicinal plants together or one after the other or at any time during pregnancy for pregnancy related illness prevention or treatment? (If no skip to Q 6.24<br>A. Yes<br>B. No | | | |
| | 6.23.2. Could you please tell me the name of the conventional medicine you used with the medicinal plants? | | | |
| | 6.23.3. Why you used the conventional medicine and medicinal plants together? | | | |
| 6.24. | 6.24.1. Is there any interactions (medicinal plants-conventional medicine and/ or medicinal plants - medicinal plants interaction) you experienced/expected during treatment. (If no skip to Q 6.25)<br>A. Yes<br>B. No | | | |
| | 6.24.2. If yes, please tell me details_____ | | | |
| 6.25. | 6.25.1. Have you ever used medicinal plant for foetal advantage purpose? (If no skip to Q 6.26)<br>A. Yes<br>B. No | | | |
| | 6.25.2. If yes, which medicinal plant?____ | | | |

| Ser. no. | Questions on medicinal plants and medicinal plant utilization<br>NB: Multiple responses are possible throughout this part | Name of the medicinal plant used & Information about its utilization | | |
|---|---|---|---|---|
| | | 1. | 2. | 3. |
| | 6.23.3. If yes, What is the proposed advantage of the medicinal plant for the foetus?___ | | | |
| 6.26. | 7.26.1. Is there any medicinal plants contraindicated during pregnancy? (If no skip to Q 6.27)<br>A. Yes<br>B. No | | | |
| | 6.26.2. If yes, why? please tell me details_____ | | | |
| 6.27. | 6.27.1. Is there any medicinal plants contraindicated during lactation? (If no skip to Q 6.28)<br>A. Yes<br>B. No | | | |
| | 6.27.2. If yes, please tell me the medicinal plant name _____ | | | |
| | 6.27.3. Why is it contraindicated during lactation? | | | |
| 6.28. | Anything you want to tell us before we conclude the interview?_____ | | | |

Part VII. **Sources of information and medicinal plants used during pregnancy**

**7.1. What is your source of medicinal plants**? _____

A. Market places
B. Traditional healers (herbalist)
C. Garden
D. Shop
E. Neighbor
F. Others, specify_____

**7.2. Who helps you in the collection of the medicinal plants**?

A. Family members (mother, father, husband, grandmother, etc.)
B. Neighbours
C. Friends
D. My-self
E. Others, specify_____

**7.3. Who recommended you to use medicinal plants during pregnancy**?

A. Family members (mother, father, husband, grandmother, etc.)
B. Neighbours
C. Friends
D. My-self
E. Others, specify_____

**7.4. If anyone recommended you, did you get any information how to use medicinal plants**?

**A.** Yes
**B.** No
**C.** Others, specify_____

**7.5. Were you satisfied with medicinal plant treatment outcomes**? (**If yes, finish!)**

**A**. Yes
**B**. No

**7.6. Why you were not satisfied?**

A. Got abortion
B. Uterine hyper-stimulation
C. Fetal distress
D. Stillbirth
E. Uterine rupture
F. Any other reason, specify _____

**7.7. Will you use medicinal plants in your future pregnancy**?

**A**. Yes

**B**. No

**I thank you for your time and cooperation!**

**Data collector: Name _____Signature _____date_____**

**Additional table 2: Data extraction form for patient medical record review**

Basic admission details and patient characteristics:

- Study Id ☐; Admission ward: Maternity/labour ☐; Gynaecology ☐
- Age ☐ ; Weight ☐; Height ☐
- Admission date ☐ Discharge date ☐ Duration of hospitalization ☐
- Gestational age (in weeks) ☐
- Gravidity: ☐ ; Parity ☐
- Type of patient: Antenatal ☐ Postnatal ☐
- Type of delivery: Vaginal delivery ☐ Cesarean delivery ☐
- Breast feeding :Yes ☐ No ☐
- Known drug allergies: Yes ☐ No ☐**;** Type of drug allergy ☐

| Details of admission (including vital signs): |
|---|

| Pregnancy outcomes and other obstetrics data (live birth, stillbirth, twin birth, postpartum haemorrhage, congenital abnormalities/birth defects, hypertension/eclampsia/HELLP, diabetes, placental abruption, etc.): |
|---|

| Any other maternal and perinatal outcomes: |
|---|

| Relevant laboratory results and investigations (Renal function test, Liver function test, Complete Blood Count (CBC), Echocardiography, Lipid Profile, Cardiac function, Electrolyte test, Glycaemic level, etc.): |
|---|

