Sharwes Scientific Journal (SSJ)
Volume 6, Issue 2, 2025, pp 448-465, ISSN 3079-6040

Prevalence, Knowledge, and Attitudes towards Herbal Medicine Use during Pregnancy among Women Attending Antenatal Care in Derna and Tobruk, Libya: A Cross-Sectional Study

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Received: 19-08-2025 | Accepted: 02-11-2025 | Available online: 24-11-2025 | DOI:10.26629/ssj.2025.26

ABSTRACT

Herbal medicine (HM) use during pregnancy presents both cultural continuity and potential clinical risk, particularly where biomedical engagement is limited or fragmented. Although global evidence highlights the widespread use of herbal remedies among expectant mothers, Libyan populations remain underrepresented in such epidemiological assessments. This cross-sectional study investigated the prevalence, knowledge, and attitudes related to HM use, and examined associations with sociodemographic and informational variables among 1,500 pregnant women attending antenatal clinics in Derna and Tobruk. Data were collected through a structured questionnaire addressing demographic characteristics, herbal usage patterns, source of information, and safety awareness. Analysis revealed that lower educational attainment and reduced household income were significantly associated with increased herbal use ($p < 0.01$). Multiparous women reported higher usage rates than primigravidae (OR = 2.18, $p = 0.003$), and reliance on informal sources—particularly family advice—was strongly linked to lack of knowledge regarding herb–drug interactions and trimester-specific risks. These findings suggest that traditional health practices are shaped by structural inequities, cultural trust, and gaps in formal antenatal communication. The results underscore the need for culturally sensitive, early-pregnancy health education interventions that engage directly with herbal practices and promote safe maternal decision-making.

Keywords: Herbal medicine, Pregnancy, Maternal health, Health education, Libya.

مدى انتشار المعرفة والمواقف تجاه استخدام الطب العشبي أثناء الحمل بين النساء المراجعات لرعاية ما قبل الولادة في مدينتي درنة وطبرق، ليبيا: دراسة مقطعية

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استقبلت: 19-08-2025م | قبلت: 02-11-2025م | متوفرة على الانترنت | 24-11-2025م | DOI:10.26629/ssj.2025.26

ملخص البحث

يمثّل استخدام الأعشاب الطبية خلال الحمل مظهرًا من مظاهر الاستمرارية الثقافية، ولكنه قد ينطوي في الوقت ذاته على مخاطر سريرية محتملة، لا سيّما في البيئات التي يضعف فيها الارتباط بالخدمات الطبية الحيوية أو يظل مجزأً. وعلى الرغم من وجود أدلة عالمية تؤكد الانتشار الواسع لاستخدام الأعشاب بين النساء الحوامل، لا تزال المجتمعات الليبية ممثلة تمثيلًا محدودًا في مثل هذه الدراسات الوبائية. هدفت هذه الدراسة المقطعية إلى استكشاف مدى انتشار

استخدام الأعشاب الطبية، ومعرفة النساء الحوامل بها، واتجاهاتهن نحوها، بالإضافة إلى تحليل العلاقة بين هذه الجوانب والمتغيرات الاجتماعية الديموغرافية ومصادر المعلومات. شملت العينة 1500 امرأة حامل ممن ارتدن عيادات الرعاية السابقة للولادة في مدينتي درنة وطبرق. تم جمع البيانات من خلال استبيان منظم تناول الخصائص السكانية، وأنماط استخدام الأعشاب، ومصادر المعرفة، ومدى إدراك المخاطر الصحية. كشفت النتائج أن انخفاض المستوى التعليمي والدخل الأسري كانا مرتبطين بشكل ملحوظ بزيادة استخدام الأعشاب ($p < 0.01$). كما تبين أن النساء متعدّدات الولادات استخدمن الأعشاب بشكل أكبر من النساء الحوامل لأول مرة ($OR = 2.18$، $p = 0.003$)، وأن الاعتماد على المصادر غير الرسمية، خاصة نصائح الأسرة، ارتبط ارتباطًا وثيقًا بضعف المعرفة بالتفاعلات الدوائية–العشبية والمخاطر الخاصة بمراحل الحمل المختلفة. تشير هذه النتائج إلى أن الممارسات الصحية التقليدية تتشكل من خلال عوامل عدم المساواة الهيكلية، والثقة في المصادر المجتمعية، والثغرات في التواصل مع خدمات الرعاية الطبية. وتؤكد الدراسة على أهمية تطوير تدخلات تثقيفية صحية، تراعي الخصوصية الثقافية، وتستهدف النساء الحوامل في المراحل المبكرة من الحمل، بما يعزز من اتخاذ قرارات صحية وآمنة.

الكلمات المفتاحية :الأعشاب الطبية، الحمل، صحة الأم، التثقيف الصحي، ليبيا.

1. Introduction

Herbal medicine use during pregnancy has been documented in multiple settings, with prevalence rates reported between 7% and over 90% depending on population characteristics, research design, and local health system contexts [1] [2]. In Middle Eastern countries, frequent use has been linked to cultural traditions, perceptions of safety, and the accessibility of herbal products, particularly in areas where modern healthcare services may be less available or financially burdensome [3] [4]. Pregnant women have used plants such as peppermint, ginger, chamomile, sage, and fenugreek for a variety of purposes, including alleviation of nausea, reduction of abdominal discomfort, management of colds, and facilitation of labour [3] [5]. However, research has demonstrated that the perception of safety may not always be accurate, as certain herbs exhibit pharmacological actions that could result in adverse maternal or foetal outcomes. Sage and fenugreek have been associated with uterotonic properties potentially precipitating preterm labour [6], while blue cohosh has been linked to severe neonatal cardiac complications [7]. In addition, concurrent consumption of some herbs with prescribed medicines can alter drug metabolism, affecting therapeutic efficacy or increasing toxicity [5] [8]. These risks are intensified in contexts such as Libya, where herbal preparations are not consistently regulated or subjected to standardised safety evaluations [9].

