CHAPTER

8

DISCUSSIONS

A cross-sectional study for the documentation of ethnobotanical practices was conducted with 387 mothers. The results present that most of the women under study were Hindu, followed by Muslim, Christian, Sikh, and Jain. It was presented in the 2011 census, that a similar percentage of the religious population lives in the study area (Government of India, 2011). Further, data present that the study sample is not just restricted to Gujarat state alone, but it includes participants born in 33.33% of state and union territories of India. Knowing the birthplace, an analysis of domicile was also done to understand the pattern of the study sample. It was found that 4.4% were though born in Gujarat but were not domicile in the state. However, most respondents were born in Gujarat state (67.7%). It can be seen from the data that most participants were married and cohabiting with their partners.

Education in women enrolled for the study was good as majority had higher secondary or more level, except 2.84% of illiterate respondents. Non-compliance with census data, the literacy rate in India was only 87.7% showing that the study sample was more literate. Further, most of the mother respondents were primiparous, and the Odds ratio suggests that it can be an influencing factor for herbs usage. Most women were vegetarians and had not followed any diet restrictions. The studies report no significant change in atopic outcomes in their children by diet restrictions of the mother during pregnancy (Netting et al., 2014).

In the present study, 86.04% of respondents (N=333) practiced herbal drugs during gestation. In other studies, herbal drugs usage during pregnancy ranges from 12.5% to 90.3%, which complies with this study (Ahmed et al., 2018; Forster et al., 2006; Gedif & Hahn, 2003; Malan & Neuba, 2011; Mothupi, 2014; Nordeng & Havnen, 2004). It was also reported in a survey of North Carolina certified nurse-midwives that 93.9% recommended complementary and alternative medicines, of which 73.2% were herbal drugs (Allaire et al., 2000). Respondents believed that herbal drugs are cheaper, safe, safe in gestation, effective and readily available, inferred as positive (92.5%) towards herbal usage. Based on the CAM health belief questionnaire (CHBQ), an overall positive attitude towards complementary and alternative medicines (CAM) was reported in Israel (Samuels et al., 2013). It was also shown that the probability of using herbal medicines by women with negative attitudes toward alternative medicines was 50% less (Azriani et al., 2009).

The present study reported that women who used herbal medicines during pregnancy were likely to use more than one class of alternative medicines. This data was consistent with many reports of prescription drug use and traditional and alternative care in women (Daw et al., 2011; Kebede et al., 2009; Nyeko et al., 2016).

Herbal drugs are used during gestation at multiple stages like antenatal, parturition, and postpartum. Most participants were found using herbal practices for more than one stage of the above. Of all stages, herbal drugs were used increasingly from the first to third trimester as well as postpartum for galactagogue effects (Chao et al., 2021; Gbadamosi & Okolosi, 2013; Nordeng & Havnen, 2004). Family members appear to be a significant source of information for parturient in the present survey. However, information obtained from media sources, members of the same or distant ethnicity, was of low importance. It is known that family and friends advised traditional medicine usage to 52.9% of informants (Al-Ghamdi et al., 2017).

In line with the attitude of the respondents towards herbal drug usage, 83.81% were found very satisfied with herbal drug usage on the Likert scale. Similar results can be observed when 75% of mothers were very satisfied with using medicinal plants (Yemele et al., 2015). However, 1.8% were very dissatisfied with the traditional practices, consistent with 3.6% who experienced side effects. Side effects are the primary concern of complementary and

alternative medicines, however, a few reports on side effects exist (Barnes, 2003; Vickers et al., 2006).

Factors associated with herbal drug usage reported in the present study are religion, birthplace, size of family, education level, income group, regular diet, and attitude toward traditional practices. Studies on herbal usage reported age, domicile, prior use of herbal medicines, attitude toward self-medication, and perception as predictive factors (Nyeko et al., 2016). In the same study, parity, usage of herbal drugs in previous pregnancy events, and distance from the nearest healthcare facility were also reported as predictive factors. The findings are also consistent with other reports concerning herbal medicine use by postpartum women (Mothupi, 2014).

During this study, 62 plant species were recorded, as informed by the participants. These species belong to 60 genera, Fabaceae being the most common family among 41 families. Of the 10 plant parts being used, roots and seeds ranked highest. Powder, paste, and decoction were practiced mostly of all plants reported in either pure form or mixture form with other herbs. Malan and Neuba reported 75 taxa distributed among 70 genera and 43 families, of which Asteraceae, Amaranthaceae, and Euphorbiaceae were the major families used during pregnancy (Malan & Neuba, 2011). Many studies have reported 20 to 85 species worldwide (Bhargava, 1983; Michel et al., 2016; Vijayakumar et al., 2015). These studies also reported major plant families used for postpartum care, including Fabaceae, Cucurbitaceae, Acanthaceae, Asteraceae, and Amaranthaceae. However, the data about families and their variation may not fulfill the aim of finding out commonly used plants by women.

