## Original research

# **BMJ Open** Indigenous herbal medicine use and its associated factors among pregnant women attending antenatal care at public health facilities in Dire Dawa, Ethiopia: a cross-sectional study

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## ABSTRACT

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**Correspondence to** Bezabih Amsalu; mamtnur100@gmail.com **Objective** The aim of this study was to investigate the prevalence of indigenous herbal medicine use and its associated factors among pregnant women attending antenatal care (ANC) at public health facilities in Dire Dawa, Ethiopia.

**Design** A facility-based cross-sectional study design. **Setting** The study was conducted in seven public health facilities (one referral hospital, three urban and three rural health centres) in Dire Dawa, Ethiopia, from October to November 2022.

**Participants** 628 pregnant women of any gestational age who had been on ANC follow-up at selected public health facilities were included.

Main outcome measures Prevalence of indigenous herbal medicine (users vs non-users) and associated factors.

**Results** The study revealed that 47.8% (95% Cl 43.8% to 51.6%) of pregnant women used herbal medicines. Lack of formal education (adjusted OR, AOR 5.47, 95% Cl 2.40 to 12.46), primary level (AOR 4.74, 95% Cl 2.15 to 10.44), housewives (AOR 4.15, 95% Cl 1.83 to 9.37), number of ANC visits (AOR 2.58, 95% Cl 1.27 to 5.25), insufficient knowledge (AOR 4.58, 95% Cl 3.02 to 6.77) and favourable perception (AOR 2.54, 95% Cl 1.71 to 3.77) were factors significantly associated with herbal medicine use. The most commonly used herbs were garden cress (*Lepidium sativum*) (32%), bitter leaf (*Vernonia amygdalina*) (25.2%), moringa (*Moringa oleifera*) (24.5%). *Common* indications were related to gastrointestinal problems, blood pressure and sugar.

**Conclusion** The prevalence of herbal medicine use is high (one in two pregnant women) and significantly associated with education level, occupation, ANC visits, knowledge and perceptions. The study's findings are helpful in advancing comprehension of herbal medicines using status, types and enforcing factors. It is essential that health facilities provide herbal counselling during ANC visits, and health regulatory bodies ought to raise awareness and implement interventions to lower the risks

# STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The study assured representativeness and generalisability using a multicentre study, six public health centres (three urban and three rural) and one public referral hospital in the study region.
- $\Rightarrow$  The study used a diverse sample (which included participants from rural and urban areas), which increased the external validity of the study.
- ⇒ The accuracy of the data was improved by the use of primary data as well as experienced data collectors.
- $\Rightarrow$  A valid data collection tool that has high internal consistency ( $\alpha$ =0.801) was used.
- ⇒ Due to the cross-sectional nature of the study, it did not show causal relationships between variables.

from over-the-counter herbal medicine use by pregnant women.

## INTRODUCTION

Traditional medicine (TM) is characterised **initial** by the WHO as 'health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral-based medicines, spiritual therapies, manual techniques, and exercises, applied singly or in combination to treat, diagnose, and prevent illnesses and maintain wellbeing'.<sup>1</sup> Indigenous herbal medicine (IHM), a branch of TM, refers to the use of locally available herbs for the treatment of illness and enhancement of general health and well-being.<sup>12</sup> These herbal medicines consist of herbs, herbal materials herbal preparations and completed herbal products that have active components that are plant parts like seeds, leaves, stems, flowers and roots.<sup>134</sup>

From a historical perspective, the WHO estimated that 80% of the global population used traditional and complementary medicine as primary healthcare.<sup>1</sup> Regarding the current global prevalence, available systematic review data reveal 32.4% medicinal herb use during pregnancy worldwide.<sup>5</sup> However, the prevalence of IHM use by pregnant women varies across countries owing to differences in access, regulations, cultural aspects, historical influence, socioeconomic levels and conventional healthcare system progress.<sup>6-10</sup> Generally, the prevalence of use is higher in low-income countries where access to conventional healthcare is inadequate, TM is protuberant due to its cultural and historical reputation, and TM is one of the key sources, or sometimes the only available basis of healthcare.<sup>10</sup> In Africa, including Ethiopia, the prevalence of IHMs is high and widely used by pregnant women and the population too.<sup>3 11–14</sup> For instance, a systematic review of studies in Africa shows the prevalence rate varying from 12% to 60%.<sup>15</sup> Likewise, a meta-analysis study revealed that the prevalence of herbal medicine use in Ethiopia is 46% (95% CI 37% to 54%).<sup>16</sup> This is because there is a lack of modern healthcare services and medicine in proportion to people, being available only to a limited number of pregnant women because they are either expensive or few are available for too many people.<sup>12</sup>

Herbs could be used for a variety of reasons, like infection prevention by increasing immunity through the use of medicinal plants.<sup>17</sup> Studies also have identified some reasons that force pregnant women to use IHM, like physiological symptoms during pregnancy, including nausea, vomiting, heartburn, constipation and so on.<sup>1819</sup> Similarly, studies show that pregnant women use IHMs for conditions like exhaustion, respiratory and skin problems, and nutritional problems.<sup>20-22</sup> Moreover, some studies have identified three key factors that contribute to pregnant women using herbal remedies: availability, perceived better therapeutic value in comparison to conventional medicines and affordability.<sup>23 24</sup>