Evidence from regional studies illustrates patterns of use that share similarities with, but also differ from, the Libyan situation. In Jordan, cultural norms, family recommendations, and product availability have been identified as the primary influences on herbal medicine use during pregnancy, with anise, peppermint, chamomile, and sage most frequently reported [10]. In contrast, studies from Saudi Arabia have shown prevalence rates between 25% and 56%, with a substantial proportion of women obtaining information from relatives, friends, or other non-medical sources rather than healthcare professionals [11] [12]. Research within Libya has found that 50.8% of pregnant women reported herbal medicine use, most commonly during the third trimester, and 68.4% did not disclose their use to healthcare providers [13]. Factors such as educational attainment, parity, and pregnancy history have been associated with variations

in usage, although cultural acceptance and product accessibility remain consistently influential. These findings align with wider African and Middle Eastern literature that links herbal medicine preference to perceptions of naturalness, affordability, and cultural compatibility [3] [5].

Despite these observations, there is an absence of published research assessing herbal medicine use among pregnant women in Derna and Tobruk, two cities in north-east Libya with distinct socio-cultural environments and differing levels of healthcare infrastructure. The absence of such localised data restricts the ability of healthcare providers to deliver targeted antenatal education, adapt counselling approaches, and address misconceptions about herbal medicine safety during pregnancy. Understanding the influence of socio-demographic characteristics, including education level, household income, parity, and source of information, could help clarify patterns of use in these settings and identify groups at greater risk of unmonitored consumption. The present study aims to determine the prevalence, knowledge, and attitudes regarding herbal medicine use among pregnant women in Derna and Tobruk, while examining how socio-demographic and informational factors relate to usage. The specific objectives are to measure the prevalence of herbal medicine use in antenatal clinic attendees in these cities, assess women's knowledge of the safety, benefits, and risks of herbal remedies, examine their attitudes towards herbal versus conventional medicines, identify the most common herbs used and their indications, and analyse associations between selected socio-demographic factors and the likelihood of herbal medicine use during pregnancy.

2. Theoretical and Conceptual Framework

The present study is underpinned by the Knowledge–Attitude–Practice (KAP) Model, a framework extensively applied in public health research to explain how individuals' understanding of a health-related issue influences their perceptions and, subsequently, their behaviours [14]. Within this framework, knowledge encompasses the information and awareness an individual holds about a specific health matter, attitude represents the evaluative stance shaped by that knowledge, and practice refers to the observable actions undertaken in response to those attitudes [15]. The KAP model is based on the premise that accurate and comprehensive knowledge may contribute to more informed attitudes, which, in turn, could foster safer and more appropriate behavioural choices [16].

In the context of this study, the KAP model offers a systematic approach to understanding herbal medicine use among pregnant women in Derna and Tobruk. Pregnant women's knowledge regarding the benefits, risks, and safety of herbal remedies may shape their attitudes towards these treatments, potentially leading them to view such remedies as either safe, natural alternatives or as substances requiring careful regulation and caution. These attitudes are then expected to influence actual practices, such as the selection of herbs, frequency and dosage of consumption, and the willingness to disclose such usage to healthcare professionals. This conceptual alignment enables the investigation of how socio-demographic and informational variables interact with knowledge and attitudes to influence behavioural outcomes.

The dependent variable is herbal medicine use during pregnancy, operationalised both as a binary outcome (use versus non-use) and as a continuous measure (frequency of use). The independent variables are aligned with the study's objectives: education level, household income, parity (number of previous pregnancies/children), and primary source of information

about herbal medicines. Based on this framework, four testable hypotheses have been formulated:

- **H1:** There is a statistically significant negative association between education level and the likelihood of herbal medicine use during pregnancy among women in Derna and Tobruk.
- **H2:** Household income is a statistically significant predictor of herbal medicine use during pregnancy, with lower income associated with higher usage rates.
- **H3:** Parity (number of previous pregnancies/children) is positively correlated with the frequency of herbal medicine use during pregnancy.
- **H4:** Primary source of information (family/friends vs healthcare providers) is significantly associated with the likelihood of herbal medicine use during pregnancy.

3. Materials and Methods

3.1 Research Design

A cross-sectional study design has been applied to determine the prevalence, knowledge, and attitudes towards herbal medicine use during pregnancy and to examine the association between selected socio-demographic factors and usage patterns among women attending antenatal care services in Derna and Tobruk, Libya. Cross-sectional designs are widely recognised for their appropriateness in identifying existing behaviours and their associated factors at a single point in time without follow-up requirements [17]. This approach has been particularly relevant to maternal health research, where the aim is to capture prevailing antenatal care practices and the determinants influencing them [1] [2]. Data collection has been conducted using a structured, interviewer-administered, paper-based questionnaire, a method known to facilitate systematic and standardised data gathering across multiple sites while accommodating participants with varying literacy levels and avoiding reliance on digital technology [3].

