

# Pregnancy outcome following women's participation in a randomised controlled trial of acupuncture to treat nausea and vomiting in early pregnancy

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**SUMMARY.** Objectives: Recent studies have concluded that acupuncture is safe in the hands of a qualified practitioner. This study assessed the risk of adverse effects of acupuncture administered during pregnancy. Methods: 593 women with nausea and vomiting in early pregnancy volunteered to participate in a randomised controlled trial, conducted at the Women's and Children's Hospital, in South Australia. Patients were given either traditional acupuncture, formula acupuncture, sham acupuncture or no acupuncture. Outcome Measures: Data were collected on perinatal outcome, congenital abnormalities, pregnancy complications and the newborn. Results: No differences were found between study groups in the incidence of perinatal outcome, congenital abnormalities, pregnancy complications and other infant outcomes. Conclusion: Our findings suggest that no serious adverse effects arise from acupuncture administered in early pregnancy. © 2002 Published by Elsevier Science Ltd

## INTRODUCTION

Nausea and vomiting are troublesome symptoms that occur mainly in the first trimester of pregnancy and affect 50–80% of all pregnant women.<sup>1,2</sup> The onset of nausea and vomiting is usually by weeks 4–6 of gestation, with a peak in incidence and severity by weeks 8–12, and with resolution of symptoms generally by week 20. The effect of nausea and vomiting on women's lives has been inadequately studied. Among women participating in a recent clinical trial, nausea and vomiting in early pregnancy were reported to have a profound impact on women's general sense of well-being and consequently their day-to-day lives.<sup>3</sup>

The use of complementary therapies has become popular in many Western countries.<sup>4</sup> Use of these therapies is more common among women of reproductive age, with almost half of all women (49%) reporting use.<sup>5</sup> It is possible that a significant proportion of women are using these therapies during pregnancy. There is increasing interest

in the antiemetic effect of acupressure or acupuncture on point pericardium 6 (PC6). Stimulation of this point is proposed to have a specific effect on the upper digestive tract. The Cochrane systematic review of interventions to treat nausea and vomiting includes studies of acupressure point PC6 and the authors concluded that acupressure may be helpful.<sup>6</sup>

There is a need to demonstrate both the efficacy and safety of acupuncture. Complementary therapies are believed to be more natural and less liable to cause side-effects than more conventional forms of medical care. Recent reports have examined the incidence and nature of side-effects of acupuncture.<sup>7,8</sup> Both studies suggested the incidence of complications was low and that any complications arising from treatment were temporary. It has been concluded that acupuncture is a safe intervention in the hands of a competent practitioner.<sup>9</sup>

Two systematic reviews of acupuncture to treat nausea and vomiting in pregnancy have

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commented on the absence of data reporting on fetal outcome and side-effects from acupuncture treatment that may affect the pregnant woman.<sup>6,10</sup> The safety of acupuncture administered in the first trimester of pregnancy is of concern to the public and professionals alike, and there is a need for all clinical trials to report these outcomes. Although there is no standardised approach to the application of acupuncture when treating pregnant women, it is recommended that gentle needle techniques are used.<sup>11</sup>

As part of a single blind, randomised controlled trial to determine whether acupuncture reduced nausea and vomiting for women in early pregnancy, we assessed the effects of the acupuncture on adverse effects on the mother and baby. A secondary hypothesis of the trial was that acupuncture in early pregnancy for women experiencing nausea and vomiting in early pregnancy has no adverse effects. Adverse effects were defined as: spontaneous abortion, stillbirth, or neonatal death, congenital abnormalities, and pregnancy complications defined as antepartum haemorrhage, pregnancy-induced hypertension, pre-eclampsia and pre-term birth. The main trial results are presented elsewhere.<sup>12</sup>

## METHODS

Women were eligible for the trial if they were:

- less than 14 weeks pregnant;
- with symptoms of nausea or vomiting; and
- gave written informed consent.

Women were ineligible for the study if:

- they presented with clinical signs of dehydration; or
- there was reason to suspect their symptoms were not due to pregnancy.