IHMs benefited from the development of many effective remedies that evolved through many generations.<sup>1 20 25</sup> Besides, the majority of contemporary pharmaceuticals and dietary supplements are developed after processing medicinal plants.<sup>26</sup> However, IHMs have associated complications that affect pregnant women and their fetus.<sup>1 20 23-25</sup>For instance, IHM use could result in heartburn, increased blood flow, miscarriage, premature labour and allergic reactions.<sup>27</sup> They also have herb-drug interactions,<sup>28</sup> are associated with induced liver injury<sup>29</sup>, and complicate the care of pregnant women who have pre-existing conditions such as epilepsy or asthma.<sup>21</sup> Moreover, intrauterine death and intrauterine growth restriction, uterine rupture, stillbirth, birth defects of the eye, ear and heart, and other risks have also been linked to the use of IHMs by pregnant women.<sup>9 14 30 31</sup> Due to various reasons, pregnant women in low-resource countries, including Ethiopia, commonly use herbal medicines. Although there are many different types of herbal medicines that come from different cultures, studies

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Selected public health facilities in **Dire Dawa administration From 2 Public Hospitals** From Urban health centers From Rural health centers **Dilchora Referral** Gende-kore Goro Dechatu Jeldessa Lege-Oda Melka-quero Hospital 219 194 246 229 297 358 73 87 83 93 113 136 PASS=n\*Ni/N = 660x358/1740 660

Figure 1 Diagram presentation of sample size allocation for the study on indigenous herbal medicine use among ANCattending pregnant women, Dire Dawa, Ethiopia, 2022. PASS indicates a proportionally allocated sample sizes, Ni=sample size, N=total estimated number of pregnant women and 660 is the sum of all proportionally allocated sample sizes. ANC, antenatal care. PASS, Proportionally allocated sample size.

proportionally allocated to each public health facility to select a representative sample (figure 1).

Figure on indigenous herbal medicine use

# **Data collection method**

The data were collected via face-to-face interview using a structured questionnaire that was adapted from literature designed for the same study purpose, and then variables were reviewed to suit the local context.<sup>111334-37</sup> The questionnaire was initially prepared in English, then translated by language experts into the local languages of Afaan Oromoo and Amharic, and finally back into English to maintain consistency. The questionnaire contains four main parts: sociodemographic characteristics; obstetrics; IHM awareness and uses during pregnancy; and environmental, past experience and medical factors. A total of eight health extension workers were recruited for data collection, and four MSc midwives supervised the whole process.

# **Operational definition**

IHM use is the use of locally available plants (any parts like seeds, roots, leaves, bark or flowers for medicinal purposes) by any route (oral, inhalation, topical application) either self-prescribed or recommended by family members, friends or herbalists to treat some abnormalities during the current pregnancy period.<sup>11 37</sup>

Knowledge was measured using seven items prepared to assess it. Study participants were asked the knowledge-З related questions, and value 1 was given for correct answers and value 0 was given for incorrect (or I do not d know) answers. Then the respondent's score was dichot-⊳ omised as sufficient knowledge or insufficient knowledge after the total score was computed by summing up all the items together.<sup>38 39</sup>

# Sufficient in knowledge

Study participants who answered equal to or greater than the mean values of knowledge-related questions.<sup>38 39</sup>

# Insufficient knowledge

training, and similar technologies Study participants who answered less than the mean values of knowledge-related questions.<sup>38 39</sup>

# Perception

The pregnant woman's perception towards the effects of IHM usage during pregnancy. Eight questions were prepared to assess it. Each question has a five-point Likert scale (1=strongly disagree, 2=disagree, 3=not sure, 4=agree and 5=strongly agree). Then the respondent's score was dichotomised as favourable perception or unfavourable perception (strongly disagree, disagree and not sure to 'unfavourable' and agree and strongly agree to 'favourable').<sup>38 39</sup>

## Income

The average family's monthly income of the pregnant women in Ethiopian Birr.<sup>40</sup>

## **Data quality control**

The questionnaire was developed in English and translated into the local languages by language experts (Afaan Oromoo, Somali and Amharic) and then back to English to maintain its consistency. The research's objectives, the sampling procedure, interviewing techniques and general approaches to the study participants were all thoroughly covered over a 2-day training session for data collectors and supervisors. We performed a pretest on 5% of the sample size out of the selected health centres at Adisketema Health Centre (urban) and Wahil Health Centre (rural) 2 weeks before the actual data collection. Based on the findings of the pretest, we made minor modifications to the questionnaire. The data collection process was closely supervised, and the completeness and accuracy of each questionnaire were checked by the investigators and supervisors daily. Data were entered into the EPI DATA software as part of data management. During data cleaning, a logical checking technique was used to identify the errors. Questionnaires are secured in a safe place for confidentiality and as a backup for later, in case a check is necessary. Finally, double data entry was done by two data clerks, and the consistency of the entered data was cross-checked. To determine the internal reliability of the data, Cronbach's  $\alpha$  was calculated ( $\alpha$ =0.801).