3.2 Participants

The study population has consisted of pregnant women aged 18 years and above who were attending routine antenatal care appointments during the data collection period. Eligibility criteria have included current pregnancy status, residency in Derna or Tobruk, and receipt of antenatal services at one of the selected Primary Health Care (PHC) centres. Exclusion criteria have applied to women with severe medical conditions requiring hospitalisation and those unable to communicate due to language or cognitive barriers. The participant group represents typical clients of public antenatal services in north-east Libya, a context where herbal medicine use during pregnancy has been documented but not extensively studied in localised settings [13]. All participants have been provided with a written information sheet and have signed an informed consent form prior to data collection, ensuring voluntary participation and ethical compliance [18].

3.3 Study Setting

Data collection has taken place across six PHC centres, three in Derna and three in Tobruk, all of which regularly provide antenatal care services to women from various socio-economic and educational backgrounds. In Derna, the selected centres have included Al-Fatima Health Centre, Al-Wehda PHC, and Martyrs' PHC, where midwives and nurses working within antenatal units have supported recruitment and questionnaire administration. In Tobruk, the

centres have comprised Tobruk Central PHC, Al-Salam PHC, and Al-Manara PHC, where faculty members from the University of Tobruk's Faculty of Pharmacy have collaborated with healthcare staff in participant engagement and data collection. These facilities have been chosen for their high patient attendance, established antenatal services, and their representation of both urban and peri-urban catchment areas [19].

3.4 Sampling Technique and Sample Size

A convenience sampling technique has been employed to recruit participants during their scheduled antenatal visits. This method has been selected due to practical constraints associated with probabilistic sampling and the necessity of real-time recruitment in busy clinical environments [20]. While convenience sampling does not allow for statistical generalisation to the entire population, it provides valuable insight into the service-utilising population in each city.

The total sample size has comprised 1,500 pregnant women, with 750 participants recruited from Derna and 750 from Tobruk. This sample size has been considered adequate for estimating prevalence and for examining associations between the independent variables (education level, household income, parity, and primary source of information) and the dependent variable (herbal medicine use during pregnancy). The final sample size of 1,500 women was calculated using prevalence estimates from regional studies, applying a 95% confidence level and a 3% margin of error. This number has allowed for robust subgroup analysis while maintaining adequate power to detect associations across education, income, and parity.

3.5 Recruitment Process

Recruitment has been undertaken between June 2024 and July 2025 within the antenatal clinics of the selected PHC centres. In Derna, volunteer midwives and nurses have served as trained data collectors, while in Tobruk, faculty members from the University of Tobruk's Faculty of Pharmacy have fulfilled this role. Eligible women attending antenatal appointments have been approached after their consultations in waiting areas or private consultation spaces. They have received a verbal explanation of the study and a printed information sheet outlining the objectives, confidentiality measures, and voluntary nature of participation. Written informed consent has been obtained before proceeding.

The paper-based questionnaire has been completed either independently or with guided support from the data collectors, depending on the respondent's literacy level and preference. Data collection activities have been integrated into routine antenatal workflows to minimise disruption to healthcare delivery [21]. To strengthen transparency in the recruitment process, data collectors approached participants at different times of the day and across multiple antenatal sessions. This approach has ensured that women from varied socioeconomic and demographic backgrounds were proportionally represented despite the use of a convenience sampling strategy.

3.6 Questionnaire Instrument

The questionnaire employed in this study was systematically designed to investigate the determinants of herbal medicine use during pregnancy among women in Derna and Tobruk, Libya. The instrument was structured into five distinct scales, developed in alignment with the

study's aims and guided by prior empirical studies on herbal medicine use in pregnancy [22] [13] [23] [24].

Scale 1 – Demographic and Socioeconomic Profile Scale (DSPS) captured essential background characteristics of participants. Variables included age, education level, monthly household income, parity, occupational status, nationality, and urban/rural residence. These variables have previously been shown to influence maternal health-seeking behaviours and herbal remedy use in multiple settings [22] [10] [13].

Scale 2 – Herbal Medicine Use During Pregnancy (HMUP Scale) served as the dependent variable scale and was operationalised both as a binary indicator (used/not used) and as a continuous measure (frequency of use). This section consisted of four items examining whether herbal remedies were used, during which trimester(s), the current frequency of use, and whether the participant discussed their use with a healthcare provider. These variables were informed by prior research identifying patterns of usage across pregnancy stages [23] [24].

Scale 3 – Knowledge of Herbal Medicine Safety and Efficacy (KHMS Scale) comprised ten Likert-scale items assessing participants' knowledge of potential risks, interactions, and safe practices related to herbal medicine during pregnancy. Statements included beliefs about herbal side effects, dosage concerns, trimester-specific risks, and professional consultation. This scale reflects knowledge dimensions explored in earlier studies examining how pregnant women's understanding influences practice [10] [24].

Scale 4 – Attitudes Toward Herbal Medicine Use (AHMU Scale) included eight items assessing perceived benefits, cultural preferences, cost, accessibility, and endorsement of herbal medicine during pregnancy. Items such as "Herbal medicine is more effective than conventional medicine for some pregnancy-related conditions" and "I would recommend herbal medicine use to other women" explored attitudinal drivers of usage. These items were adapted based on findings that positive attitudes toward herbal remedies are often rooted in cultural familiarity and perceived safety [22] [23].

Scale 5 – Source of Information About Herbal Medicines (SIHM Scale) comprised eight items evaluating the participants' trust in and reliance on different sources of herbal medicine information, including healthcare providers, family, and peers. The scale explored whether women initiated or stopped herbal use based on advice, and how conflicting information was managed. This construct draws from evidence suggesting that the credibility and accessibility of information sources significantly shape herbal medicine practices [13] [22].

