


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

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To cite: Ahmed SM, Sundby J, Aragaw YA, *et al.* Medicinal plants used among pregnant women in a tertiary teaching hospital in Jimma, Ethiopia: a cross-sectional study. *BMJ Open* 2021;**11**:e046495. doi:10.1136/bmjopen-2020-046495

► Prepublication history and additional online supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2020-046495>).

Received 03 November 2020
Accepted 07 July 2021

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 1117 hospitalised 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 utilisation 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 the 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. (*damakessie*—safety unknown) 3.6% and *Carica papaya* L. (papaya—use with caution) 3.1%. The most common reason 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 one-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 healthcare professionals and patients, and increased access to childbirth providing healthcare facilities are important in order to promote safer pregnancies and better health outcomes for women and their unborn children.

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

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 under-reported.
- Among the postpartum 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.

WHO estimates that 65%–80% of the world's population in developing countries depend on medicinal plants for primary healthcare.³ Women are recognised 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 multiethnic, multicultural and multireligious 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



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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 four children born per woman, and mother's mean age at first birth is 20 years.⁶ Physician density is only one per 12500 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 100,000 live births) and neonatal mortality (28 deaths per 1000 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 alternative⁴ 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 USA 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 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 centre has a patient load of approximately 7600 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 other 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

Hospitalised 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 4 hours, and non-pregnant women admitted in the gynaecology ward were excluded from the study.

Single population proportion Kish formula²⁵ 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 hospitalised 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 1121 pregnant women was required.

Data collection and procedures

Hospitalised pregnant and postpartum women were consecutively interviewed from February to June 2017. A pretested 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 hospitalised 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 (online supplemental 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 pretest, the data extraction form required minor revisions to improve comprehension and order (online supplemental 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 utilisation (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 (online supplemental 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

Sociodemographic 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, 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/influenza, pain in back, neck or shoulder, headache, heartburn/reflux problems, abdominal cramps/ache, preparation for labour, induction of labour, expel retained placenta, postpartum bathing, well-being and nourishing fetus, leg/foot swelling, gestational hypertension, gestational diabetes, gastritis/burning sensation, constipation, general well-being, nausea, vomiting, emergency illnesses, urinary tract infection, depression, joint pain, sleeping problems and mental well-being. 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 V.25.0 for Windows (IBM SPSS Statistics). Respondents

were categorised as users if they used at least one type of medicinal plant in their index pregnancy, whereas others were categorised 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 ORs with 95% 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 $p < 0.05$ 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, no patients or public were involved in the conception, design, conduct and planning of this study.

RESULTS

From 1137 pregnant or postpartum women invited to participate, responses from four were incomplete, and 16 declined to participate in the study resulting in 1117 participants in the final dataset (response rate 98.6%). The median age was 25 years (IQR 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 min (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 and write (42.3%); and were housewife (46.9%) or farmer (23.4%) by occupation (table 1).

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 1–8). 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. lamifolium* ('damakesie') (12.5%) and *C. papaya* (papaya) (11.0%) were the three most commonly used medicinal plants (table 2; online supplemental 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/influenza (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/influenza 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. Five women who used potentially unsafe medicinal plants used *Trigonella foenum-graecum* (potential risk of uterine contraction and hypoglycaemic), *Ruta chalepensis* (potential risk of uterine contraction and emmenagogue), *Cinnamomum verum* (potential risk of fetal 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) (online supplemental 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%).

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 (32.0%) (online supplemental table 5).

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.

