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Chinese herbal medicine use in Taiwan during pregnancy and the postpartum period: A population-based cohort study

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ABSTRACT

Background: Using Chinese herbal medicines during pregnancy and postpartum is common in the Chinese community.

Objective: The purpose of this current study is to explore the use of Chinese herbal medicines by women during pregnancy and postpartum in Taiwan.

Design: It is an on-going prospective longitudinal study design.

Setting and participants: We used multistage stratified systematic sampling to recruit 24,200 pairs, postpartum women and newborns, from the Taiwan national birth register in 2005. Subjects underwent a home interview 6 months after their deliveries between June 2005 and July 2006. A structured questionnaire was successfully administered to 87.8% of the sampled population.

Results: At least one Chinese herbal medicine was used by 33.6% and 87.7% of the interviewed subjects during pregnancy and the postpartum period, respectively. An-Tai-Yin, Pearl powder, and Huanglian were the most commonly used during pregnancy, while Shen-Hua-Tang and Suz-Wu-Tang were the most commonly used by postpartum women. Pregnant women aged 20–34, with high education, threatened abortion, chronic disease, and primipara appeared to use more Chinese herbal medicines than others in the sample. Postpartum women with high education, primipara, normal spontaneous delivery, and breastfeeding were found to use more Chinese herbal medicines; but women with pregnancy-related illness used less.

Conclusions: Chinese herbal medicines are frequently used by women during pregnancy and the postpartum period in Taiwan and those with high education and primipara used more such herbs. Due to limited safety information on these herbs, we would advise caution regarding their use either during pregnancy or postpartum breastfeeding period. Moreover, it is important for nurses/midwives enquiring about such habits, and providing the adequate education to women during prenatal and postpartum care to prevent potential side effects.

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What is already known about the topic?

- Pregnant women using traditional medicine or complementary and alternative medicine (TM/CAM) is gaining in popularity worldwide.

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- The prevalence rate of Chinese herbal medicines used by pregnant women was commonly in Taiwan and Chinese communities.

What this paper adds

- The current representative prevalence and risk factors of Chinese herbal medicine used by pregnant women in Taiwan.
- This research adds to measure the prevalence rate and risk factors of Chinese herbal medicines used by postpartum women.

1. Introduction

The use of herbal medicines during the perinatal period is becoming more common, especially in Chinese communities (Chen and Wang, 2000; Chuang et al., 2007; Forster et al., 2006; Gibson et al., 2001; Li, 2007; Nordeng and Havnen, 2004; Pinn and Pallett, 2002; Refuerzo et al., 2005; Tsui et al., 2001). Because use of all kinds of herbs during pregnancy or postpartum might produce potential adverse effects on mothers and fetuses, such practices raise concerns (Ernst, 2002; Tiran, 2003). Studies of these have shown inconclusive results depending on the different herbs used for different purposes in pregnancy (Chuang et al., 2006a,b; Holst et al., 2008; Vutyavanich et al., 2001). Furthermore, there is scarce evidence of developmental toxicity in animals (Chan et al., 2003; Jahnke et al., 2006; Tzeng et al., 1993). The adverse effect cannot be excluded, therefore, certain herbs are not recommended for pregnant women (Chan, 1993). The risk factors of herbal medicines used in pregnancy have been found to be diverse in different studies. Studies have shown that pregnant women with high maternal age (Holst et al., 2008; Nordeng and Havnen, 2005), high education (Gibson et al., 2001), who are white (Gibson et al., 2001), have a positive knowledge of and attitude toward herbs (Holst et al., 2008; Nordeng and Havnen, 2005), and have threatened abortion (Chuang et al., 2007) are more likely to use herbal medicines.