**Data collector: Name** _____ **Signature** _____

**Supplementary table 3**: Definitions of safety categories of medicinal plants used during pregnancy at JUMC, Ethiopia

| Classification | Description |
|---|---|
| Safe to use in pregnancy | Available human evidence suggests the medicinal plant can be safely used in pregnancy |
| Use with Caution | Available human evidence for the medicinal plant is limited so it should not be used without consulting a qualified health care practitioner |
| Potentially harmful to use in pregnancy | Available evidence has shown adverse impacts on pregnancy or fetus following the use of the medicinal plant |
| Information unavailable | No reference was found regarding use of the medicinal plant in pregnancy |

Source [adapted from]: Kennedy DA, Lupattelli A, Koren G, Nordeng H. Safety classification of herbal medicines used in pregnancy in a multinational study. BMC Complement Altern Med. 2016; 16: 102.

**Supplementary table 4**: Overview of medicinal plants used during pregnancy according to safety classification and number of users at JUMC, Ethiopia

| Type of medicinal plant used | Safety class* | Number of users (N=319) | Percentage [#] |
|---|---|---|---|
| *Linum usitatissimum* L. (*Telba*) | Caution | 246 | 77.1 |
| *Ocimum lamiifolium* L. (*Damakessie*) | Unavailable | 40 | 12.5 |
| *Carica papaya* L. (*Papaya*) | Caution | 35 | 11.0 |
| *Zingiber officinale* Roscoe. (*Zingibil*) | Safe | 29 | 9.1 |
| *Allium sativum* L. (*Nech shinkrut*) | Safe | 28 | 8.8 |
| *Trigonella foenum-graecum* L. (*Abish*) | Harmful | 24 | 7.5 |
| *Nigella sativa* L. (*Tikur Azmud*) | Unavailable | 21 | 6.4 |
| *Ruta chalepensis* L. (*Tenadam*) | Harmful | 15 | 4.7 |
| *Eucalyptus globulus* Labill. (*Nech-bier zaf*) | Safe | 13 | 4.1 |
| *Cinnamomum verum* J.Presl (*Qarafa*) | Harmful | 4 | 1.3 |
| *Taverniera abyssinica* A. Rich. *(Dingetegna)* | Unavailable | 3 | 0.9 |
| *Artemisia abyssinica* Sch.Bip. ex A.Rich. (*Chikugn*) | Harmful | 3 | 0.9 |
| *Croton macrostachyus* Hochst. (*Bisena/Misana*) | Harmful | 3 | 0.9 |
| *Echinops kebericho* Mesfin (*Kebericho*) | Harmful | 3 | 0.9 |
| *Hagenia abyssinica* (Bruce ex Steud.) J.F.Gmel. (*Kosso*) | Harmful | 2 | 0.6 |
| *Vernonia amygdalina* Del. (*Grawa*) | Unavailable | 2 | 0.6 |
| *Saccharum officinarum* L. (*Sugar cane*) | Safe | 2 | 0.6 |
| *Brassica nigra* (L.) K.Koch (Senafitch) | Unavailable | 1 | 0.3 |
| *Zehneria scabra* Sond. (*Areg Riesa*) | Unavailable | 1 | 0.3 |
| *Artemisia afra* Jacq. ex Willd. (*Ariti*) | Harmful | 1 | 0.3 |
| *Lepidium sativum* L. (*feto*) | Unavailable | 1 | 0.3 |
| *Guizotia abyssinica* (L.f.) Cass. (*Nug*) | Unavailable | 1 | 0.3 |
| *Vicia faba* L. (*faba Beans*) | Unavailable | 1 | 0.3 |
| *Ananas comosus* (L.) Merr. (*Annanas*) | Caution | 1 | 0.3 |
| *Phoenix dactylifera* L. (*Temir*) | Safe | 1 | 0.3 |
| *Pycnostachys abyssinica* Fresen. (*Yeroo*) | Unavailable | 1 | 0.3 |
| Bahuu/B'auu (Oromiffa language name) | Unavailable | 1 | 0.3 |