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

Characteristics	No (%) 1117 (100)*	Medicinal plant use during pregnancy		Crude OR (95% CI)†	Adjusted OR (95% CI)‡
		Yes No (%) 319 (28.6)	No No (%) 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 to 1.41)	
Age (years)§					
≤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 to 2.05)	1.30 (0.88 to 1.94)
26–30	320 (28.7)	102 (32.0)	218 (27.3)	1.54 (1.04 to 2.27)	1.42 (0.94 to 2.14)
≥31	186 (16.7)	49 (15.4)	137 (17.2)	1.18 (0.75 to 1.85)	1.17 (0.73 to 1.87)
Marital status					
Married	1071 (95.9)	314 (98.4)	757 (94.9)	1	1
Others¶	46 (4.1)	5 (1.6)	41 (5.1)	0.29 (0.12 to 0.75)	0.39 (0.14 to 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 to 1.69)	
Protestant/others**	81 (7.3)	19 (6.0)	62 (7.8)	0.81 (0.47 to 1.39)	
Educational level††					
Illiterate	378 (34.0)	98 (30.7)	280 (35.1)	1	1
Primary/read and write	470 (42.3)	138 (43.3)	332 (41.6)	1.19 (0.88 to 1.61)	1.22 (0.88 to 1.68)
Secondary school	162 (14.6)	56 (17.6)	106 (13.3)	1.51 (1.02 to 2.25)	1.54 (1.01 to 2.36)
Postsecondary school	102 (9.2)	27 (8.5)	75 (9.4)	1.03 (0.63 to 1.69)	1.06 (0.62 to 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 to 1.71)	
Trader/merchant	163 (14.6)	49 (15.4)	114 (14.3)	1.16 (0.79 to 1.70)	
Government employee	95 (8.5)	30 (9.4)	65 (8.1)	1.24 (0.77 to 1.99)	
Others‡‡	74 (6.6)	16 (5.0)	58 (7.3)	0.74 (0.41 to 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 to 1.32)	0.83 (0.48 to 1.45)
Yem	81 (7.3)	24 (7.5)	57 (7.1)	1.04 (0.63 to 1.72)	1.14 (0.66 to 1.97)
Dawuro	70 (6.3)	12 (3.8)	58 (7.3)	0.51 (0.27 to 0.97)	0.64 (0.33 to 1.25)
Others§§	100 (9.0)	38 (11.9)	62 (7.8)	1.52 (0.99 to 2.34)	1.57 (1.00 to 2.48)
Access to health facility ¶¶ 					
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 to 13.58)	6.92 (1.77 to 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 to 1.35)	
Far >60 min	125 (11.4)	43 (13.5)	82 (10.3)	1.36 (0.91 to 2.04)	
Gravidity***					
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 to 1.28)	
Gestational age					

Continued

Table 1 Continued

Characteristics	No (%) 1117 (100)*	Medicinal plant use during pregnancy		Crude OR (95% CI)†	Adjusted OR (95% CI)‡
		Yes No (%)	No No (%)		
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 to 1.57)	0.80 (0.52 to 1.25)
Post term pregnancy	62 (5.6)	27 (8.5)	35 (4.4)	2.20 (1.23 to 3.93)	1.65 (0.85 to 3.20)
Others†††	89 (8.0)	24 (7.5)	65 (8.1)	1.05 (0.61 to 1.83)	0.72 (0.38 to 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 to 3.23)	2.80 (1.43 to 5.48)
Chronic illness‡‡‡					
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 to 3.62)	1.83 (1.04 to 3.24)
Conventional medicine use§§§					
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 to 2.23)	1.83 (1.36 to 2.46)
Chew <i>Khat</i> (<i>Catha edulis</i>)¶¶¶¶					
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 to 3.75)	2.53 (1.46 to 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 to 4.33)	2.43 (1.28 to 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 to 2.28)	

*Numbers may not add up to 1117 due to missing values.

†Significant findings are in bold ($p < 0.05$).

‡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.

§Median age 25 years, IQR 22–30 years.

¶Others includes single 41 (3.7%), divorced 4 (0.4%), widowed 1 (0.1%).

**Protestant/others includes Protestant 74 (6.6), Catholic 2 (0.2%), Waqqefeta 1 (0.1%), missing 4 (0.4).

††Read and 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.