## **Data management and analysis**

The data were coded, entered into Epi Data (V.3.1) and exported to SPSS (V.22) statistical software for analysis. A univariate analysis was used to describe the frequency distribution variables. We coded the outcome variables as '1' for 'IHM user' and '0' for 'non-user.' The association between the outcome and independent variables was analysed using a binary logistic regression model. Variables with a p<0.25 at the bivariable binary logistic regression analysis were retained and entered into the multivariable binary logistic regression analysis using a forward stepwise approach. A multicollinearity test was performed to determine the linear correlation among the independent variables using the variance inflation factor (>10) and standard error (>2). The goodnessof-fit test was performed using the Hosmer-Lemeshow test (p>0.05). For an outcome variable, an adjusted OR (AOR) with a 95% CI and a p value of less than 0.05 was considered statistically significant.

## RESULTS

## Sociodemographic characteristics

A total of 628 study participants were included, yielding a response rate of 95.15%. The respondents' ages ranged from 18 to 40 years (mean=27 years, SD=6.5 years). More

Sociodemographic characteristics of the Table 1 respondents, Dire Dawa, Ethiopia, 2022 (n=628)

Variables	Category	Frequencies	Percentage
Age (in complete years)	>30	194	30.9
	20–30	345	54.9
	<20	89	14.2
Residence	Urban	408	65
	Rural	220	35
Level of	No formal education	152	24.2
education	Primary (1–8)	207	33
(women)	High school (9–10)	132	21
	Preparatory and diploma	95	15.1
	Degree and above	42	6.7
Marital status	Married	571	90.9
	Single	36	5.7
	Divorced	13	2.1
	Widow	8	1.3
Level of	No formal education	95	16.6
education (busband	Primary (1–8)	147	25.7
n=571)	High school (9 10)	155	27.1
	Preparatory and diploma	129	22.6
	Degree and above	45	7.9
Occupation	House wife	321	51.1
	Merchant	164	26.1
	Private employee	100	15.9
	Public employee	43	6.8
Monthly	<us\$100< td=""><td>174</td><td>27.7</td></us\$100<>	174	27.7
income	US\$100-US\$150	380	60.5
	>US\$150	74	11.8
Religion	Muslim	289	46
	Orthodox	213	33.9
	Protestant	103	16.4
	Catholic	23	3.7

18.8%, 53.2% and 28% were in the first, second, and **B** third trimesters, respectively. Less than half (45.1%) had three or more ANC visits, and more than half (55.9%) were pregnancies that were planned.

## Awareness of herbal medicine

Most respondents had awareness of IHM (89.6%), and their most common sources of information were neighbours and friends (41.3%), family and relatives (34%), traditional healers (14%) and religious fathers (10.7%).

Local name/English name	Scientific name	Frequency	Reason of use with frequency	Part use	Another additive used with IHM
'Fexo'/garden cress	Lepidium sativum L	96	<ul> <li>Hepatitis E<sup>9</sup></li> <li>Intestinal parasites<sup>46</sup></li> <li>Haemorrhoids<sup>7</sup></li> <li>Lowering blood pressure<sup>11</sup></li> <li>Lowering blood sugar with moringa<sup>20</sup></li> <li>Relieving pain/backache, leg cramps<sup>4</sup></li> <li>Digestion problem<sup>6</sup></li> </ul>	Seed	For BP and DM bulb of garlic, ginger with honey -moringa
'Girawa'/bitter leaf	Vernonia amygdalina	77	Indigestion <sup>6</sup> <ul> <li>Constipation<sup>5</sup></li> <li>Nausea and vomiting<sup>16</sup></li> <li>Headache<sup>29</sup></li> <li>Intestinal worm<sup>21</sup></li> </ul>	Roots or leaves	With Rue or moringa water
'Shifera'/moringa	Moringa oleifera	74	<ul> <li>Constipation<sup>34</sup></li> <li>Gastritis<sup>11</sup></li> <li>Indigestion<sup>14</sup></li> <li>Candidiasis<sup>4</sup></li> <li>Diabetes<sup>11</sup></li> </ul>	Leaf	Coffee
Talbaa'/flax seed	Linum Usitatissimum	46	<ul> <li>To increase appetite<sup>12</sup></li> <li>Constipation<sup>22</sup></li> <li>To treat stomach ulcer<sup>12</sup></li> </ul>		Slaughter
Nech bahirzaf'/ eucalyptus tree	Eucalyptus globulus	41	<ul> <li>Nausea and vomiting<sup>42</sup></li> </ul>	Fresh leaf/ dried leaf is put on fire and smoked	No
Abish'/fenugreek	Trigonella foenum- graecum	36	<ul> <li>To increase appetite<sup>30</sup></li> <li>Lowering blood sugar/ diabetes<sup>6</sup></li> </ul>	Seed and leaf	Fexo and moringa
Botoroo'	Stereospermum Kunthinium	28	► Tooth ache <sup>28</sup>	Bark	Ginger
Tenaadam'/Rue	Ruta chalepensis	27	<ul> <li>Abdominal cramp/colic<sup>16</sup></li> <li>Constipation<sup>4</sup></li> <li>Common cold<sup>7</sup></li> </ul>	Leaves	Zinger garlic

BP, blood pressure; DM, Diabete Melitus; IHM, indigenous herbal medicine.