*__Safe__: safe to use in pregnancy; __Caution__: requires cautious to use in pregnancy; __Unavailable__; information on safety to use in pregnancy was not available in the current literature; __Harmful__: potentially harmful to use in pregnancy [Contraindicated]; [#]Total percentage may exceed 100% due to multiple responses

**Supplementary table 4: Overview of the utilization pattern of the most frequently used medicinal plants during pregnancy at JUMC, Ethiopia**

| | Utilization properties (No. of citations) * | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Scientific name, English name, Number of users, (n = 319) | Part of plant | Plant condition | Solvent | Excipients and reason for addition** | Routes of administration | Dose and measure of formulation | Frequency*** | Duration of treatment*** | Number of occasions of use in pregnancy**** |
| *L. usitatissimum* (Flaxseed) (N=246) | Seed (244) | Dried (234)<br>Fresh or dried (10)<br>Fresh (2) | Water (192)<br>Soup (53) | Sugar (86), sweetener<br>Salt (6), flavourant<br>Butter (2), flavourant<br>Yogurt (1), flavourant<br>Sugar or Salt (1), sweetener/flavourant/ | Oral (245)<br>Topical (1) | 1 WGJC (176)<br>1 CC (38)<br>ANSA (7)<br>2 WGJC (7)<br>1 TSP (4) | Once (151)<br>Twice (60)<br>Every time (20)<br>Trice (9)<br>1 to 2 times (3) | During labour (92)<br>Every time (40)<br>Two months (39)<br>Three months (19)<br>Two days (17) | Once (138)<br>Twice (44)<br>Many times (38)<br>Trice (19) |
| *O. lamifolium (No common English name)* (N=40) | Leaf (39) | Fresh (30)<br>Fresh or dried (8) | Water (27)<br>NSD (8) | - | Oral (18)<br>Nasal/Inhalation (13) | ANSA (13)<br>1 CC (11)<br>1 to 2 CC (4) | Once (19)<br>Every time (16) | Every time (22)<br>One day (8) | Many times (17)<br>Once (16) |
| *C. papaya* (Papaya) (N=35) | Fruit (32)<br>Stem or Root Bark (2) | Fresh (32)<br>Fresh or dried (2) | Water (6)<br>NSD (29) | Sugar (8), sweetener<br>Annans (1), for better effect | Oral (35) | 1 WGJC (22)<br>ANSA (9) | Once (24)<br>Twice (5)<br>Every time (3) | During labour (17)<br>Two months (6)<br>Every time (5) | Once (22)<br>Many times (8) |
| *Z. officinale* (Ginger) (N=29) | Root or tuber (27) | Fresh or dried (14)<br>Dried (9)<br>Fresh (6) | Water (17)<br>Tea (6) | Garlic (1), for better effect | Oral (27)<br>Nasal/Inhalation (2) | 1 CC (11)<br>ANSA (7)<br>1 WGJC (4) | Once (11)<br>Every time (9)<br>Twice (5) | Every time (19)<br>One day (5) | Many times (21)<br>Once (4) |
| *A. sativum* (Garlic) (N=28) | Root or tuber (28) | Fresh or dried (16)<br>Dried (7)<br>Fresh (5) | Water (14)<br>NSD (7) | Honey (2), sweetener<br>Ginger (1), for better effect | Oral (27) | ANSA (9)<br>1 CC (5)<br>1 head of garlic (3) | Every time (11)<br>Once (9)<br>Twice (5) | Every time (18)<br>One day (3) | Many times (22) |
| *T. foenum-graecum* (Fenugreek) (N=24) | Seed (21) | Dried (22) | Water (19)<br>Soup (5) | Sugar (2), sweetener | Oral (23) | 1 WGJC (16)<br>1 CC (5)<br>ANSA (2) | Once (13)<br>Twice (8)<br>Every time (3) | During labour (14)<br>3 months (4)<br>Every time (3) | Once (19)<br>Many times (4) |
| *N. sativa* (Black seed) (N=21) | Oil (11)<br>Seed (9) | Oil (11)<br>Dried (7) | Water (7)<br>NSD (8) | Cheese (1), flavourant | Oral (16) | ANSA (4)<br>1 TSP (3) | Every time (10)<br>Once (6) | Every time (17)<br>One day (3) | Many times (13) |
| *R. chalepensis* (Fringed rue) (N=15) | Leaf (15) | Fresh (12)<br>Fresh or dried (3) | Water (11)<br>Coffee (4) | Garlic (1), for better effect | Oral (15) | 1 WGJC (6)<br>1 CC (4)<br>ANSA (4) | Once (9)<br>Every time (5) | Every time (10)<br>Two days (2) | Many times (9)<br>Once (4) |
| *E. globulus* (''Eucalyptus''/ blue gum) (N=13) | Leaf (12) | Fresh (12) | Water (11) | *O. lamifolium* and *Leucas martinicensis* (Jacq.) R.Br. (1), for better effect<br>*O. lamifolium* (1), for better effect | Nasal/Inhalation (10) | ANSA (12) | Every time (9)<br>Once (4) | Every time (7)<br>One day (5) | Many times (9)<br>Once (3) |