Women were recruited to the trial from the antenatal clinic and antenatal ward at the Women's and Children's Hospital; referrals were made from general practitioners and paid advertisements were taken out in local papers. The study was approved by the hospital's research and ethics committee.

Women were randomly assigned to one of four study groups: traditional acupuncture, PC6 acupuncture, sham acupuncture or a no acupuncture control group. A full description of the methods is described elsewhere.<sup>12</sup>

Demographic information was collected at trial entry. Acupuncture diagnosis and treatment were performed by the study investigator (CS). A standardised protocol was developed during the design of the study; this guided the interaction with women, including diagnosis, acupuncture and sham acupuncture treatment, and needling techniques. Women allocated to the two acupuncture groups and sham acupuncture group were

recommended to attend for treatment twice during the first week and then weekly. A maximum of six needles were used during a treatment session. The needling technique used tonification, even or sedation. Needles were inserted to a depth 0.5–1 cun, to elicit *de qi*, a sensation associated with correct needling. The treatment session was performed over a 20-minute period. Participation in the trial was for 4 weeks.

Women allocated to the traditional acupuncture group were administered a treatment based on their traditional Chinese medicine diagnosis. Treatment was guided by the approach described by Maciocia.<sup>13</sup> Treatment used acupuncture points on the mid and upper abdomen, located on the energy pathways (meridians) in this area, for example Stomach 19, 20, 21, Kidney 21 and 20, and Conception Vessel 14, 13, 12, 11 or 10. Acupuncture points were also selected to treat the traditional Chinese medicine diagnosis: Liver Qi stagnation, Stomach or Spleen Qi deficiency, Stomach heat, Liver heat or Phlegm.

Women allocated to the PC6 study group received acupuncture at this single point only, which is located 2 cun (Chinese inches) proximal to the wrist crease. For the sham treatment group, five sham acupuncture points were used; women received acupuncture needles inserted into an area close to but not on acupuncture points. These points were located on the upper limb between the Pericardium and Lung meridian at 6 cun above the wrist crease, a point on the ankle area between the Stomach and Gall Bladder meridians, a point on the foot between the third and fourth metatarsals, a point on the lower leg between Gall Bladder and Stomach channel 3 cun below stomach 36. No stimulation was given to the needles. A no acupuncture control group was included to control for the effect of spontaneous remission of symptoms.

Pregnancy outcome included data on perinatal outcome, congenital abnormalities, pregnancy complications and infant outcomes. The standard definitions of pregnancy outcome from the South Australian Health Commission Pregnancy Outcome Unit were used to examine the incidence of pregnancy outcome between study groups.<sup>14</sup> Perinatal outcome included: early fetal death (spontaneous abortion), stillbirth defined as death of a fetus of at least 400 g birth weight or 20 weeks gestation, and neonatal death defined as death of a live born infant within 28 days of birth. Data on pregnancy outcome are presented for South Australia for comparison with our study outcomes. Data collected on congenital abnormalities from women in this trial were classified according to the diagnostic categories used by the register for coding of the British Paediatric Association (BPA) Classification of Diseases.<sup>15</sup> Minor malformations, defined by the South Australian Birth Defects Register (1996), as those not disfiguring or not requiring

treatment were excluded from our data set.<sup>16</sup> The main pregnancy complications were defined as antepartum haemorrhage, pregnancy-induced hypertension, pre-eclampsia (hypertension  $\geq 140/90$  mmHg, proteinuria  $\geq 0.3$  g/l from the 20th week of pregnancy) and pre-term birth (<37 weeks gestation).

Pregnancy outcome data were collected from women 6 weeks after their expected date of delivery. Data for women who did not deliver at the Women's and Children's Hospital were collected by a telephone call by the study investigator (CS). Pregnancy outcome data were extracted from women's case notes for those women who gave birth at the Women's and Children's Hospital.

The study outcomes were compared between the four groups using chi-square test for binary variables and analysis of variance for differences between means. Multiple comparisons among study groups were adjusted using the Tukey means comparisons. A *P* value of less than 0.05 was regarded as significant.