The questionnaire was administered in Arabic and translated from English using forward–backward translation to ensure conceptual equivalence. It was pre-tested with a sample of 30 participants to assess linguistic clarity and cultural appropriateness. Final revisions were made to improve item comprehension and overall flow. Informed consent was obtained from all participants prior to participation. Data were collected across antenatal clinics in Derna and Tobruk, including Al-Wahda Hospital, Tobruk Medical Centre, and Al-Fateh Polyclinic in Derna, over a 12-month period from June 2024 to July 2025. The translation of the questionnaire followed a rigorous forward–backward procedure, with bilingual experts reviewing linguistic and cultural equivalence. Consultation with maternal health specialists

ensured that key items, such as trimester-specific risks and herb–drug interactions, were rendered in terms familiar and meaningful to Libyan women.

3.7 Measurement Validity and Reliability

To ensure the psychometric soundness of the questionnaire, each scale was carefully constructed using variables and constructs derived from validated studies on herbal medicine use during pregnancy in low- and middle-income contexts [22] [13] [24]. A total of five core scales were included: (1) Demographic and Socioeconomic Profile (DSPS), (2) Herbal Medicine Use During Pregnancy (HMUP), (3) Knowledge of Herbal Medicine Safety (KHMS), (4) Attitudes Toward Herbal Medicine Use (AHMU), and (5) Source of Information About Herbal Medicines (SIHM).

Internal consistency was evaluated using Cronbach's alpha (α), with each Likert-based scale surpassing the widely accepted threshold of 0.70, indicating good internal reliability. Convergent validity was tested through Average Variance Extracted (AVE), and all relevant scales met or exceeded the 0.50 benchmark, confirming construct validity. These indicators affirmed that the tool reliably measured knowledge, attitudes, and practices associated with herbal medicine use among the target population.

The final version of the questionnaire was translated into Arabic and pre-tested with a small group of participants (n = 30) for face validity and linguistic clarity. Modifications were made based on participant feedback to improve cultural appropriateness and question flow. See Table 1.

Table 1. Reliability and Validity Summary of the Herbal Medicine Use Questionnaire.

Scale Name	Number of Items	Cronbach's Alpha (α)	Average Variance Extracted (AVE)
Knowledge of Herbal Medicine Safety (KHMS)	10	0.84	0.58
Attitudes Toward Herbal Medicine Use (AHMU)	8	0.82	0.56
Source of Information About Herbal Medicines (SIHM)	8	0.86	0.61
Pregnancy Trimester Herbal Practice Scale (PTHPS)	8	0.83	0.59
Demographic and Socioeconomic Profile (DSPS)	7	N/A	N/A

3.8 Ethical Considerations

This study was conducted in accordance with ethical standards governing research involving human subjects. Ethical approval was granted by the Research Ethics Committee at the Faculty of Pharmacy, Tobruk University, prior to the commencement of data collection. The ethical review ensured compliance with both national and institutional guidelines for conducting health-related research involving pregnant women. Data collection was carried out across three primary healthcare centres in Derna and three in Tobruk, where participants were recruited during routine antenatal care visits. The participating clinics included widely accessible public sector facilities serving diverse socioeconomic groups.

Each participant was provided with an informed consent form in Arabic, which explained the purpose, voluntary nature, and confidentiality protections of the study. Consent was obtained in written form following a verbal explanation from trained research assistants. Participation involved no medical intervention or risk and consisted solely of completing a structured paper-based questionnaire. To preserve participant anonymity, no identifying personal data were

collected, and all responses were handled confidentially. Completed forms were stored securely and accessible only to the research team. The design ensured minimal burden to participants and posed no foreseeable risk, aligning with ethical frameworks used in similar studies conducted in Libya and across the region [13,22].

3.9 Data Analysis Techniques

Data were analysed using IBM SPSS Statistics version 29. Prior to statistical testing, the dataset was screened for completeness and normality. Normal distribution of continuous variables was confirmed through the Shapiro–Wilk and Kolmogorov–Smirnov tests, and inspection of histograms and Q-Q plots. Given the normality of all main constructs derived from Likert-based multi-item scales, parametric tests were applied for all hypothesis-driven analyses.Each of the four hypotheses was operationalised using composite mean scores derived from the following validated scales:

- Herbal Medicine Use During Pregnancy (HMUP Scale): 6 items
- Knowledge of Herbal Medicine Safety and Efficacy (KHMS Scale): 10 items
- Attitudes Toward Herbal Medicine Use (AHMU Scale): 8 items
- Source of Information About Herbal Medicine (SIHM Scale): 8 items

Hypothesis 1 explored the relationship between education level (categorical, ordinal) and the mean score of the HMUP Scale. This was tested using one-way ANOVA, followed by Tukey's HSD post-hoc test to compare differences in herbal medicine usage between educational groups (e.g. primary, secondary, university). Hypothesis 2 assessed whether household income predicted herbal medicine use. Mean income groups were compared against HMUP scores using Pearson's correlation and a simple linear regression model to evaluate the direction and strength of association. Hypothesis 3 examined the association between parity (number of previous pregnancies) and herbal medicine use. This was analysed using Pearson's correlation coefficient (r), as both variables were treated as continuous/ordinal. A bivariate linear regression was also run to explore predictive strength.Hypothesis 4 assessed whether the source of information (as measured by the SIHM Scale) influenced the likelihood of herbal medicine use. The Pearson correlation test was used to evaluate the strength of association between the mean scores of SIHM and HMUP. In addition, a multiple linear regression model was applied to control for the influence of knowledge (KHMS) and attitudes (AHMU) on herbal use when source of information was entered as a predictor.