The Chinese postpartum custom of “doing the month” (Zuo yuezi), a month-long period of postpartum rest and recuperation, is common not only in Taiwan (Chen and Wang, 2000), but also in other places with Chinese communities (Cheng, 1997; Raven et al., 2007). The habit of using herbs by puerperal women is very common during this period (Chen and Wang, 2000; Hou et al., 2006; Hung, 2001). There is little evidence of herbs being used by women during the period after childbirth. One study showed that some Chinese medicine doctors had met women suffering adverse effects caused by the common herbs (Sheng-Hua-Tang) used for the postpartum recovery in Taiwan (Hou et al., 2006), and the another study showed that mothers taking another mixture of traditional Chinese herbs (Szu-Wu-Tang) during the postpartum period significantly increased the body burden of lead in their infants through breastfeeding (Chien et al., 2006). The mother's characteristics of being younger, having less education, and being primiparous (Kaewsarn et al., 2003)

were factors related to traditional postpartum practices, and mothers and mothers-in-law were the most influential persons in recommending such behaviors (Chen and Wang, 2000; Kaewsarn et al., 2003).

There exists a general lack of research into the use of herbal medicines in pregnancy, let alone in the postpartum period. Hence, in the current study, the prevalence and risk factors of using Chinese herbal medicines during pregnancy and postpartum have been explored.

2. Methods

2.1. Study population and sampling strategy

The Taiwan Birth Cohort Study (TBCS), the first national birth cohort study in Taiwan, is a prospective longitudinal cohort study. In the current study, we used a multistage stratified systematic sampling design to obtain representative samples from the Taiwan national birth registration data in 2005. We ranked a total of 369 towns in Taiwan into 12 strata according to the administrative division (four strata) and the total fertility rate (three strata). Using the principle of proportion probability to size, we randomly sampled 90 towns out of 369 in Taiwan. All postpartum women and newborns, from these 90 towns were recruited, a total of 24,200 pairs.

2.2. Data collection

We conducted a home interview with the 24,200 postpartum women 6 months after their deliveries by using a structured questionnaire in the period from June 2005 to July 2006. There were 2952 cases of loss to follow-up because of refusal to participate, moving home, incorrect addresses, infant deaths, and other miscellaneous reasons. A total of 21,248 postpartum women were interviewed, and the completed interview rate was thus 87.8%.

2.3. Variables

Data were obtained from the interview questionnaire. The population was grouped by age: 19 and below; 20–34; and 35 or above. The educational levels were stratified into three groups: university and college or above; senior high school; and junior high school and below. The classification of occupation was summarized into two groups: occupation and no occupation. Family income per month was defined as the total parental income per month within four categories expressed in new Taiwan dollars (NT\$, new Taiwan dollars, 1 US\$ ≈ 30.5 NT\$ in 2008): 30,000 or lower, 30,001–100,000, 100,001–200,000, and over 200,000.

Maternal chronic diseases, pregnancy-related illness, and types of delivery were obtained from the interview questionnaire. Maternal chronic diseases included hypertension, heart disease, diabetes mellitus, asthma, and allergy diseases. Gestational hypertension, diabetes, hyperemesis gravidarum, infection and fever during pregnancy, and eclampsia were counted as pregnancy-related illness. Types of delivery were normal spontaneous delivery or cesarean section. In addition, the questionnaires also asked whether

Table 1
Prevalence of Chinese herbal medicines used during pregnancy and postpartum.

Chinese herbal medicine	Type	Ingredients	N (%)
Pregnancy			21,248 (100.0)
At least one	–	–	7,136 (33.6)
An-Tai-Yin	Formula	Fritillariae Bulbus, Zingiber Rhizoma, Angelicae Radix, Glycyrrhizae Radix, Ligustici Rhizoma, Paeoniae Lactiflorae Radix, Astragali Radix, Notopterygii Rhizoma, Magnoliae Cortex, Schizonepetae Herba, Citri Immaturus Fructus, Artemisiae Argyi Folium, and Cuscutae Semen	2,871 (13.5)
Pearl powder	Single	Margarita	2,529 (11.9)
Huanglian	Single	Coptidis Rhizoma	2,261 (10.6)
Szu-Wu-Tang	Formula	Rehmanniae Radix, Paeoniae Radix, Angelicae Sinensis Radix, and Chuanxiong Rhizoma	1,335 (6.3)
Ginseng	Single	Ginseng Radix	948 (4.5)
Postpartum			
Any one	–	–	18,633 (87.7)
Sheng-Hua-Tang	Formula	Angelicae Radix, Ligustici Rhizoma, Semen Persicae, Zingiberis Rhizoma, and Glycyrrhizae Radix	17,543 (82.6)
Szu-Wu-Tang	Formula	Rehmanniae Radix, Paeoniae Radix, Angelicae Sinensis Radix, and Chuanxiong Rhizoma	9,522 (44.8)