‡‡Others includes daily labourers 24 (2.1), students 22 (2.0), private institution workers 18 (1.6), other sectors 10 (0.9%).

§§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).

¶¶Access to health facility means access to either primary, secondary or tertiary levels of healthcare; it mainly represents access to health posts.

***Gravidity includes the current pregnancy.

†††Women are in the first, second or third trimester of pregnancy but exact week of pregnancy is not known.

‡‡‡Includes hypertension, diabetes mellitus, asthma, cardiac diseases, chronic gastritis/peptic ulcer, HIV, chronic renal failure, chronic liver disease, etc.

§§§Refers to self-medication with conventional medicine before hospitalisation.

¶¶¶¶Khat (*Catha edulis*) plant leaves are chewed by people for their stimulant action.

JUMC, Jimma University Medical Centre.

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 (online supplemental 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.

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

*This prevalence of use of individual medicinal plant is based on those pregnant women who used one or more medicinal plants (N=319). Based on the overall study participants (N=1,117) the prevalence of use of individual medicinal plant is, for example, *Linum usitatissimum* L. 22.0%, *Ocimum lamiifolium* L. 3.6%, and *Carica papaya* L. 3.1%.

†'Reduction of labour': includes reduced intensity and shortened duration of labour.

‡'Mitch': a febrile illness believed to develop when strong sunlight strikes a part of the body that is sweating or unclean.

§'Bird': an illness typified by a feeling of chills, arthralgia, myalgia, generalised body weakness, pain (particularly chest pain) and coughing. In general, it is characterised by pneumonia/influenza-like symptoms.

JUMC, Jimma University Medical Centre.

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

Table 3 Pregnancy disorders treated with medicinal plants at JUMC, Ethiopia, n=319