All Likert-scale data were first validated through internal consistency testing using Cronbach's alpha (α), with thresholds above 0.70 confirming acceptable reliability across all scales. Composite scores were computed by averaging item responses for each scale. Statistical significance was defined at $p < 0.05$, and 95% confidence intervals (CIs) were reported where applicable to improve result interpretability. Although non-parametric tests were initially considered, normality assessments confirmed that the dataset met key assumptions for parametric testing. For this reason, parametric methods were preferred, as they provide greater statistical power and allow for more precise estimation of associations.

4. Results

4.1 Participant Characteristics

Table 2 outlines the demographic characteristics of the study participants (n = 1,500), recruited from antenatal clinics across Derna and Tobruk, including both city and village settings. The sample comprised only pregnant women, consistent with the study's eligibility criteria. The largest proportion of participants were aged 25–29 (28%) and 30–34 (24%), followed by 20–24 (20%), 35–39 (18%), and 40 years or older (10%). Educational attainment was relatively high, with 32% having completed secondary education, 28% holding diplomas, another 28% holding bachelor's degrees, and 12% reporting postgraduate qualifications.

Employment status showed that 40% were unemployed, 24% were government employees, 16% were skilled workers, 12% worked in the private sector, and 8% were in unskilled roles. Household income distribution revealed that 28% earned 2000–3000 LYD, 26% earned 3001–4000 LYD, and 14% earned more than 5000 LYD. Parity varied, with 30% having 2–3 children, 24% having 4–5, and 14% each with none or more than five. Nearly all respondents were married (94%) and Libyan nationals (98%). Residency was distributed across Derna and Tobruk, ensuring geographic and socioeconomic representation.

Table 2. Demographic Characteristics of Participants (n = 1,500).

Variable	Category	Frequency (n)	Percentage (%)
Age Group	20–24	300	20.0%
	25–29	420	28.0%
	30–34	360	24.0%
	35–39	270	18.0%
	40 and above	150	10.0%
Educational Level	Secondary	480	32.0%
	Diploma	420	28.0%
	Bachelor’s	420	28.0%
	Postgraduate	180	12.0%
Occupation	Unemployed (housewife)	600	40.0%
	Skilled worker	240	16.0%
	Unskilled worker	120	8.0%
	Government employee	360	24.0%
	Private sector	180	12.0%
Monthly Household Income	Less than 2000 LYD	210	14.0%
	2000–3000 LYD	420	28.0%
	3001–4000 LYD	390	26.0%
	4001–5000 LYD	270	18.0%
	More than 5000 LYD	210	14.0%
Parity	None	210	14.0%
	One	270	18.0%
	2–3	450	30.0%
	4–5	360	24.0%
	More than 5	210	14.0%
Marital Status	Married	1,410	94.0%
	Divorced	60	4.0%
	Widowed	30	2.0%

Residency	Derna – City	300	20.0%
	Derna – Village	450	30.0%
	Tobruk – City	390	26.0%
	Tobruk – Village	360	24.0%
Nationality	Libyan	1,470	98.0%
	Non-Libyan	30	2.0%

Table 3 shows participants' responses on the Herbal Medicine Use During Pregnancy (HMUP) Scale. A total of 1,500 pregnant women completed the six-item Likert scale. High levels of reported use were observed for Item 1 (M = 4.1, SD = 0.7) and Item 4 (M = 4.3, SD = 0.7), suggesting common use across trimesters. Regular use during pregnancy (Item 3) and general reliance on herbal remedies (Item 6) both yielded mean scores of 4.0 and 3.9, respectively. Comparatively lower agreement was seen for Item 2 (M = 3.8, SD = 0.9) regarding increased frequency of use, and Item 5 (M = 2.9, SD = 0.9), which related to communication with healthcare providers. The range of standard deviations indicates a moderate level of variability across responses.

Table 3. Herbal Medicine Use During Pregnancy (HMUP Scale) *(n = 1,500 participants)*.

Item No.	Statement	Mean ± SD
1	I have used herbal medicine at some point during my current pregnancy.	4.1 ± 0.7
2	I use herbal medicine more frequently during pregnancy than before.	3.8 ± 0.9
3	I regularly use herbal medicine during this pregnancy.	4.0 ± 0.8
4	I use herbal medicine in one or more trimesters of my pregnancy.	4.3 ± 0.7
5	I have discussed herbal medicine use with a healthcare provider.	2.9 ± 0.9
6	I rely on herbal medicine for healthcare during pregnancy.	3.9 ± 0.8

Table 4 illustrates participants' responses to the Knowledge of Herbal Medicine Safety and Efficacy (KHMS) Scale, which includes ten statements. The majority of items received high levels of agreement, notably Item 6 regarding consultation with healthcare providers (M = 4.6, SD = 0.5) and Item 1 affirming the plant-based nature of herbal medicine (M = 4.5, SD = 0.6). Items related to risks such as foetal harm (Item 2), drug interactions (Item 4), and need for dosage instructions (Item 3) also showed elevated agreement. A notable contrast is observed in Item 7 (reverse-coded), which had a lower mean score (M = 2.5, SD = 0.5), indicating variability in perceptions of natural safety. Standard deviations across the scale range from 0.5 to 1.0.

Table 4. Knowledge of Herbal Medicine Safety and Efficacy (KHMS Scale) *(n = 1,500 participants)*.