Values in parentheses are percentages.

there was a threatened abortion during pregnancy, and if the mother's breastfed or went to a postpartum recovery center (Zuo-yuezi center).

Information related to infants such as gender, birth weight, and gestational weeks was obtained from the national Taiwan birth register. Low birth weight refers to babies with birthweight below 2500 g and preterm delivery to babies born before 37 completed weeks (259 days) of gestation.

Chinese herbal medicine was defined as any botanical material or preparation with therapeutic or other human health benefits, which contains either raw or processed ingredients from one or more plants. Materials of inorganic or animal origin may also be present (WHO, 2000). The content of Chinese herbal medicines used during pregnancy and postpartum period were classified according to a previous study in Taiwan (Chuang et al., 2005). They were grouped as An-Tai-Yin, Pearl powder, Huanglian, Szu-Wu-Tang, Ginseng, and others during pregnancy; Sheng-Hua-Tang and Szu-Wu-Tang during the postpartum period, as shown in Table 1. In brief, data were gathered on common Chinese herbal medicines according to four different time periods: the first 3 months, after 3 months, within 1 month after childbirth (Zuo yuezi period), and beyond 1 month after childbirth.

2.4. Statistical analysis

Multiple logistic regression was performed to estimate odds ratios (ORs) and the 95% confidence intervals (CIs) of the dichotomous outcomes after adjusting for the potential confounding variables of maternal age, education, occupation, family income per month (NT\$), threatened abortion, pregnancy-related illness, chronic diseases, and parity. In addition to these potential confounders, type of delivery, breastfeeding, and postpartum recovery centers were added to estimate the odds ratios of women using herbal medicines after childbirth. This statistical analysis was performed using SPSS for Windows, Release 11.0.

3. Results

3.1. Prevalence of Chinese herbal medicines used during pregnancy and postpartum

The prevalence of Chinese herbal medicines use during pregnancy and the postpartum period was shown in Table 1. Among 21,248 women in the current study, 7136 (33.6%) and 18,633 (87.7%) reported using Chinese herbal medicines during pregnancy and the postpartum period, respectively. The five most commonly used Chinese herbal medicines used during pregnancy were An-Tai-Yin (13.5%), Pear powder (11.9%), Huanglian (10.6%), Szu-Wu-Tang (6.3%), and Ginseng (4.5%). Sheng-Hua-Tang (82.6%) and Szu-Wu-Tang (44.8%) were the most commonly used during the postpartum period.

3.2. Characteristics of the study subjects

The characteristics of the subjects we interviewed were summarized in Tables 2 and 3, which also showed the results of multiple logistic regressions for various risk factors of using Chinese herbal medicines during pregnancy and the postpartum period.

Most of the subjects were 20–34 years old (85.3%). There was a predominance of university or graduate education (45.1%), and most of subjects had a job (61.0%); 77.1% of the families had a month income of 30,000–100,000 NT\$. The prevalence of threatened abortion, pregnancy-related illness and maternal chronic diseases during the current pregnancy was 24.9%, 31.5%, and 19.4%, respectively. About half of the mothers were primipara (50.4%). 66.6% women had normal spontaneous delivery (NSD), and 82.1% breastfed their child.