Variables	No (%)*	Most common medicinal plants (no of users)
Induction and 'reduction' of labour†	192 (60.2)	<i>Linum usitatissimum</i> (Flaxseed) (179) <i>Trigonella foenum-graecum</i> (Fenugreek) (6) <i>Carica papaya</i> (Papaya) (4)
Common cold/influenza	65 (20.4)	<i>Zingiber officinale</i> (Ginger) (23) <i>Allium sativum</i> (Garlic) (13) <i>Eucalyptus globulus</i> (<i>Nech-bahir zaf</i>) (12)
Preparation for labour	50 (15.7)	<i>Linum usitatissimum</i> (Flaxseed) (22) <i>Carica papaya</i> (Papaya) (17) <i>Trigonella foenum-graecum</i> (Fenugreek) (11)
Abdominal cramps/ache	30 (9.4)	<i>Nigella sativa</i> (Black seed) (7) <i>Allium sativum</i> (Garlic) (5) <i>Carica papaya</i> (Papaya) (4)
Headache/migraine	27 (8.5)	<i>Nigella sativa</i> (Black seed) (10) <i>Ocimum lamiifolium</i> (<i>Damakessie</i>) (8) <i>Allium sativum</i> (Garlic) (3)
Heartburn/reflux problems	27 (8.5)	<i>Linum usitatissimum</i> (Flaxseed) (19) <i>Carica papaya</i> (Papaya) (5)
<i>Mitch‡</i>	24 (7.5)	<i>Ocimum lamiifolium</i> (<i>Damakessie</i>) (19)
Gastritis/burning sensation	22 (6.9)	<i>Linum usitatissimum</i> (Flaxseed) (14)
Constipation/obstipation	17 (5.3)	<i>Linum usitatissimum</i> (Flaxseed) (16)
General well-being	15 (4.7)	<i>Allium sativum</i> (Garlic) (5) <i>Ruta chalepensis</i> (Fringed rue) (3)
Nausea	11 (3.4)	<i>Zingiber officinale</i> (Ginger) (4) <i>Ruta chalepensis</i> (Fringed rue) (4)
Helminths	6 (1.9)	<i>Carica papaya</i> (Papaya) (2) <i>Hagenia abyssinica</i> (<i>Kosso</i>) (2)
Leg/foot swelling	5 (1.6)	<i>Linum usitatissimum</i> (Flaxseed) (1) <i>Cinnamomum verum</i> (Cinnamon) (1) <i>Croton macrostachyus</i> (<i>Bisena</i>) (1) <i>Veronia amygdalina</i> (<i>Grawa</i>) (1) B'auu (1)
Prevent bad smell	5 (1.6)	<i>Ocimum lamiifolium</i> (<i>Damakessie</i>) (5)
Strong craving	5 (1.6)	<i>Linum usitatissimum</i> (Flaxseed) (1) <i>Carica papaya</i> (Papaya) (1) <i>Nigella sativa</i> (Black seed) (1) <i>Ruta chalepensis</i> (Fringed rue) (1) <i>Zingiber officinale</i> (Ginger) (1)
Emergency illnesses	4 (1.3)	<i>Ocimum lamiifolium</i> (<i>Damakessie</i>) (3)
Postpartum bathing	4 (1.3)	<i>Eucalyptus globulus</i> (<i>Nech-bahir zaf</i>) (3)
Vomiting	3 (0.9)	<i>Zingiber officinale</i> (Ginger) (2)
Yemahitsen <i>mitch‡</i> (<i>'gynaecologic mitch'</i>)	3 (0.9)	<i>Croton macrostachyus</i> (<i>Bisena</i>) (1) <i>Ocimum lamiifolium</i> (<i>Damakessie</i>) (1) <i>Pycnostachys abyssinica</i> (<i>Yeroo</i>) (1)
Depression	3 (0.9)	<i>Echinops kebericho</i> (<i>Kebericho</i>) (1) <i>Ruta chalepensis</i> (Fringed rue) (1) <i>Cinnamomum verum</i> (Cinnamon) (1)
Well-being and nourishing the fetus	3 (0.9)	<i>Linum usitatissimum</i> (Flaxseed) (2) <i>Trigonella foenum-graecum</i> (Fenugreek) (1)
Cough	2 (0.6)	<i>Nigella sativa</i> (Black seed) (1) <i>Saccharum officinarum</i> (Sugar crystals) (1)
Birdd§	2 (0.6)	<i>Allium sativum</i> (Garlic) (1) <i>Nigella sativa</i> (Black seed) (1)

Continued

Table 3 Continued

Variables	No (%) [*]	Most common medicinal plants (no of users)
Diarrhoea	2 (0.6)	<i>Ocimum lamiifolium</i> (Damakessie) (1) <i>Taverniera abyssinica</i> (Dingetegn) (1)
Joint pain (<i>kurtimatt</i>)	2 (0.6)	<i>Allium sativum</i> (Garlic) (1) <i>Nigella sativa</i> (Black seed) (1)
Sleeping problems	2 (0.6)	<i>Artemisia abyssinica</i> (<i>Chikugn</i>) (2)
Mental well-being	2 (0.6)	<i>Ruta chalepensis</i> (Fringed rue) (2)
Evil eye	2 (0.6)	<i>Artemisia afra</i> (<i>Ariti</i>) (1) <i>Veronia amygdalina</i> (<i>Grawa</i>) (1)
Others [¶]	15 (4.7)	<i>Linum usitatissimum</i> (Flaxseed) (3) <i>Allium sativum</i> (Garlic) (3) <i>Ocimum lamiifolium</i> (<i>Damakessie</i>) (3)

^{*}Total percentage may exceed 100% due to multiple responses.

[†]Reduction of labour: includes reduced intensity and shortened duration of labour.

[‡]'Mitch': A febrile illness believed to develop when strong sunlight strikes a part of the body that is sweating or unclean.

[§]Bird'd': an illness typified by a feeling of chills, arthralgia, myalgia, generalised body weakness, pain (particularly chest pain) and coughing. In general, it is characterised by pneumonia/influenza-like symptoms.