# Prevalence of IHM use during the current pregnancy

Out of the total of 628 respondents, 47.8% (300) (95% CI 43.8% to 51.6%) used IHM during their current pregnancy. From this, 16.3%, 45%, 29.3%, 3.3%, 3.7% and 2.3% used only the first trimester, only the second trimester, only the third trimester, only the first and second trimesters, only the second and third trimesters, and all trimesters, respectively.

# Herbals used, indications, parts and additives

The most commonly used IHMs were garden cress (*Lepidium sativum*) (32%), bitter leaf (*Vernonia amygda-lina*) (25.2%), moringa (*Moringa oleifera*) (24.5%), flax seed (*Linum usitatissimum*) (15.3%) and eucalyptus tree (*Eucalyptus globulus*) (13.7%) (table 2).

The most common stated reasons were related to gastrointestinal system problems: intestinal parasites (27%), nausea and vomiting (21.7%), constipation (20%), to increase appetite (17.3%), relief of stomach aches (9.7%), indigestion (7.7%) and abdominal cramps (7%). The others were related to headache (17.7%), malaria (10.7%), high blood sugar (9.7%) and blood pressure (7.7%). The most commonly used parts of the herbs were seeds and leaves, with different additives (table 2). More than half of the respondents used the leaves of herbs, followed by the seeds. Moringa, rue and honey were the most commonly used additives (table 2).

## Routes, number and frequency per day

The majority (91.3%) of pregnant women took IHM via oral routes; the rest, 5.7% and 3%, were through nasal inhalation and topical form, respectively. Out of 300 respondents, the majority (142) took 2 types of IHM, followed by 3 types (76) and 1 type.<sup>41</sup> 59.7% of pregnant

Occasionally used herbal medicines, indications, parts and additives during pregnancy, Dire Dawa, Ethiopia, 2022 Table 3 (n=300)

Local name/English name	Scientific name	Frequency	Reason of use with frequency	Part use	Another additive used with IHM
'Kurkura'/Christ's thorn jujube	Ziziphus spina- christi	22	<ul> <li>Diarrhoea<sup>12</sup></li> <li>Diabetes<sup>7</sup></li> <li>Dementia<sup>3</sup></li> </ul>	Leaves	Moringa water
'Sinafch'/mustard	Brassica nigra	21	<ul> <li>To increase appetite<sup>10</sup></li> <li>Lower depression/'to be alert'<sup>11</sup></li> </ul>	Powder	No
'Ye Kosso zaf fire'	Hagenia abyssinica	21	Intestinal parasites <sup>21</sup>	Seed	No
'Gambello'	Gardenia ternifolia	20	<ul> <li>Stomach ache<sup>11</sup></li> <li>Fever<sup>4</sup></li> <li>Hypotension<sup>4</sup></li> </ul>		Rue
'Tikur azmud'/black cumin	Nigella sativa	16	<ul> <li>Headache=9</li> <li>Common cold=5</li> <li>Cough=4</li> </ul>	Seed	No
'Annan Kuti'/spearmint	Mentha spicata	12	<ul> <li>Lowering blood pressure<sup>5</sup></li> <li>Asthma<sup>3</sup></li> </ul>		Moringa
'Dammakessie'	Ocimum lamiifolium Hochst	11	<ul> <li>Common cold<sup>9</sup></li> <li>Inflammation of leg<sup>3</sup></li> <li>Diabetes<sup>3</sup></li> </ul>	Leaves	Ginger garlic
'Eret'/aloe	Aloe sinana	9	Malaria <sup>9</sup>	Leaves	Honey or sugar

women took IHM two times, 24.6% took it once (early morning in the bare stomach) and 15.7% took it three times per day. There were herbal medicines occasionally used by pregnant women (table 3).

## Side effects, discussions with health professionals and satisfaction

Among IHM users, 16.7% stated side effects after IHM intake. The most commonly stated types of these side effects were malaises (42.6%), abdominal pain (12.5%), vomiting (17%), and headaches (14.9%), and only 3.5%had discussions about them with health professionals. The majority (73%) were satisfied, 23% were on average and 4% were dissatisfied with the use of IHM during pregnancy.

## Source place and influential factors for IHM usage

When asked where they got their IHMs, respondents reported traditional healers (60%), religious places (14%), marketplaces (13.7%), a neighbour (3%), selfpreparation (2.7%) and more than one source (6.6%). The most commonly stated influential reasons for using IHMs were the perception that 'IHMs are more therapeutic than modern medicines' (43.7%) and 'safe in pregnancy' (17%) (figure 2).

# knowledge and perception of respondents towards IHM

More than half (63.5% and 59.4%) of respondents had sufficient knowledge of the effects of IHM use

during pregnancy and a favourable perception of IHM, respectively.

# Environmental, past experience and medical factors (n=628)

Protected by copyright, including for uses related to text and data mini Access to health facilities: 18.3%, 53.2% and 28.5% had Bu access to health facilities within <5 km, between 5 and 10 ⊳ km, and >10 km, respectively.

training, The presence of traditional healers in close proximity: 88.7% and 11.3% of respondents reported the presence of traditional healers >5 km and  $\leq$ 5 km, respectively.