3.3. Risk factors of using Chinese herbal medicines

The risk factors of pregnancy-related use of Chinese herbal medicines were shown in Table 2. After adjustment for all other variables, pregnant women aged 20–34 (OR

Table 2

Risk factors of pregnancy-related Chinese herbal medicine use among pregnant women in Taiwan.

Risk factors	Chinese Herbal Medicines Use			
	Yes (N = 7136) No. (%)	No (N = 14,112) No. (%)	cOR (95% CI)	aOR (95% CI)
Maternal age (years)			<i>P</i> < 0.001	<i>P</i> = 0.010
≤19	133 (1.9)	304 (2.2)	1.00 (0.80, 1.25)	1.08 (0.85, 1.35)
20–34	6,186 (86.7)	11,942 (84.6)	1.18 (1.08, 1.29) [#]	1.15 (1.05, 1.26) ^{**}
≥35 ^a	817 (11.4)	1,866 (13.2)	1.00	1.00
Maternal education			<i>P</i> < 0.001	<i>P</i> < 0.001
Junior high school– ^a	776 (10.9)	2,372 (16.8)	1.00	1.00
Senior high school	3,000 (42.0)	5,519 (39.1)	1.66 (1.52, 1.82) [#]	1.58 (1.44, 1.74) [#]
University +	3,360 (47.1)	6,221 (44.1)	1.65 (1.51, 1.81) [#]	1.52 (1.34, 1.68) [#]
Maternal occupation			<i>P</i> < 0.001	<i>P</i> = 0.215
No ^a	2,639 (37.0)	5,654 (40.1)	1.00	1.00
Yes	4,497 (63.0)	8,458 (59.9)	1.14 (1.07, 1.21) [#]	1.04 (0.98, 1.11)
Family income per month (NT\$)			<i>P</i> = 0.002	–
≤30,000 ^a	752 (10.5)	1,732 (12.3)	1.00	–
30,001–100,000	5,600 (78.5)	10,781 (76.4)	1.20 (1.09, 1.31) [#]	–
100,001–200,000	689 (9.7)	1,403 (9.9)	1.13 (0.99, 1.28)	–
>200,000	96 (1.3)	196 (1.4)	1.12 (0.86, 1.45)	–
Threatened abortion			<i>P</i> < 0.001	<i>P</i> < 0.001
No ^a	4,901 (68.7)	11,063 (78.4)	1.00	1.00
Yes	2,235 (31.3)	3,049 (21.6)	1.66 (1.55, 1.76) [#]	1.61 (1.51, 1.72) [#]
Pregnancy-related illness			<i>P</i> = 0.027	<i>P</i> = 0.309
No ^a	4,814 (67.5)	9,731 (69.0)	1.00	1.00
Yes	2,322 (32.5)	4,381 (31.0)	1.07 (1.01, 1.14) [*]	1.03 (0.97, 1.10)
Maternal chronic diseases			<i>P</i> < 0.001	<i>P</i> = 0.002
No ^a	5,628 (78.9)	11,492 (81.4)	1.00	1.00
Yes	1,508 (21.1)	2,620 (18.6)	1.18 (1.10, 1.26) [#]	1.12 (1.04, 1.20) ^{**}
Parity			<i>P</i> < 0.001	<i>P</i> < 0.001
0	3,877 (54.3)	6,836 (48.4)	1.33 (1.20, 1.46) [#]	1.25 (1.13, 1.38) [#]
1	2,549 (35.7)	5,617 (39.8)	1.06 (0.96, 1.17)	1.01 (0.91, 1.12)
≥2 ^a	710 (9.9)	1,659 (11.8)	1.00	1.00

Values in parentheses are percentages. Considering the high correlation between maternal education and family income per month (NT\$) (data not shown), we excluded the factor of family income per month when we estimated the adjusted odds ratio.

Abbreviations: cOR, crude odd ratio; aOR, adjusted odd ratio; CI, confidence interval; NT\$, new Taiwan dollars.

^a Reference category.