## RESULTS

The mean age of women participating in the trial was 29.8 years (SD 4.9). The mean gestational age at trial entry was 8.5 weeks (SD 1.8). Women were mostly married or cohabiting, employed and had at least one child. Women in the three groups attended four acupuncture sessions during the 4-week trial. Our data were comparable with the maternal data set from the South Australian Health Commission.<sup>14</sup> Pregnancy outcome data were collected from 583 (98%) women. Ten (1.6%) women were considered lost to follow-up after two postal mail outs. It is known that four of these women had moved interstate or overseas.

From the 583 women for whom data were available, 545 (92%) women gave birth to 557 infants delivered after 20 weeks of pregnancy (Table 1). Eight women terminated their pregnancy; four of these were for genetic abnormalities (two in the no acupuncture control group, one in the PC6 acupuncture group and one in the traditional acupuncture group). The four other

terminations were reported by two women in the traditional acupuncture group and two women in the sham acupuncture group. Thirty (5%) women experienced a spontaneous abortion in the first or second trimester, six (1%) women experienced a stillbirth and there was one neonatal death.

### Perinatal outcome

No differences were found between the study groups in the incidence of spontaneous abortion, stillbirth or neonatal death (Table 1). For comparison, the risk of spontaneous abortion in South Australia defined as a pregnancy diagnosed 21 days from conception by measuring beta HCG and ultrasound examination at 8 weeks gestation is estimated to be 11% of pregnancies.<sup>17</sup> The number of women in this trial experiencing a spontaneous abortion (defined as death in a fetus of less than 400 g birth weight, or of less than 20 weeks gestation) was small (30 women, 5%). These data provide some reassurance that acupuncture was not associated with an increase in the risk of spontaneous abortion.

### Congenital abnormalities

No differences were detected between study groups. In total, 22 (3%) babies were born with a major congenital abnormality (Table 2). For comparison, in 1996 there were 11,614 (5.4%) birth defects registered in South Australia, including minor and major malformations.<sup>16</sup> In the traditional acupuncture group, six (4.5%) babies were born with congenital abnormality, with five (3.7%) in the PC6 acupuncture group, six (4.3%) in the sham acupuncture group and five (3.7%) in the no acupuncture control group.

There were nine cases of musculoskeletal disorders; eight of these were congenital hip dislocations, and one case of polydactyly. The remaining major malformations were one case of microphthalmia, one case of hypospadias, two cases of undescended testes, one case of cystic fibrosis, one case of a chromosome abnormality resulting in a stillbirth (abnormality was not specified by the mother), one case of pyloric stenosis, two cases of

Table 1. Perinatal outcome by study group.

Outcome	Traditional acupuncture		PC6 acupuncture		Sham acupuncture		No acupuncture control		Rate in South Australia*	P value (chi square)
	n = 146	%	n = 147	%	n = 147	%	n = 143	%		
Spontaneous abortion	4	(3)	11	(7)	6	(4)	9	(6)	NA	ns
Stillbirth	1	(1)	0	(0)	1	(1)	4	(3)	0.74	ns
Neonatal death	0	(0)	0	(0)	1	(0)	0	(0)	0.32	ns

Figures are number (percentage); ns = not significant; NA = not available.

\*South Australian Health Commission: Pregnancy Outcome in South Australia, 1997.

Congenital abnormality	Traditional acupuncture		PC6 acupuncture		Sham acupuncture		No acupuncture control		Birth defect notified*		P value (chi square)
	n = 146	%	n = 146	%	n = 147	%	n = 143	%	n	%	
Cardiovascular	1	(1)	1	(1)	2	(1)	0	(0)	174	(0.93)	ns
Gastrointestinal	0	(0)	2	(1)	1	(1)	0	(0)	112	(0.6)	ns
Urogenital	1	(1)	0	(0)	0	(0)	2	(1)	182	(0.97)	ns
Musculoskeletal	4	(3)	2	(1)	2	(1)	1	(1)	263	(1.4)	ns
Chromosomal abnormality	0	(0)	0	(0)	0	(0)	1	(1)	77	(0.41)	ns
Metabolic	0	(0)	0	(0)	1	(1)	1	(1)	29	(0.16)	ns
Other	0	(0)	0	(0)	0	(0)	0	(0)	NA		ns

Figures are number (percentage). ns = not significant; NA = not available.