Regarding prior IHM use experience (during a past pregnancy), 45.7% reported using it, and only 9.5% had used IHM for other health problems.

# Reasons for not using IHM among non-users (n=328)

and similar technologies Perceiving unsafe during pregnancy (60.4%), forbidden by husbands (20.4%), preference for modern medicines (14.6%), lack of availability (6.7%).

# Factors associated with IHM use by pregnant women

In the multivariable binary logistic regression analysis, level of education: no formal education (AOR 5.47, 95% CI 2.40 to 12.46), primary level (AOR 4.74, 95% CI 2.15 to 10.44), being a housewife (AOR 4.15, 95% CI 1.83 to 9.37), low number of ANC visits (AOR 2.58, 95% CI 1.27 to 5.25), insufficient knowledge on the effect of IHM during (AOR 4.58, 95% CI 3.02 to 6.77) and favourable perception (AOR 2.54, 95% CI 1.71 to 1.77) were

## Figure on indigenous herbal medicine use



**Figure 2** Most common influential reasons for using IHMs by ANC attending pregnant women, Dire Dawa, Ethiopia, 2022 (n=300). The black indicates 'perceived as more therapeutic'. The red indicates 'perceiving more safety in pregnancy'. The pink indicates 'family and relatives' influence'. The yellow indicates 'socio-cultural influence', the blue indicates 'easy access and the green indicates 'less expensive'. ANC, antenatal care; IHMs, indigenous herbal medicine.

significantly associated with IHM use during the current pregnancy (table 4).

## DISCUSSION

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For a country with a national policy aimed at strengthening the quality of healthcare, such as Ethiopia, it is fundamental to investigate the status of conventional and TMs with their potential influencing factors, such as in pregnant women. This study gives important findings regarding the prevalence and factors significantly associated with the use of IHM during pregnancy. The present study revealed that the prevalence of IHM use during a current pregnancy is high (one in two pregnant women, 47.8%). This finding was in line with a study in Turkey (47.3%).<sup>42</sup> Such consistency might be because of the aggregated similarity of some sociodemographic characteristics of study participants. In the present study, the majority of study participants were in the age range of 20-30 (54.9%), were housewives (51%) and were married (90.9%). Likewise, in the study in Turkey, the study participants' ages ranged from 21% to 25%; the majority were housewives (87.4%) and 34.2% had completed only primary school or below.<sup>42</sup> The present finding was also in line with three studies in Ethiopia: Nekemte (50.4%),<sup>40</sup> Gonder  $(48.5\%)^{33}$  and Dessie (51.2%)<sup>43</sup> Similarly, the possible reason for consistency

might be related to the major compacted variables among study participants. In all three studies, most participants' ages were below 30 years, their education level was secondary and below, and they were urban residents, unemployed or housewives.<sup>33 40 43</sup> Similarly, in the present study, more than half (54.9%) of participants were in the age range of 20–30 years, unemployed or housewives (51.1%), and the majority were urban dwellers (65%), and their education level was secondary or below (78.2%).

The present study's prevalence is higher than studies conducted in Italy (27.8%),<sup>44</sup> two studies in Africa, Nigeria (36.8%),<sup>45</sup> Uganda (20%)<sup>8</sup> and one study in Ethiopia (36.3%).<sup>41</sup> This discrepancy might be due to study methods. For instance, the study in Italy used only two hospitals and 392 samples with a 10-month study period.<sup>44</sup> The study in Nigeria used only a tertiary hospital and 500 samples selected by systematic techniques.<sup>45</sup> Likewise, the study in Uganda used four study sites, a mixed study design with 383 samples for the quantitative part, and participants were interviewed while attending postnatal care about the use of herbal medicines during their pregnancy period; this could have a recall bias that varied the study result.<sup>8</sup> In addition, the study in Northern Ethiopia, Debre Tabor, used a mixed community-based study design with 267, 12 and 6 sample sizes for

Table 4 Bivariable and multivariable binary logistic regression analysis results indicating factors associated with IHM use during pregnancy, Dire Dawa, Ethiopia, 2022 (n=628)