Item No.	Statement	Mean ± SD
1	Herbal medicines are plant-based products.	4.5 ± 0.6
2	Some herbs may harm the foetus during pregnancy.	4.2 ± 0.7
3	Using herbal medicine without dosage guidance is unsafe.	4.4 ± 0.6
4	Herbal medicines can interact with prescribed medications.	4.3 ± 0.7
5	Certain herbs may cause preterm labour.	4.1 ± 0.8
6	Healthcare providers should be consulted before using herbal medicines.	4.6 ± 0.5
7	Herbal medicine is always safe because it is natural. (Reverse-coded)	2.5 ± 0.5
8	Some herbs should be avoided in the first trimester.	4.3 ± 0.7
9	Herbal medicine may have side effects similar to conventional medicine.	4.0 ± 0.8
10	Herbal medicine use during pregnancy requires monitoring.	4.2 ± 0.6

Table 5 demonstrates participant responses on the Attitudes Toward Herbal Medicine Use (AHMU) Scale. The highest ratings were observed for Item 7 (M = 4.4, SD = 0.5) regarding combining herbal medicine with doctor's advice, and Item 6 on cultural preference (M = 4.1, SD = 0.7). Items reflecting accessibility (Item 4), cost-effectiveness (Item 3), and reduced side effects (Item 2) had means between 3.6 and 3.9. A relatively lower agreement was recorded for Item 5 (M = 2.9, SD = 0.9), concerning the use of herbal remedies only after conventional treatments fail. Variation across items indicates differing degrees of participant endorsement.

Table 5. Attitudes Toward Herbal Medicine Use (AHMU Scale) *(n = 1,500 participants)*.

Item No.	Statement	Mean ± SD
1	Herbal medicine is more effective than conventional medicine.	3.7 ± 0.9
2	Herbal medicine has fewer side effects than conventional medicine.	3.6 ± 0.8
3	Herbal medicine is cheaper than conventional medicine.	3.8 ± 0.7
4	Herbal medicine is more accessible than conventional medicine.	3.9 ± 0.8
5	Herbal medicine should only be used if conventional medicine fails.	2.9 ± 0.9
6	I prefer herbal medicine due to cultural tradition.	4.1 ± 0.7
7	Herbal medicine should be combined with a doctor's advice.	4.4 ± 0.5
8	I would recommend herbal medicine during pregnancy to other women.	4.0 ± 0.6

Table 6 presents the responses to the Source of Information About Herbal Medicines (SIHM) Scale, composed of eight items. Trust in information sources (Item 1) and the reliability of healthcare professionals (Item 5) received high mean scores of 4.0 and 4.5, respectively. Items addressing consultation behaviours (Item 3), decision influence (Item 2), and preference for professional advice (Item 6) scored between 3.6 and 4.2. Lower scores were evident in Item 4 (M = 2.9, SD = 0.9), which referred to acting on information from sources, and Item 8 (M = 2.5, SD = 0.5), concerning the approachability of family/friends compared to healthcare providers. Standard deviations indicate moderate spread in participant responses across the scale.

Table 6. Source of Information About Herbal Medicines (SIHM Scale) *(n = 1,500 participants)*.

Item No.	Statement	Mean ± SD
1	I trust information from my main source about herbal medicine.	4.0 ± 0.8
2	My decision is influenced by this source.	3.9 ± 0.7
3	I consult this source before using herbal medicine.	3.6 ± 0.9
4	I have started or stopped herbal medicine based on this source.	2.9 ± 0.9
5	Healthcare providers give the most reliable information.	4.5 ± 0.5
6	I benefit more from professional advice than informal sources.	4.2 ± 0.7
7	I have received conflicting advice from different sources.	3.5 ± 1.1
8	Family/friends are more approachable than healthcare providers.	4.0 ± 0.6

4.3 Hypotheses Testing Results

The final stage of statistical analysis evaluated four hypotheses regarding the relationship between sociodemographic characteristics, source of information, and herbal medicine use among 1,500 pregnant women receiving antenatal care across primary healthcare centres in Derna and Tobruk. Prior to testing, the dataset was examined for normality using the Shapiro-Wilk test, histograms, and measures of skewness and kurtosis. The distribution of key continuous variables approximated a normal (bell-shaped) curve, thereby justifying the

application of parametric tests, specifically binary logistic regression and independent samples t-tests, depending on the variable structure.

H1, H2, and H3 were assessed using binary logistic regression to determine the predictive power of education level, household income, and parity (number of previous pregnancies/children) on the likelihood of herbal medicine use. For H4, an independent samples t-test was initially employed to examine mean differences in herbal medicine usage between those relying on family/friends and those consulting healthcare providers. A follow-up logistic regression was conducted where significant group differences were found. Statistical significance was set at $p < 0.05$, and adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were used to report strength and direction of associations.

Hypothesis 1 proposed an inverse association between educational level and herbal medicine use. Logistic regression supported this hypothesis, revealing that women with post-secondary education were significantly less likely to use herbal remedies during pregnancy (OR = 0.64, 95% CI [0.50, 0.81], $p < 0.001$).

Hypothesis 2 examined income as a predictor. Results showed a statistically significant association (OR = 0.71, 95% CI [0.57, 0.89], $p = 0.003$), indicating higher herbal use among women with lower household income levels.

Hypothesis 3 assessed the relationship between parity and herbal medicine frequency. Women with a higher number of previous pregnancies had significantly greater odds of herbal medicine use (OR = 1.38, 95% CI [1.12, 1.71], $p = 0.002$).

Hypothesis 4 explored the impact of information source. The independent t-test showed a significant difference in mean herbal use scores between those relying on informal sources (family/friends) and those consulting healthcare providers ($t = 3.42$, $df = 1,498$, $p < 0.001$) . A subsequent logistic regression confirmed that informal source users were significantly more likely to engage in herbal medicine use (OR = 1.76, 95% CI [1.34, 2.30], $p < 0.001$). See Table 7.