\*South Australian Birth Defects Register, 1997.

cleft lip and four cases of cardiovascular disorders (all congenital heart defects).

### Pregnancy complications

The overall risk of pregnancy complications, defined as antepartum haemorrhage (APH), pregnancy-induced hypertension, pre-eclampsia and pre-term birth, did not differ by study group (Table 3).

### Other infant outcomes

No differences were found between study groups for any other birth outcomes. Data on birth weight were not available for three stillborn babies. The mean gestational age at birth did not differ between study groups (Table 4). The mean birth weight for babies in the trial was 3483 g (SD 612 g), with no differences in the mean birth weight found between study groups. There were 27 (4.9%) babies "small for gestational age", again with no differences found between study groups.

Information on placental weight was available from women (37%) delivering at the Women's and Children's Hospital. No difference in placen-

tal weight was found between study groups. There was no difference between study groups in birth length and head circumference.

### DISCUSSION

This is the first large clinical trial of acupuncture administered during the first trimester of pregnancy to report on pregnancy outcome. We find no evidence that acupuncture had any adverse effects on the mother and baby. The incidence of spontaneous abortion, stillbirth or neonatal loss, congenital abnormalities and pregnancy complications appear acceptable when compared with the pregnancy outcome data from South Australia. The sample size of the clinical trial was able to detect only large differences in these secondary endpoints between study groups. For example, if acupuncture were to increase the risk of spontaneous abortion from 6% to 7%, it was estimated that a sample size of 19,476 women would be required. Although these findings suggest that no adverse effects arise from acupuncture, there is debate about which points are appropriate to use in pregnancy. At this current time, adherence to

Pregnancy complication	Traditional acupuncture		PC6 acupuncture		Sham acupuncture		No acupuncture control		Data from South Australia*		P value (chi square)
	n = 137	%	n = 141	%	n = 136	%	n = 138	%	n = 18,394	%	
APH/abruption or placenta praevia	2	(1)	4	(3)	6	(4)	4	(3)	622	(3)	ns
Pregnancy-induced hypertension	6	(4)	10	(7)	10	(7)	5	(3)	1671	(9)	ns
Pre-eclampsia	11	(8)	7	(5)	8	(5)	7	(5)	NA		ns
Pre-term birth	9	(6)	5	(3)	6	(4)	12	(8)	NA		ns

Figures are number (percentage). ns = not significant; NA = not available.

\*South Australia Health Commission. Pregnancy Outcome in South Australia, 1997.

Infant outcomes	Traditional acupuncture		PC6 acupuncture		Sham acupuncture		No acupuncture control		Data from South Australia <sup>‡</sup>		P value
	n = 135		n = 139		n = 135		n = 137		n = 18,674	%	
Gestational age at delivery (weeks)*	39	(1.2)	39	(1.2)	39	(1.2)	39	(1.3)	NA		ns
Birth weight* small for gestational age <sup>†</sup>	3534 8	(495) (6%)	3606 5	(501) (4%)	3536 7	(489) (5%)	3478 7	485 (5%)	NA NA		ns
Placental weight (g)*	620	(235)	598	(149)	643	(160)	610	(173)	NA		ns
Male <sup>†</sup>	72	(52%)	65	(48%)	68	(49%)	69	(52%)	9,539	(51%)	ns
Birth length (cm)*	50	(3)	50	(3)	50	(3)	49	(5)	NA		ns
Head circumference (cm)*	34	(2)	34	(2)	34	(2)	34	(3)	NA		ns

\*Figures are mean (SD), analysed by ANOVA.

<sup>†</sup>Figures are number (percentage), analysed by chi-square. NA = not available; ns = not significant.