		IHM use				
Variables	Category	Yes	No	COR (95% CI)	AOR (95% CI)	P value
Age (in completed years)	>30	85 (43.8%)	109 (56.2%)	1.72 (1.037 to 2.86)*	1.13 (0.61 to 2.09)	0.707
	20–30	164 (47.5%)	181 (52.5%)	1.48 (0.93 to 2.37)	1.13 (0.64 to 1.99)	0.668
	<20	51 (57.3%)	38 (42.7%)	1	1	
Residence	Urban	207 (50.7%)	201 (49.3%)	1	1	
	Rural	93 (42.3%)	127 (57.7%)	1.41 (1.01 to 1.96)*	1.46 (0.97 to 2.18)	0.068
Education level	No formal education	43 (28.3%)	109 (71.7%)	6.34 (2.97 to 13.51)***	5.47 (2.40 to 12.46)	0.000
	Primary (1st-8th grade)	71 (34.3%)	136 (65.7%)	4.79 (2.31 to 9.92)***	4.74 (2.15 to 10.44)	0.000
	High school (9th–10th grade)	99 (75.0%)	33 (25.0%)	0.83 (0.38 to 1.81)	0.85 (0.36 to 1.98)	0.704
	Preparatory and diploma	57 (60.0%)	38 (40.0%)	1.67 (0.76 to 3.65)	1.44 (0.60 to 3.45)	0.409
	Degree and above	30 (71.4%)	12 (28.6%)	1	1	
Occupation	Housewife	130 (40.5%)	191 (59.5%)	2.74 (1.41 to 5.34)**	4.15 (1.83 to 9.37)	0.001
	Private employee	56 (56.0%)	44 (44.0%)	1.47 (0.70 to 3.08)	1.66 (0.68 to 4.07)	0.268
	Merchant	86 (52.4%)	78 (47.6%)	1.69 (0.84 to 3.40)	2.19 (0.94 to 5.09)	0.069
	Public employee	28 (65.1%)	15 (34.9%)	1	1	
Number of	3 and more	156 (55.1%)	127 (44.9%)	1	1	
ANC	1–2	144 (41.7%)	201 (58.3%)	1.71 (1.25 to 2.35)**	2.58 (1.27 to 5.25)	0.009
Gestation	First	50 (42.4%)	68 (57.6%)	1.63 (1.02 to 2.61)*	1.38 (0.77 to 2.47)	0.274
	Second	154 (46.1%)	180 (53.9%)	1.40 (0.97 to 2.02)	1.37 (0.88 to 2.14)	0.166
	Third	96 (54.5%)	80 (45.5%)	1	1	
Prior IHM use	No	176 (51.6%)	165 (48.4%)	1	1	
experience	Yes	124 (43.2%)	163 (56.8%)	1.40 (1.02 to 1.92)*	0.84 (0.42 to 1.71)	0.638
IHM use for other health problem	No	279 (49.1%)	289 (50.9%)	1	1	
	Yes	21 (35.0%)	39 (65.0%)	1.79 (1.03 to 3.12)*	1.74 (0.88 to 3.46)	0.113
Knowledge (IHM)	Sufficient	240 (60.2%)	159 (39.8%)	1	1	
	Insufficient	60 (26.2%)	169 (73.8%)	4.25 (2.98 to 6.07)***	4.58 (3.02 to 6.97)	0.000
Perception	Unfavourable	160 (62.7%)	95 (37.3%)	1	1	
	Favourable	140 (37.5%)	233 (62.5%)	2.80 (2.02 to 3.90)***	2.54 (1.71 to 3.77)	0.000
Presence of traditional healer in near	>5 km	277 (49.7%)	280 (50.3%)	1	1	
	≤5 km	23 (32.4%)	48 (67.6%)	2.06 (1.22 to 3.49)**	1.44 (0.75 to 2.76)	0.268
1=reference. *p≤0.05, **p≤0.0 ANC, antenatal	11, ***p=0.000. care; IHM, indigeno	us herbal medicine				

quantitative, focus group discussion and in-depth interviews, respectively.<sup>41</sup> While the present study used multiple health settings, both urban and rural, with a facility-based study design and 628 samples, pregnant women attended ANC visits. This may be due to the accessibility and affordability of the regulatory systems of IHM and TM usage in different countries. These may make a difference in countries such as Italy and Nigeria, versus in Ethiopia, where traditional healers and TM usage are relatively common. For instance, in

the present study, 88.7% and 11.3% of respondents reported the availability of traditional healers at a distance >5 km and  $\leq 5$  km, respectively.

The present study's prevalence, however, is lower than studies conducted in Bangladesh (70%),<sup>20</sup> Iran (71.3%),<sup>24</sup> Zimbabwe (69.9%),<sup>46</sup> Mali (79.9%),<sup>47</sup> Sierra Leone  $(82.7\%)^{48}$  and Uganda  $(76.7\%)^{14}$  The discrepancy may be caused by variations in the study setting, sample size, sampling technique, study design, study

populations, study duration and participants' ages. For instance, in a study in Bangladesh,<sup>20</sup> two public hospitals, a study in Iran,<sup>24</sup> 12 health centres, a study in Mali,<sup>47</sup> 3 health centres and a study in Zimbabwe,<sup>46</sup> only 2 rural districts were included as study settings. In the present study, 3 health centres from urban areas, 3 urban public health centres, 3 rural public health centres and 1 public referral hospital were included.

Regarding the sample size, 243, 150, 398, 209, 134 and 46 sample sizes were used in studies in Bangladesh, Iran, Zimbabwe, Mali, Serra Leon and Uganda, respectively.<sup>14 20 24 46-48</sup>

But in the present study, a sample size of 628 was used. In the present study, a facility-based cross-sectional study design was used, while a study in Uganda used a community-based survey, which could also result in result variations.<sup>14</sup> In the present study, the study populations were pregnant women on ANC visits while in a study in Bangladesh, postpartum women were interviewed about patterns of herbal medicines used in the previous pregnancy; this can have recall bias and could result in result variations.<sup>20</sup> In addition, the studies in Zimbabwe and Uganda used convenient and snowball sampling techniques, respectively.<sup>14 46</sup> While the present study used random sampling techniques. The participant's age may also be a possible reason for variation, as their experience with IHM knowledge and perception might be related to age.<sup>39</sup> All these methodological variations could create discrepancies between the studies. Besides, the discrepancy may be related to sociocultural variables like residence area, education level and awareness status in different countries and their districts. Moreover, the discrepancy may be related to access to community and/or health facilitybased population health education programmes that involve TMs. The present study's prevalence was also lower than one study conducted in southern Ethiopia, Hosana (73.1%).<sup>38</sup> This discrepancy may be caused by variations in the study setting, sample size and sampling technique. The study in southern Ethiopia, Hosana, used public health facilities available only in the town, a sample size of 363 and a systematic sampling technique.<sup>38</sup> While the present study used public health facilities available both in urban and rural sites, a larger sample size (628) and a random selection technique. Besides, the discrepancy may be related to sociocultural variations and the awareness or attitude of populations in different districts of Ethiopia.