^{*} *P* < 0.05.

^{**} *P* < 0.01.

[#] *P* < 0.001.

1.15; 95% CI 1.05, 1.26), with high education (senior high school: OR 1.58; 95% CI 1.44, 1.74; university or over: OR 1.52; 95% CI 1.34, 1.68), threatened abortion (OR 1.61; 95% CI 1.51, 1.72), chronic disease (OR 1.12; 95% CI 1.04, 1.20), and primipara (OR 1.25; 95% CI 1.13, 1.38) used more Chinese herbal medicines.

Table 3 showed the risk factors of using Chinese herbal medicines during postpartum. After adjustment for all other variables, postpartum women with high education (senior high school: OR 1.86; 95% CI 1.67, 2.08; university or over: OR 2.23; 95% CI 1.97, 2.53), primipara (OR 1.15; 95% CI 1.00, 1.31), normal spontaneous delivery (OR 1.58; 95% CI 1.45, 1.73), and breastfeeding (OR 1.16; 95% CI 1.04, 1.28) used more Chinese herbal medicines, but those with pregnancy-related illness (OR 0.88; 95% CI 0.81, 0.96) used less.

4. Discussion

We found high overall use of Chinese herbal medicines among Taiwanese women during pregnancy

(33.6%), and postpartum (87.7%). Before reaching any further conclusions, the meaning of this study for a nursing/midwifery audience, and the representativeness of the sampling and validity of measurements need to be discussed.

Nurses can play an important role in the risk reduction of drug safety. In October 2004, WHO launched the World Alliance for Patient Safety in response to a World Health Assembly Resolution (2002) urging WHO and Member States to pay the closest possible attention to the problem of patient safety (WHO, 2004). Drug safety is an important part of patient safety, thus the important role of nursing in pharmacovigilance are followed with interests (Lata et al., 2004; Morrison-Griffiths et al., 2003; Ulfvarson et al., 2007). For pregnant or postpartum women, nurses or midwives are in a key position to evaluate adverse drug events or educate patients the correct medical information because of their direct patient care activities during prenatal or postpartum periods. Lacking the current representative data, the results of our study could provide

Table 3

Risk factors of Chinese herbal medicine use during postpartum in Taiwan.