[¶]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, appetiser, upper extremity fatigability, for any illness, each with a frequency of one.

JUMC, Jimma University Medical Centre.

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 well-being and nourishing of the fetus. One woman reported the use of *O. lamiifolium* to improve fetal movements and breathing. *O. lamiifolium*, *Z. officinale* and *A. sativum* were also reported to be useful for general fetal well-being. Fear of complications to the fetus (44.5%) and religious prohibition (25.9%) were the common reasons for avoiding use of medicinal plants during pregnancy.

DISCUSSION

Knowledge; both lay and professional, about medicinal plants use in pregnancy is essential to provide optimal maternal/fetal 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 healthcare personnel, researchers, policy-makers and pregnant women themselves. Nearly one-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 counted⁴ 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), *damakessie* (safety unknown) and papaya (use with caution, it is considered potentially unsafe in large amounts only) (table 2; online supplemental 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 2). A recent study from Ethiopia had also found similar reason for its use.¹⁵

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

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*: 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), Stillbirth (1)
Kosso†: 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)‡	Kosso: Diarrhoea (2)	Kosso: Severe diarrhoea (2)
Dingetegna: Harmful during pregnancy, reason unknown (1)§	Dingetegna¶: 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††: After applying MPs stay at home, going outside is forbidden (1)**	Damakessie: Loss of appetite (1), Bitter (after) taste (1), Sneezing (1)	Chikugn¶¶¶: Anencephaly: giving birth to a headless neonate (1)
Tej Sar***: Causes uterine stimulation (1), harmful during pregnancy, reason unknown (1)§	Cinnamon†††: Inflammatory to the stomach, thus eat food before taking cinnamon (1)	Cinnamon: Heart burn (1)	Cinnamon: Severe heart burn (1)
Ensilal†††: Causes uterine stimulation (1), harmful during pregnancy, reason unknown (1)§	Garlic: Larger dose of garlic is irritant, thus eat food before taking it (1)	Garlic: Discomfort to fetus (1), Gastric irritation (1), Loss of appetite (1)	Garlic: Harm to the fetus (1), Bad mouth smell (1), Severe heart burn (1)
Grawa§§§: Causes uterine stimulation (2) harmful during pregnancy, reason unknown (1)§	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 fetus (1)	Ginger: Harm to fetus (1), Severe heart burn (1)
Black seed: Generally not good for the woman and the fetus, thus better not to take it during pregnancy (1)	Yeroo††: After applying MPs stay at home, going outside is forbidden (1)**	Black seed: Gastric irritation (3), Loss of appetite (1)	-----
Bisana¶¶¶: Causes uterine stimulation (2), harmful to the fetus (1), generally not good for the fetus (1), its smell deteriorates health of pregnant women (1)	Bisana§§§: After applying MPs stay at home, going outside is forbidden (1)**	'Eucalyptus'****: Decrease in appetite (1)	-----
Kebericho: Generally not good for the fetus(1)	Kebericho††††: Kebericho interacts with damakessie and worsen the Mitch†††† disease (1)	Sugar§§§§ : Eye irritation (1)	-----
Astenagr/Etse faris¶¶¶¶: Harmful to the fetus (1), Causes uterine stimulation (3), Generally not good for pregnant woman and the fetus (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*****: Causes uterine stimulation (1)	-----	-----	-----

Continued

Table 4 Continued

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)
Endod†††††: Causes uterine stimulation (1)	-----	-----	-----
Metere‡‡‡‡‡: Harmful to the fetus (1)	-----	-----	-----
Feto§§§§§: Causes uterine stimulation (1)	-----	-----	-----

*After consuming Flaxseed (*Linum usitatissimum*) preparation the woman should stay at home, exposure to sunlight results in Mitch disease.

†*Hagenia abyssinica*.

‡'Tila', loosely translated means the shade of a person that is believed to have pernicious effect.