According to this study, low levels of education, being housewives, lower ANC visits, insufficient knowledge and favourable perceptions were all associated with a higher likelihood of IHM use during a current pregnancy. Pregnant women who had no formal or primary-level education were more than five and four times more likely to use IHM than those who had secondary or higher education. This was supported by research conducted in Turkey,<sup>42</sup> Nigeria<sup>45</sup> and different parts of Ethiopia.<sup>33 38 41 43 49</sup> The study conducted at Debre Birhan, Dessie, Gonder,

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Hosana and Debre Tabor revealed the odds of IHM use during pregnancy were 2, 3, 4, 4 and 9 times higher among pregnant women with low-level education, respectively.<sup>33 38 41 43 49</sup>

Pregnant women who had insufficient knowledge regarding the effects of herbal medicine usage during pregnancy were almost four times more likely to use IHM compared with those who had sufficient knowledge. Previous studies conducted in the west and northern parts of Ethiopia did not assess participants' knowledge on the effects of herbal medicine usage during preg-nancy.<sup>33 40 41 43</sup> But two studies, one in north Ethiopia, Hosana, Debre Birhan and one in southern Ethiopia, Hosana, assessed participants' knowledge on the effects of herbal **Z** medicine usage during pregnancy.<sup>38 49</sup> The former study **8** (at Debre Birhan) did not show an association between knowledge and herbal medicine usage during preg-nancy.<sup>49</sup> While the latter one revealed that knowledge nancy.<sup>49</sup> While the latter one revealed that knowledge on the effect of herbal medicine use during pregnancy had a significant association with its use,<sup>38</sup> which is in line with the present study. The possible explanation may be the fact that insufficient knowledge regarding the effects of herbal medicine usage during pregnancy may reduce uses thoughtfulness to the risks that can occur during pregnancy, either to pregnant women or their fetus or to both.

nancy, either to pregnant women or their fetus or to both. In previous studies done in different parts of Ethiopia, only one study assessed perception but did not show a significant association with the use of IHM by pregnant women.<sup>38</sup> In contrast, the present study showed the odds of IHM use during pregnancy were more than two times higher among favourable preceptors. One possible explanation might be that those who had a favourable perception of IHM might perceive herbal medicines as lacking risks that can occur during pregnancy, either to pregnant women or their fetus or to both.

Moreover, the present study revealed two variables **9**, A training a significant association with the use of IHM by pregnant women: being housewives and the number of ANC visits. Pregnant women who were housewives were almost four times more likely to use IHM compared with their counterparts. The possible explanation might be due to the fact that housewives might have a lack of awareness of IHMs compared with their counterparts and a positive perception towards their use. Pregnant women who attended fewer ANC visits were more than two times more likely to use IHM compared with those who attended more ANC visits. The possible reason might be due to the effects of counselling during ANC, like risk and nutritional counselling, and this needs further research.

Furthermore, at the binary level, this study also showed the presence of traditional healers in a nearby area has an association with the use of IHM by pregnant women, but this also needs further study.

The present study showed commonly used herbal medicines during pregnancy as garden cress (*L. sativum*) (32%), bitter leaf (*V. amygdalina*) (25.2%), moringa (*M. oleifera*) (24.5%), flax seed (*L. usitatissimum*) (15.3%) and eucalyptus tree (*E. globulus*) (13.7%). A little bit related

finding was indicated by a study conducted in Nigeria, in which the bitter leaf/iron weed plant (V. amygdalina) (54.3%) was the most common herbal medicine used by pregnant women.<sup>45</sup> Studies conducted in Turkey<sup>42</sup> and Ethiopia showed ginger (Zingiber officinale) as the most common herbal medicine used by pregnant women.<sup>33 38 40 41 43 49</sup> Unlike previous studies in Ethiopia<sup>33</sup> <sup>38</sup> <sup>40</sup> <sup>41</sup> <sup>43</sup> <sup>49</sup>, ginger was not the most common herb but rather used as an additive in the present study.