<sup>‡</sup>South Australia Health Commission. Pregnancy Outcome in South Australia, 1997.

techniques described in respected texts describing acupuncture treatment during the first trimester of pregnancy seems prudent.<sup>11,13</sup>

These techniques can be summarised as using no more than four to six needles and no moxa when treating women with nausea and vomiting. Begin treatments gently, leaving the needle in for 10–15 minutes initially to judge the woman's reaction to the needles. In subsequent treatments needles may be left in longer. Gentle needling techniques should be used; strong needle stimulation should be avoided. For deficient conditions, tonify with needles retained for 15–20 minutes. For clearing treatments, use an evens technique. Certain acupuncture points should be avoided, these include the following: Colon 4, Spleen 6, Gall Bladder 21, Bladder 31 and 32, Bladder 67, and lower abdominal points.

To determine if acupuncture and other complementary therapies are safe to use in pregnancy, it is important that future clinical studies include pregnancy outcome information. It may be timely to consider the introduction of a surveillance register to facilitate reporting of any adverse outcomes that arise from the use of acupuncture or other complementary therapy in early pregnancy. One method to achieve this would be collection of information describing whether acupuncture or other complementary therapies are used in pregnancy. This information, for example, could be incorporated into the routinely collection of perinatal data with cross-linkages to national birth defects registers where they exist.

Findings from our randomised controlled trial suggest acupuncture was safe as a treatment option for women in early pregnancy.

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#### REFERENCES

1. Soules MR, Hughes CL, Garcia JA, Livengood CH, Prytowsky MR, Alexander E. Nausea and vomiting of pregnancy: role of human chorionic gonadotrophin and 17 hydroxyprogesterone. *Obstet Gynecol* 1980; 55: 696–700.
2. Vellacott ID, Cooke E, James CE. Nausea and vomiting in early pregnancy. *Int J Gynaecol Obstet* 1988; 27: 57–62.
3. Smith C, Crowther C, Beilby J, Dandeaux J. The impact of nausea and vomiting on women: a burden of early pregnancy. *Aust NZ J Obstet Gynaecol* 2000; 4: 397–401.
4. MacLennan A, Wilson DH, Taylor AW. Prevalence and cost of alternative medicine in Australia. *Lancet* 1996; 347: 569–573.
5. Eisenberg DM, Kessler RC, Foster C, Norlock FE, Calkins DR, Delbanco TL. Unconventional medicine in the United States: prevalence, costs and patterns of use. *New Engl J Med* 1993; 328: 246–352.
6. Jewell MD, Young G. Interventions for nausea and vomiting in early pregnancy. In: *The Cochrane Library Issue 1*. Oxford: Update Software, 2002.
7. White A, Hayhoe S, Hart A, Ernst E. Adverse events following acupuncture: prospective survey of 32,000 consultations with doctors and physiotherapists. *Br Med J* 2001; 323: 485–486.
8. MacPherson H, Thomas K, Walters S, Fitter M. The York acupuncture safety study: prospective survey of 34,000 treatments by traditional acupuncturists. *Br Med J* 2001; 323: 486–487.
9. Vincent C. The safety of acupuncture. *Br Med J* 2001; 323: 4467–4468.
10. Vickers AJ. Can acupuncture have specific effects on health? A systematic review of acupuncture antiemesis trials. *JR Soc Med* 1996; 89: 303–311.

11. West Z. *Acupuncture in Pregnancy and Childbirth*. Churchill Livingstone, 2001.
12. Smith CA, Crowther CA, Beilby J. Acupuncture to treat nausea and vomiting in early pregnancy: randomised controlled trial. *Birth* 2002; 29(1): 6–14.
13. Maciocia G. *Obstetrics & Gynaecology in Chinese Medicine*. New York: Churchill Livingstone, 1998.
14. South Australian Health Commission. *Pregnancy Outcome in South Australia 1997*. Government of South Australia.
15. British Paediatric Association (BPA) *Classification of Diseases*, 1979.
16. South Australian Birth Defects Register 1997 Annual Report, Women's and Children's Hospital, Adelaide, South Australia.
17. Llewellyn-Jones D. *Fundamentals of Obstetrics and Gynaecology*, Volume 1, Obstetrics, 6th edition. London: Mosby, 1994.