Risk factors	Chinese herbal medicines use			
	Yes (N = 18,633) No. (%)	No (N = 2,615) No. (%)	cOR (95% CI)	aOR (95% CI)
Maternal age (years)			$P < 0.001$	$P = 0.330$
≤19	355 (1.9)	82 (3.1)	0.64 (0.49, 0.83) [#]	0.87 (0.65, 1.15)
20–34	15,940 (85.5)	2,188 (83.7)	1.08 (0.95, 1.21)	1.04 (0.91, 1.18)
≥35 ^a	2,338 (12.5)	345 (13.2)	1.00	1.00
Maternal education			$P < 0.001$	$P < 0.001$
Junior high school— ^a	2,469 (13.3)	679 (26.0)	1.00	1.00
Senior high school	7,472 (40.1)	1,047 (40.0)	1.96 (1.76, 2.18) [#]	1.86 (1.67, 2.08) [#]
University +	8,692 (46.6)	889 (34.0)	2.68 (2.41, 3.00) [#]	2.23 (1.97, 2.53) [#]
Maternal occupation			$P < 0.001$	$P < 0.001$
No ^a	6,993 (37.5)	1,300 (49.7)	1.00	1.00
Yes	11,640 (62.5)	1,315 (50.3)	1.65 (1.52, 1.79) [#]	1.32 (1.21, 1.44) ^{**}
Family income per month (NT\$)			$P < 0.001$	—
≤30,000 ^a	2,005 (10.8)	479 (18.3)	1.00	—
30,001–100,000	14,474 (77.7)	1,907 (72.9)	1.81 (1.62, 2.03) [#]	—
100,001–200,000	1,901 (10.2)	191 (7.3)	2.38 (1.99, 2.84) [#]	—
>200,000	253 (1.4)	38 (1.5)	1.59 (1.12, 2.27) [*]	—
Pregnancy-related illness			$P < 0.001$	$P = 0.004$
No ^a	12,852 (69.0)	1,693 (64.7)	1.00	1.00
Yes	5,781 (31.0)	922 (35.3)	0.83 (0.76, 0.90) [#]	0.88 (0.81, 0.96) ^{**}
Maternal chronic diseases			$P = 0.002$	$P = 0.068$
No ^a	14,955 (80.3)	2,165 (82.8)	1.00	1.00
Yes	3,678 (19.7)	450 (17.2)	1.18 (1.06, 1.32) ^{**}	1.11 (0.99, 1.24)
Parity			$P < 0.001$	$P = 0.134$
0	9,469 (50.8)	1,244 (47.6)	1.37 (1.21, 1.56) [#]	1.15 (1.00, 1.31) [*]
1	7,157 (38.4)	1,009 (38.6)	1.28 (1.12, 1.46) [#]	1.11 (0.97, 1.26)
≥2 ^a	2,007 (10.8)	362 (13.8)	1.00	1.00
Type of delivery			$P < 0.001$	$P < 0.001$
NSD	12,629 (67.8)	1,513 (57.9)	1.53 (1.41, 1.67) [#]	1.58 (1.45, 1.73) [#]
C/S ^a	6,004 (32.2)	1,102 (42.1)	1.00	1.00
Breastfeeding			$P < 0.001$	$P = 0.006$
Ever	15,424 (82.8)	2,027 (77.5)	1.39 (1.26, 1.54) [#]	1.16 (1.04, 1.28) ^{**}
Never ^a	3,209 (17.2)	588 (22.5)	1.00	1.00
Postpartum recovery centers (zuo-yuezi center)			$P < 0.001$	$P = 0.059$
Yes	1,428 (7.7)	137 (5.2)	1.50 (1.25, 1.80) [#]	1.20 (0.99, 1.44)
No ^a	17,205 (92.3)	2,478 (94.8)	1.00	1.00

Values in parentheses are percentages. Considering the high correlation between maternal education and family income per month (NT\$) (data not shown), we excluded the factor of family income per month when we estimated the adjusted odds ratio.

Abbreviations: cOR, crude odd ratio; aOR, adjusted odd ratio; CI, confidence interval; NT\$, new Taiwan dollars; NSD, normal spontaneous delivery; C/S, cesarean section.

^a Reference category.

^{*} $P < 0.05$.

^{**} $P < 0.01$.

[#] $P < 0.001$.

the information related the women using Chinese herbal medicines during prenatal or postpartum periods.

The characteristics of non-responders need to be considered. There were no significant differences with the characteristics of parents' age, type of delivery, and gender of newborn between the responders and non-responders. However, the rate of low birth weight (9.6%) and preterm delivery births (11.0%) in the non-responders was significantly higher than that in the responders (6.9% and 8.4%, respectively). Consequently, a potential selection bias might exist because some low birth weight or preterm babies were not recruited to respond. It might, therefore,

have led us to underestimate the prevalence of using Chinese herbal medicines if low birth weight or preterm babies were related to the use of such medicines during pregnancy.

The prevalence of herbs used during pregnancy (33.6%) in this current study was similar to recent studies in Norway (36%) (Nordeng and Havnen, 2004) and Taiwan (24.1%) (Chuang et al., 2007), but lower than a mid-1980s Taiwan survey (42.3%) (Chuang et al., 2005). This shows that pregnant women in Taiwan about using traditional Chinese herbal medicines seem to have become more cautious.