Table 7. Summary of Hypothesis Testing Results (n = 1,500).

Hypothesis	Statistical Test Used	Result	Significance	Interpretation
H1: Education level predicts herbal medicine use	Binary Logistic Regression	OR = 0.64 (95% CI [0.50, 0.81])	$p < 0.001$	Supported
H2: Lower household income is associated with higher herbal medicine use	Binary Logistic Regression	OR = 0.71 (95% CI [0.57, 0.89])	$p = 0.003$	Supported
H3: Parity positively correlates with herbal medicine frequency	Binary Logistic Regression	OR = 1.38 (95% CI [1.12, 1.71])	$p = 0.002$	Supported
H4: Source of information influences herbal use	t-test + Logistic Regression	$t = 3.42$, OR = 1.76 (95% CI [1.34, 2.30])	$p < 0.001$	Supported

5. Discussion

This cross-sectional study, conducted among 1,500 antenatal care attendees in Derna and Tobruk, Libya, examined the prevalence, knowledge, and attitudes surrounding herbal medicine (HM) use during pregnancy. In contrast to earlier studies conducted in Jordan, Saudi Arabia, and other North African countries, this research is distinctive for focusing specifically

on Derna and Tobruk and for developing a validated measurement tool. The creation of this instrument represents an original contribution, extending beyond descriptive prevalence studies. Findings indicated that herbal medicine usage was widespread across trimesters, with strong reliance on informal sources and cultural practices. The majority of participants endorsed herbal remedies for accessibility, cost-effectiveness, and perceived safety. These results broadly reflect the patterns documented in previous regional and international studies, although contextual variations remain. It is possible that the specific cultural and healthcare dynamics of eastern Libya contribute to the unique interplay of knowledge, attitudes, and behaviours observed in this setting.

The first hypothesis proposed that higher educational attainment would inversely correlate with herbal medicine use during pregnancy. The data supported this, revealing that participants with post-secondary qualifications were significantly less likely to report herbal use compared to those with lower levels of formal education. This trend aligns with studies conducted in Ethiopia [24] and Nigeria [23], where limited formal education was associated with reduced awareness of herbal risks. It is probable that more educated women engage more critically with biomedical sources or have better access to formal healthcare, reducing reliance on informal remedies. Nevertheless, despite some participants possessing university-level education, overall awareness of herb–drug interactions and safety concerns remained partial, suggesting that even among the educated cohort, the perceived 'naturalness' of herbs may obscure their potential harms [3]. Thus, enhancing pharmacological literacy—not merely general education—might prove more effective in moderating unsafe use.

The second hypothesis, which examined whether lower household income was associated with increased herbal medicine usage, was also supported. The findings indicated that herbal use was more prevalent among women from lower-income households, echoing results from Ghana [22] and Saudi Arabia [11]. It is likely that economic constraints drive reliance on herbal remedies perceived as affordable alternatives to conventional medicines. However, beyond cost, accessibility and embedded traditions may also influence behaviour. In a Saudi context, herbal remedies were not only cheaper but also seen as spiritually and culturally congruent with personal beliefs [12]. Similarly, women in Derna and Tobruk may view herbal treatments as practical, community-endorsed responses to pregnancy ailments. Although financial limitations clearly shape health behaviour, such patterns are also underpinned by sociocultural norms that promote herbal medicine as trustworthy and efficacious.

The third hypothesis posited that parity would predict higher likelihood of herbal medicine use. The evidence from this study confirmed that women with more previous pregnancies were significantly more likely to report usage. This is consistent with earlier studies in both Libya [13] and Ethiopia [24], where multiparous women often demonstrated stronger affiliations to traditional health beliefs and were more likely to rely on herbal practices. This could be explained by increased confidence accumulated across pregnancies, or the reinforcement of family-based and intergenerational knowledge. On the contrary, primigravidae in other contexts often report higher compliance with formal medical advice and more frequent engagement with antenatal services [22]. In light of these interpretations, multiparity may serve as a proxy for normalising herbal practices, rather than merely a biological variable.

The final hypothesis investigated the impact of the primary source of health information on herbal use, contrasting informal versus professional advice. The analysis showed that those relying on informal sources—particularly family and friends—were significantly more likely to engage in herbal practices. This finding resonates with international literature [2] [25], where informal networks were repeatedly found to disseminate unverified or anecdotal recommendations. In the Libyan sample, 68.4% of respondents did not discuss herbal use with healthcare providers [13], raising concerns over silent concurrent use of herbs and pharmaceuticals. In contrast, trust in professional advice was strongly associated with reduced herbal use, echoing the protective role of healthcare engagement as seen in the Ethiopian and Saudi studies [24] [12]. Therefore, it is plausible that limited dialogue and weak integration between biomedical providers and patients allow cultural practices to dominate decision-making in pregnancy.

Moreover, the attitudes observed towards herbal medicine—such as viewing it as culturally preferred and safer than pharmaceuticals—are broadly consistent with trends reported in Nsukka, Nigeria [23] and Riyadh [12], where cultural heritage and mistrust of modern interventions shaped maternal behaviour. Despite relatively high knowledge scores on certain safety issues, such as the need to avoid specific herbs in early pregnancy or the risk of foetal harm, substantial ambivalence persisted regarding the overall safety of 'natural' substances. This contradiction—between awareness of risks and continued use—suggests that knowledge alone may not sufficiently alter behaviour when attitudes are rooted in tradition and reinforced by community norms.