A study in Italy showed chamomile, licorice, fennel, aloe, valerian, echinacea, almond oil, propolis and cranberry as the common herbal medicines used by pregnant women.<sup>44</sup> A study in Mali revealed *chevalieri* (55.5%), Combretum micranthum (39.7%), Parkia biglobosa (12.0%) and Vepris heterophylla (8.1%) as the common herbal medicines used by pregnant women.<sup>47</sup>

In addition, a study in Serra Leon identified Luffa acutangula ((L.) Roxb the most cited herbal medicine used during pregnancy).<sup>48</sup> The study at Gonder and Dessie, north Ethiopia, showed ginger (Zingiber ofcinale Roscoe) (43.8%) and garlic (Allium sativum L.) as the the most common herbal medicines used by pregnant women.<sup>43</sup> The study at Debre Birhan showed ginger (Zingiber officinale Roscoe), damakesse (Ocimum lamiifolium) and tenadam (Fringed rue) as the the most common herbal medicines used by pregnant women.<sup>49</sup> In the study at Nekemte, west Ethiopia, ginger (44.36%) and tenaadam (9.15%) were found to be the most common herbal medicines used by pregnant women.<sup>40</sup> This indicates that the types and frequency of herbal medicines vary according to different research findings. This might be due to the fact that there are many different types of herbal medicine from different cultures and the variety of sample sizes in different research studies. Such variation could also be due to differences in user-friendliness, openness (lacking a regulatory body) and environmental spreading of the herbs across diverse countries and provinces in the same country.

As per the present study, common indications of herbal remedies were related to gastrointestinal system problems: intestinal parasites (27%), nausea and vomiting (21.7%), constipation (20%), to increase appetite (17.3%) and relief of stomach aches (9.7%). The others were related to headache (17.7%), malaria (10.7%), high blood sugar (9.7%) and blood pressure (7.7%). The indications of herbal remedies also vary; for instance, a study in Mali showed: for wellbeing (36.7%), symptoms of malaria (37.1%) and to reduce oedema (19.2%)).<sup>47</sup> A study at Serra Leon indicated urinary tract infection and pedal oedema.<sup>48</sup>A study at Dessie, north Ethiopia, showed indications for herbal drug use were nausea/vomiting (43.8%), headache (30.8%) and common cold (25.4%).<sup>43</sup> In a study at Gonder, north Ethiopia, common cold (66%) and inflammation (31.6%) were the most common reasons.<sup>33</sup> This suggests that there are a number of therapeutic tasks that herbal remedies are demanded to play during the gestational period, duties that may

require scientific explanation. The present study showed that only a few pregnant women are aware of the side effects after taking herbal medicines and only a few have disclosure for discussion with health professionals about the side effects. This suggests that to prevent the possible harm imposed by the use of herbal medicines, healthcare providers should emphasise safety issues to pregnant women and make functional counselling during ANC cares and provide updated evidence-based information regarding herbal medicines. Unlike the previous studies available in Ethiopia so far,<sup>33 38 40 41 43 49</sup> the present study identified traditional healers (60%), followed by religious places, as the major source place to obtain herbal medicines by **Z** pregnant women. This indicates the need for training 8 for traditional healers and religious leaders about the possible risks for pregnant women and their fetuses, dose proportion of herbs and gestational time of pregnant women.

The present study also revealed the most commonly stated influential reasons for using IHM as perception that 'IHMs are more therapeutic than modern medicines' and 'safe in pregnancy'. Moreover, the present study showed reason for not using IHM among non-users as perceiving unsafe during pregnancy (60.4%), forbidden by husbands (20.4%) and preference for modern medicines (14.6%). These indicates the need for community awareness of herbal medicines including husbands, traditional healers and religious leaders at community level.

Furthermore, unlike the previous studies available in Ethiopia,<sup>33 38 40 41 43 49</sup> the present study showed the additives, number and frequency per day of IHM used. Consequently, moringa, rue, honey and ginger were at a commonly used as additives. In the present study, the  $\exists$ majority of pregnant women took two types of IHM, followed by three types; the majority took IHM two times ≥ per day, and a quarter (24.6%) of them took it once (early morning in the bare stomach). This highlights the issue of herbal medicine frequency as well as dose during pregnancy.

The findings of the study could have implications for society, research and practice (health professionals and healthcare programmes). Implications for:

Social: The study findings suggest the need for continuous awareness for pregnant women considering education level, housewives and the number of ANC visits since IHM use during pregnancy was higher among these women. They might lack awareness of the risks of pregnancy to themselves and their fetus. It also suggests the need for community awareness to clear up misconceptions about IHM during pregnancy and among general women.

Research: The need for future research to identify IHM use by pregnant women at the community level. Another recommendation for further research is to conduct research on the effects of the number of ANC visits and the influence of traditional healers and religious leaders on IHM use by pregnant women. Further research on

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the bioavailability, dose, efficacy and safety of the herbal medicines used by pregnant women should also be done.

Implications for practice (health professionals and health care programmes): According to the study's findings, health facilities require counselling of pregnant women about IHM use during ANC visits and counselling pregnant women to disclose IHM usage and any untoward or side effects if they use it. Since there is a high prevalence and low disclosure rate of herbal medicine use, it should be ensured that obstetricians, midwives and other health professionals establish a good level of communication with pregnant women during ANC visits.

## Conclusion

The prevalence of herbal medicine use is high (one in two pregnant women) and significantly associated with education level, occupation, ANC visits, knowledge and perceptions. The study's findings are helpful in advancing comprehension of herbal medicines using status, types and enforcing factors. It is essential that health facilities provide herbal counselling during ANC visits, and health regulatory bodies ought to raise awareness and implement interventions to lower the risks from OTC herbal medicine use by pregnant women.

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