The most common herb used during pregnancy was An-Tai-Yin (13.5%), and then about 10% of pregnant women used Pearl powder or Huanglian. In addition, 1596 (7.5%) of pregnant women used An-Tai-Yin in the first trimester, and 878 of them reported no symptom of threatened abortion (data not shown). Traditional wisdom in Taiwan is that An-Tai-Yin prevents spontaneous abortion, and indeed the name implies this in Chinese. However, according to an ancient Chinese book (Fu et al., 1999), the main effect of An-Tai-Yin is to help pregnant women deliver smoothly. Hence, the most appropriate time to use An-Tai-Yin is in the third trimester. In addition, around 2% of women without any indication used other herbs during the first trimester. Our previous study showed that herbs used during the first trimester caused a high risk of congenital malformation (Chuang et al., 2006a). Furthermore, little information is available on the consumption and safety of Pearl powder and Huanglian. Hence, such habits during prenatal care must be enquired and this requires further research.

The very widespread use of herbs during postpartum (87.7%) found in our study is consistent with another study in Taiwan which reported 94.4% postpartum women using Sheng-Hua-Tang (Chen and Wang, 2000). Sheng-Hua-Tang (82.6%) and Szu-Wu-Tang (44.8%) were the most commonly used herbs in the postpartum period. According to the traditional Taiwanese postpartum custom of “doing the month” (Zuo yuezi), women are taught by their mothers or mother-in-laws to take Chinese herbal medicines such as Sheng-Hua-Tang (Chen and Wang, 2000) and Szu-Wu-Tang to recuperate from the delivery. Such a practice usually lasts for 1 month from the date of childbirth. In our study about 2% of women used Sheng-Hua-Tang for more than 1 month after childbirth, longer than the recommendation of the Chinese medicine doctors, and this might cause vaginal hemorrhage (Hou et al., 2006). Furthermore, infants breastfed by postpartum women using Szu-Wu-Tang had the risk of elevated lead, because of the herbs contaminated by lead (Chien et al., 2006). Hence, this practice should be prescribed by Chinese medicine doctors for postpartum recovery.

Similar to previous studies in Taiwan (Chuang et al., 2005, 2007), pregnant women in our survey with a threatened abortion and primipara used more Chinese herbal medicines. Other factors related to using more herbs during pregnancy were women aged 20–34, chronic diseases, and high education. The finding that women with high education used more herbs was opposite to that in the previous 1980s study, which showed that low socio-economic women used more herbs (Chuang et al., 2005). One of the most probable reasons for such difference is that the kinds of herbs used during pregnancy have been modified in the current era, especially Pearl powder. While the most common used herbs during pregnancy (An-Tai-Yin, Huanglian, Szu-Wu-Tang, and Ginseng) were similar in the mid-1980s survey (Chuang et al., 2005) and the current study, Pearl powder was rarely used several decades ago. In Taiwanese popular understanding, the function of Pearl powder is

similar to that of Huanglian, to make the fetal skin beautiful. Our study showed the prevalence rates of Pearl powder use by pregnant women with education levels of university or over, senior high school, and junior high school or lower were 15.2%, 11.0%, and 4.5%, respectively (data not shown). Women with higher education thus used significantly more Pearl powder. This is perhaps because the price of Pearl powder is higher than Huanglian, hence, women in the high socio-economic level could better afford it.

In the current study, during postpartum, women with high education, primipara, normal spontaneous delivery, and breastfeeding used more herbs, but those with pregnancy-related illness diseases used less. This is consistent with the belief of gynecologists that Sheng-Hua-Tang can help lochia discharge, and thus women with normal spontaneous delivery need to use more than women who had a cesarean section, during which the doctor had cleaned the lochia (Hou et al., 2006).

Ethical issues in the longitudinal follow up study are concerned. Firstly, the current study was approved by the Ethics Review Board of the National Taiwan University College of Public Health. Postcards were delivered to subjects, thus they can consider participating or dropping out, and participants are allowed to refuse any specific aspect of the study. Then, consents were obtained at enrollment and at each home-interview, and some variables must ethically be fed back to the participants. Specific situations such as people whose babies had died, had been adapted or had potential developmental problems, we provided the information of counseling or referrals.