**Abbreviations**: WGJC: water glass/water jug cup (≈250mL), 1WGJC: One water glass/water jug cup, CC: Coffee cup, ANSA: take as 'needed in safe amount' using any appropriate measuring device for the appropriate duration the woman believes, SSp: Soup Spoon, NSD: No solvent needed, TSP: Teaspoon full. *Numbers may not add up due to missing values. **For better effect: Added to produce either synergistic or additive effect. ***Every time: a duration or frequency of treatment whereby the pregnant woman takes the MP for many frequencies per day that she believes is appropriate for a period of time until she feels cured. ****use for a given duration is taken as one occasion, for example use of the medicinal plant for a week, one month, two months, three months or more duration is taken as one occasion. On the other hand, if a woman uses for 2 weeks in the first month of pregnancy, and in the 2nd, 3rd, 4th and 5th months of pregnancy, each for one-week duration then the number of occasions will be five.

# Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

## Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectionalreporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.



| | | Reporting Item | Page Number |
|---|---|---|---|
| **Title and abstract** | | | |
| Title | #1a | Indicate the study's design with a commonly used term in the title or the abstract | 1 |

| | | | |
|---|---|---|---|
| Abstract | #1b | Provide in the abstract an informative and balanced summary of what was done and what was found | 2 |
| **Introduction** | | | |
| Background / rationale | #2 | Explain the scientific background and rationale for the investigation being reported | 4,5 |
| Objectives | #3 | State specific objectives, including any prespecified hypotheses | 5,6 |
| **Methods** | | | |
| Study design | #4 | Present key elements of study design early in the paper | 6, 7 |
| Setting | #5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 6-8 |
| Eligibility criteria | #6a | Give the eligibility criteria, and the sources and methods of selection of participants. | 6, 7 |
| | #7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 8-11 |
| 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. Give information separately for exposed and unexposed groups if applicable. | 8-10 |

| | | | |
|---|---|---|---|
| Bias | #9 | Describe any efforts to address potential sources of bias | 7,8, 11 |
| Study size | #10 | Explain how the study size was arrived at | 7 |
| Quantitative variables | #11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why | 10, 11 |
| Statistical methods | #12a | Describe all statistical methods, including those used to control for confounding | 10, 11 |
| Statistical methods | #12b | Describe any methods used to examine subgroups and interactions | 10, 11 |
| Statistical methods | #12c | Explain how missing data were addressed | n/a |
| Statistical methods | #12d | If applicable, describe analytical methods taking account of sampling strategy | 10, 11 |
| Statistical methods | #12e | Describe any sensitivity analyses | n/a |
| **Results** | | | |
| Participants | #13a | 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. Give information separately for for exposed and unexposed groups if applicable. | 12 |
| Participants | #13b | Give reasons for non-participation at each stage | 12 |

| | | | |
|---|---|---|---|
| Participants | #13c | Consider use of a flow diagram | n/a |
| Descriptive data | #14a | Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable. | n/a |
| Descriptive data | #14b | Indicate number of participants with missing data for each variable of interest | 12 |
| Outcome data | #15 | Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable. | 23,24 |
| Main results | #16a | 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 | 23,24 |
| Main results | #16b | Report category boundaries when continuous variables were categorized | 23,24 |
| Main results | #16c | If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | n/a |
| Other analyses | #17 | Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses | n/a |
| **Discussion** | | | |
| Key results | #18 | Summarise key results with reference to study objectives | 16 |

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|---|---|---|---|
| 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. | 19,20 |
| Interpretation | #20 | Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence. | 16-19 |
| Generalisability | #21 | Discuss the generalisability (external validity) of the study results | 19, 20 |
| **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 |