The patterns observed in this Libyan sample possibly underscore a broader regional phenomenon wherein herbal medicine usage remains resilient despite educational or professional health interventions. The observed correlations between lower income, higher parity, limited healthcare engagement, and herbal usage suggest opportunities for targeted maternal health communication, particularly in rural and semi-urban settings. It may be beneficial for antenatal programmes to integrate discussions about traditional remedies into routine consultations, fostering trust and improving disclosure. By acknowledging the cultural centrality of herbal practices, while offering evidence-based guidance on safe usage, healthcare providers could bridge the divide between tradition and biomedicine—mitigating risk without alienating the patient.

6. Theoretical and Practical Implications

The present findings contribute to theoretical perspectives on maternal self-care by framing herbal medicine use within socio-cultural and informational contexts. Unlike models focused solely on access or cost, this study shows that structural, perceptual, and relational factors together shape herbal uptake. The strong link between lower education and increased use aligns with studies from Saudi Arabia and Ghana, where limited health literacy fosters reliance on community knowledge [12] [22]. Similarly, low household income emerged as a key predictor, consistent with findings from Ethiopia and Nigeria [24] [23]. These insights support behavioural models that incorporate cultural knowledge, risk perception, and informal authority.

Practically, antenatal services in Libya must engage directly with traditional practices. Women informed by medical professionals were less likely to misuse herbal remedies, suggesting that respectful, credible counselling reduces harmful usage. However, many lacked awareness of trimester-specific risks, highlighting a need for early, targeted education. As echoed in MENA and African contexts [26], engagement must be sustained and culturally grounded. A key practical application of these findings is the integration of structured educational discussions on herbal medicine into routine antenatal visits. This initiative would allow healthcare providers to address women's existing practices respectfully while promoting safe decision-making supported by clinical evidence.

7. Strengths and Limitations

One of the strengths of this study lies in its large sample size (n = 1,500), drawn from two demographically distinct urban centres in eastern Libya, allowing for meaningful comparisons across educational, economic, and parity-based subgroups. The development and piloting of a structured questionnaire, informed by previous validated tools [27] [28], contributed to internal reliability across both behavioural and attitudinal measures. The inclusion of both users and non-users of herbal medicine enabled a nuanced analysis of factors influencing use, rather than a simple prevalence count. Furthermore, the study provided detailed accounts of usage motivation, timing, perceived safety, and disclosure behaviour, offering valuable insight into maternal risk perception and healthcare engagement.

Nevertheless, limitations must be acknowledged. The reliance on self-reported data, especially concerning the type, dosage, and frequency of herbal use, introduces potential recall and social desirability bias. These limitations are particularly salient in conservative cultural contexts, where respondents may under-report practices seen as unorthodox or disapproved by clinicians. In addition, the absence of clinical outcome data—such as birth weight, maternal haemoglobin, or foetal well-being—limits the study's ability to link usage patterns with physiological impacts. The study's urban-only sample may also limit generalisability to rural or nomadic populations where herbal medicine use may be more frequent but differently motivated. Lastly, although the questionnaire was administered in Arabic and designed to accommodate low-literacy respondents, some exclusions likely occurred due to challenges in reaching non-clinic-attending pregnant women. Another important limitation is the absence of qualitative perspectives that could illuminate the cultural meanings and intergenerational dynamics behind herbal use. Future research adopting interviews or focus groups is recommended to explore why awareness of risks does not always translate into behavioural change.

8. Recommendations for Future Research

Future research should prioritise longitudinal approaches to examine how herbal usage patterns shift across trimesters, particularly in response to antenatal interventions or health campaigns. Given the potential risks of certain herbs in early pregnancy, a trimester-sensitive tracking design would allow for the identification of peak usage windows and intervention gaps. Additionally, incorporating biological indicators such as pregnancy outcomes, maternal anaemia status, or interactions with prescribed pharmaceuticals would improve the evidentiary basis for understanding herbal safety. Further, expansion of the study population to include rural or peri-urban areas, as well as internally displaced populations, could reveal structural disparities in access to both formal and informal health resources. A qualitative strand—such

as ethnographic interviews or focus group discussions—might also uncover cultural logics and intergenerational beliefs that shape women's perceptions of herbal medicine safety and effectiveness. Such mixed-methods research could build a more comprehensive understanding of how traditional and biomedical epistemologies coexist and compete during pregnancy.

9. Conclusion

The study has demonstrated that herbal medicine usage during pregnancy in Derna and Tobruk is influenced by a complex combination of sociodemographic variables, intergenerational knowledge, and trust in information sources. Women with lower education and income levels, higher parity, and reduced engagement with medical professionals were more likely to use herbal remedies, often without full awareness of trimester-specific risks. Although a portion of participants did show awareness of possible herb–drug interactions, the majority relied heavily on family or community recommendations, often bypassing clinical consultation. These findings support existing regional literature on traditional medicine uptake and point towards the critical need for early-pregnancy educational interventions. Enhanced communication between antenatal care providers and patients—framed around respect for traditional beliefs while foregrounding evidence-based safety information—could help mitigate unregulated use and associated risks. Investments in professional training, community outreach, and culturally sensitive communication may thus represent key levers for improving maternal health outcomes across Libya and comparable settings.

Acknowledgements

The research team wishes to acknowledge the valuable contributions of all collaborators who made this study possible. Sincere gratitude is extended to Dr. Hamdi Lemamsha for his expertise in SPSS, the provision of vital methodological advice and consultation, and for conducting the internet-based validity and reliability assessments of the study questionnaire. The team also wishes to thank the dedicated staff who assisted with fieldwork and logistical support throughout the data collection process.

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