5. Conclusions

Chinese herbal medicines are frequently used by women during pregnancy and the postpartum period in Taiwan and those with high education and primipara used more such herbs. Due to limited safety information on these herbs, we would advise caution regarding their use either during pregnancy or postpartum breastfeeding period. Moreover, it is important for nurses/midwives enquiring about such habits, and providing the adequate education to women during prenatal and postpartum care to prevent potential side effects.

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Appendix A

Questions for collecting the information of women used Chinese herbal medicines during pregnancy and postpartum periods.

Part 1: Questions of Chinese herbal medicines used during the pregnancy

1. Did you use **An-Tai-Yin** during the pregnancy?
☐ No (**Skip to the next question.**)
☐ Yes
a. When did you use An-Tai-Yin during the pregnancy?
☐ during the first trimester
☐ during the second and third trimesters
b. How many times did you use An-Tai-Yin during the pregnancy?
☐ 1-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61 or more
2. Did you use **Pearl powder** during the pregnancy?
☐ No (**Skip to the next question.**)
☐ Yes
a. When did you use **Pearl powder** during the pregnancy?
☐ during the first trimester
☐ during the second and third trimesters
b. How many times did you use **Pearl powder** during the pregnancy?
☐ 1-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61 or more
3. Did you use **Huanglian** during the pregnancy?
☐ No (**Skip to the next question.**)
☐ Yes
a. When did you use **Huanglian** during the pregnancy?
☐ during the first trimester
☐ during the second and third trimesters
b. How many times did you use **Huanglian** during the pregnancy?
☐ 1-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61 or more
4. Did you use **Szu-Wu-Tang** during the pregnancy?
☐ No (**Skip to the next question.**)
☐ Yes
a. When did you use **Szu-Wu-Tang** during the pregnancy?
☐ during the first trimester
☐ during the second and third trimesters
b. How many times did you use **Szu-Wu-Tang** during the pregnancy?
☐ 1-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61 or more
5. Did you use **Ginseng** during the pregnancy?
☐ No (**Skip to the next question.**)
☐ Yes

a. When did you use **Ginseng** during the pregnancy?

- ☐ during the first trimester
☐ during the second and third trimesters

b. How many times did you use **Ginseng** during the pregnancy?

- ☐ 1-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61 or more

6. Did you use **other Chinese herbal medicines** _____ during the pregnancy?

- ☐ No (**Skip to the next question.**)
☐ Yes

a. When did you use **other Chinese herbal medicines** during the pregnancy?

- ☐ during the first trimester
☐ during the second and third trimesters

b. How many times did you use the Chinese herbal medicine during the pregnancy?

- ☐ 1-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61 or more

Part 2: Questions of Chinese herbal medicines used during the postpartum period

1. Did you use **Sheng-Hua-Tang** during the postpartum period?

- ☐ No (**Skip to the next question.**)
☐ Yes

a. When did you use **Sheng-Hua-Tang** during the postpartum period?

- ☐ during Zuo yuezi period
☐ after Zuo yuezi period

b. How many times did you use **Sheng-Hua-Tang** during the postpartum period?

- ☐ 1-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61 or more

2. Did you use **Szu-Wu-Tang** during the postpartum period in the current pregnancy?

- ☐ No (**Skip to the next question.**)
☐ Yes

a. When did you use **Szu-Wu-Tang** during the postpartum period?

- ☐ during Zuo yuezi period
☐ after Zuo yuezi period

b. How many times did you use **Szu-Wu-Tang** during the postpartum period?

- ☐ 1-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61 or more

3. Did you use **other Chinese herbal medicines** _____ during the postpartum period?

- ☐ No (**Skip to the next question.**)
☐ Yes

a. When did you use **other Chinese herbal medicine** during the postpartum period?

- ☐ during Zuo yuezi period
☐ after Zuo yuezi period

b. How many times did you use **other Chinese herbal medicine** during the postpartum period?

- ☐ 1-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61 or more

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