§The plant is harmful during pregnancy, but the woman does not know the reason for contraindication.

¶*Taverniera abyssinica*.

**Stay at home after applying the /††Damakessie (*Ocimum lamiifolium* L.)/‡‡Yeroo (*Pycnostachys abyssinica* Fresen.)/§§Bisana (*Croton macrostachyus* Hochst) mixture formulation, going outside is forbidden; Otherwise there is relapse of the disease.

††Damakessie (*Ocimum lamiifolium* L.).

‡‡Yeroo (*Pycnostachys abyssinica* Fresen.).

§§Bisana (*Croton macrostachyus*)

¶¶*Artemisia abyssinica* Sch.Bip. ex A.Rich.

****Cymbopogon citratus* (DC.) Stapf.

†††*Cinnamomum verum*.

‡‡‡*Foeniculum vulgare*.

§§§*Vernonia amygdalina*.

¶¶¶*Croton macrostachyus*.

*****Eucalyptus globulus*.

††††*Echinops kebericho*.

‡‡‡‡Mitch: A febrile illness believed to develop when strong sunlight strikes a part of the body that is sweating or unclean.

§§§§*Saccharum officinarum* L.

¶¶¶¶*Datura stramonium* L.

*****inserting the root in to the vagina and/or drink its juice

†††††*Phytolacca dodecandra* L'Hér.

‡‡‡‡‡*Glinus lotoides* L.

§§§§§*Lepidium sativum*.

JUMC, Jimma University Medical Centre.

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 cautious 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 3). 'Mitch' is a culturally common illness in Ethiopia and is a local name given to a febrile illness characterised 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 to as 'Yemahitsen Mitch' ('gynaecologic mitch') (table 3). In general our result agrees with the findings of Ethiopians at home¹⁵ and in diaspora¹ regarding 'Mitch' and its treatment. Studies of the leaf extract of *O. lamiifolium* have shown analgesic effects in mice³⁸ 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 2000mg/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 2). Moreover, they claimed that consumption of cold papaya would soothe their gastrointestinal tract relieving them from heartburn, gastritis and cramps (table 3). 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 influenza 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 sociodemographic factors were associated with use of medicinal plants in pregnancy (table 1). We found that women who did not have access to health facility (including 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 threefold 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. Healthcare 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 healthcare 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. First, 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. Second, 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 with participants who were Orthodox and from the Dawuro ethnic group. Our results will consequently not be generalisable to the entire country. This finding underpins the importance of including ethnic and religious background information in studies on medicinal plants, as it will have large impacts on utilisation and reporting patterns. Third, 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 utilisation. It may well be that the use of medicinal plants is underestimated due to poor recall or under-reporting. 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 one-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 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 healthcare facilities, hospitalisation in the maternity ward and social drug use.

Given that women use unsafe plants during the pregnancy, increased awareness about potential benefits or risks of medicinal plants use during the pregnancy among healthcare professionals and patients, and increased access to healthcare facilities are important in order to promote safer pregnancies and better health outcomes for women and their unborn children.

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Correction notice This article has been corrected since it was first published. The formatting errors of table 1 has been corrected now.

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Acknowledgements We are grateful to the pregnant women admitted at JUMC who generously shared with us information about their medicinal plant use. The authors owe a debt of gratitude to the enumerators who skilfully collected the data. We would like to thank Norwegian PhD School in Pharmaceutical Sciences for the travel grant assistance for the data collection. Special thanks go to the Norwegian Loan Fund (Lånekassen) for granting scholarship for the PhD student (SMA) in the University of Oslo. The authors thank PharmaSafe research group, University of Oslo for funding to cover open access fees. The authors are also indebted to Dr. Ibrahim Mdala for assistance with data analysis.

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 finalised the manuscript. SMA, HN, JS and YAA critically reviewed the manuscript and contributed intellectual content. All authors read and approved the final manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

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.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request.

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