The relative frequency of citations indicates the fraction of respondents practicing a particular species. The highest RFC[a] value for plants reported was 0.68 for *Tribulus terrestris* L. and the lowest for *Desmodium gangeticum* DC. and *Anthocephalus cadamba* Miq. Plants with RFC[a] value above 0.5 were *Glycyrrhiza glabra* L., *Anethum sowa* Roxb. ex Flem., *Myristica fragrans* Houtt., *Foeniculum vulgare* Mill, *Zingiber officinale* Roxb., *Lepidium sativum* L., *Asparagus racemosus* Willd., *Piper longum* L., *Trigonella foenum-graecum* L. etc. Also, during the study, 24 different traditional practices were reported varying from decoction to delicacies prepared with polyherbal mixtures. Of these, Methi-laddu and Batrisu vasanu were found to be used postpartum. Batrisu vasanu, katlu or battisa is an ethnobotanically popular polyherbal

galactagogue and postpartum remedy in western India (Acharya et al., 2013). The word 'batrisu' here refers to thirty-two herbs, and 'vasanu' means its preparation (Raval et al., 2022). It is also known as Battisa or katlu and is taken during the first three months of lactation. It is believed to improve lactation and health while also boosting the immunity of the mother and the newborn. Due to the popularity of this herbal preparation, it is widely marketed at herbal drug and condiment shops in powder form. However, in the absence of reference for this polyherbal mixture, the botanical composition of the marketed product is a serious concern (Charola et al., 2021). These two were reported as widely practiced, but their clinical relevance and detailed observational studies were less (Pant & Chothia, 1990). Methi-laddu is ethnobotanically reported to be used by lactating mothers as a galactagogue (Alam, 2019; Naik et al., 2018; Pangal et al., 2010; Pant & Chothia, 1990). Both of these practices reported here are used during the weaning period and are also popular as nutraceuticals among Indians as winter sweets (Kaushik & Mathew, 1988). With the objectives of validating those practices, prospective human and experimental animal studies were conducted.

Tribulus terrestris L. was already reported as commonly practiced by ethnical groups of India and abroad (Bhatia et al., 2014; Morvin Yabesh et al., 2014). A study concludes its effect as analgesic, diuretic and uricosuric including improved reproductive function by elevating estradiol, luteinizing hormone, and testosterone (Akram et al., 2011; Gauthaman et al., 2002; Gauthaman & Adaikan, 2005). *Glycyrrhiza glabra* L. is found in more than half of Chinese medicines (Arif Icer & Sanlier, 2017). Pregnant women in Europe, America, and Australia is reported to consume around 7 to 45% of herbal medicines, and licorice is associated with low birth weight and premature birth (June Seek Choi et al., 2013; Strandberg et al., 2002). It poses a substantial risk of *G. glabra* L. usage during the parturition period. Further, *Anethum sowa* Roxb. ex Flem., commonly known as dill seeds has therapeutic potential on dysmenorrhea, amenorrhea, follicular maturity and as a galactagogue (Katakdound, 2017; Moini Jazani et al., 2019). *Myristica fragrans* Houtt. exerts antifertility activity and prevents the proliferation of ovarian follicles and endometrial glands but increases the weight of the pups in gestational studies (Sakpa & Eguavoen, 2021). Folliculogenesis, estrogenic and antioxidant properties of *Foeniculum vulgare* Mill were also reported in an animal model (Pourjafari et al., 2020; Rahimi et al., 2013). *Zingiber officinale* Roxb. was as effective as the

reference drug (Vitamin B6) against pregnancy-induced nausea and vomiting, confirming its positive effect on pregnant women (Borrelli et al., 2005). A diet supplemented with *Lepidium sativum* L. is known for its effect as a galactagogue, emmenagogue, mammogenesis in animal models (Datta et al., 2011). Shatavari (*Asparagus racemosus* Willd.) is considered the most important herb for women's fertility as it is used to treat infertility, miscarriage, menopause, and as a galactagogue (Bopana & Saxena, 2007; Nandy et al., 2020; Sachan et al., 2012). *Piper longum* L. used during antenatal presents antifertility activity, however, its inclusion in postpartum care may help reduce bulkiness (Kumar et al., 2011; Rohmat et al., 2019). Fenugreek (*Trigonella foenum-graecum* L.) is widely used as traditional medicine and nutraceutical food for its effects as antidiabetic, anticarcinogenic, antihyperlipidemic, and galactagogue (Ghedira et al., 2010). However, its teratogenic activities as anti-implantation, antifertility, and abortifacient due to saponin contents are also known (Ouzir et al., 2016). It suggests that many herbs reported during the study were either safe to use during the antenatal or postpartum period, which poses a risk for women utilizing them without proper guidance and knowledge.

For clinical studies on pregnant women, N=38 women in three groups, namely unexposed (non-user of herbs), exposed group 1 (using Methi-laddu postpartum), and exposed group 2 (using batrisu vasanu postpartum) were recruited and followed up to 3 months postpartum. It was noted that antenatal stats for all the groups were similar for all demographic and clinical details. For the unexposed group, it can be noted that 64.2% of participants had used herbal drugs antenatal, and 44.4% were forced to use the drugs. However, at the end of the study, it was ensured by asking them that they had not practiced any herbal drugs postpartum. Fetal growth in all the groups was normal, and chief complaints during the antenatal visit were nausea, morning sickness, heartburn, urinary tract infection, backache, and tiredness, as reported earlier (Chaturvedi et al., 2017). All the mothers had delivered the baby by normal delivery however, three mothers with more than 500ml blood loss.

Colostrum was absent in one-fourth women at parturition in unexposed (21.4%), exposed group 1 (28.6%) and exposed group 2 (29.4%). However, it can be noted that their postpartum visit reports that colostrum was absent only for 14.3% of women in the unexposed group, which suggests the galactagogue effect of Methi-laddu and batrisu vasanu. Users of methi-laddu had 14.3% of women been prescribed galactagogue, suggesting one of

the two mothers who did not have colostrum, was required galactagogue. The small sample size was the limitation in concluding the effect of methi-laddu as a galactagogue. Further, it can be noted that weight velocity and growth velocity for the child to both exposed group mothers were significantly increased than unexposed group mothers. The data suggest that postpartum Methi-laddu and Batrisu vasanu consumption had a significant effect on child health.

As discussed earlier, batrisu vasanu lacks authentic documentation on its ingredients and clinical utility. With the notion to verify the marketed product ingredient variability and its phytochemical composition, a systemic survey was conducted, which reported 69 different plant species being used in various marketed products. Findings of herb sharing showed an average of 12 herbs being shared among samples tested. However, differences in the number of herbs per sample might have resulted in poor sharing. This result was further strengthened by cluster dendrogram analysis and poor average Jaccard coefficient. Jaccard coefficient and herb-sharing data support the argument that herbs added to products were heterogeneous.

Further, only 19 herbs (27.5%) having RFC more than 0.5 indicated a highly inconsistent herbal composition. Gokshura (*Tribulus terrestris* L.) was found in all the products analyzed, supporting its popularity for postpartum care. *Tribulus terrestris* L. is used as a diuretic, anti-inflammatory, anabolic, cardiotonic, and for cough and asthma (Khare, 2007). It is used as a herbal decoction given to new mothers (Chaturvedi et al., 2017; Jain et al., 2011). Satavari, Mishreya, and Vidarikanda are known for potential galactagogue activity and treating female genitourinary tract disorders (Sumanth & Narasimharaju, 2011). In ethnobotanical studies, Kulanjana, Sthulaila, Vidanga, and Shunthi are also reported as a tonic in postpartum recovery and as a galactagogue (Lamxay et al., 2011). Additionally, Gokshura, Haridra, Methi, Babbuula, Shunthi, Jatiphala, and Yavani are popular medicinal plants used during postpartum care in India (Khare, 2007). Many herbs reported in this study are also used in diet therapy during postpartum care (Jain et al., 2011).

The relevance of plant species and their total phenols, flavonoids, and antioxidant capacity during pregnancy is reported (Jain et al., 2011). To evaluate the same, all batrisu vasanu methanolic extracts were tested for total phenols, flavonoids, flavonols and antioxidant capacity. Plant secondary metabolites are known for their effects as hepatoprotective,

antiallergic, diuretic, anticancer and antioxidant (Ghasemian et al., 2016). DPPH radical scavenging activity is attributed largely to total phenols (S. Ahmed et al., 2018). Plants with a higher flavonoid-to-phenol ratio are proven to be flavonoid rich (Rice-Evans et al., 1997; Santas et al., 2008). FRAP value and total antioxidant capacity indicate the sample's overall capacity to be called an antioxidant. As shown in the results, BV01, BV02, BV11, and BV12 were found to have higher phenol:flavonoid ratio, out of which BV01, BV11, and BV12 were found to have better antioxidant performance. This proves that samples had significant variability not only at the ingredient level but also for phytochemicals presence.

Rats fed with batrisu vasanu at 1 g and 10 g of human dose equivalent batrisu vasanu in treated group 1 and treated group 2, respectively had non-significant diet and water intake. However, its body weight decreased significantly from the control group, but fecal weight increased. It suggests better gastrointestinal motility and decreased absorption in the body (Jae Suk Choi et al., 2014; Na et al., 2021). Similar results were shown in a study where food consumption was normal, but body weight and Food efficiency ratio decreased (López-Varela et al., 1995).

Further, serological tests suggest lowered triglycerides and total cholesterol compared to the control group. In contrast, HDL was significantly elevated in treated groups compared to the control. The increased HDL and lowered cholesterol and triglycerides may indicate lowered adiposity in the rats (Nemoseck et al., 2011). Further, the elevated WBC count in treated groups might indicate the effect of phytochemicals on hematological parameters as shown in study with ethanolic root extract of *Gonglonema latifolium* in rats (Antai et al., 2009). However, the rest of the parameters were not significantly affected by Batrisu vasanu treatment. Liver function test, Thyroid function, and reproductive hormones were found unchanged among all the groups, suggesting the safety of Batrisu vasanu for the dosage and can be consumed as a nutraceutical (Benvenga et al., 2020).