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ORIGINAL ARTICLE



Birth preparation acupuncture for normalising birth: An analysis of NHS service routine data and proof of concept

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ABSTRACT

A number of studies show that acupuncture may help with labour and delivery. An NHS maternity acupuncture service providing birth preparation acupuncture has assessed its routine hospital maternity annual data from 2014 to 2016 to see what effect it had on labour and delivery outcomes. The data from this service was analysed and women who had birth preparation acupuncture were compared with those who did not receive it. Maternal age, parity and socio-economic status were considered confounders and were adjusted for in the analysis. Women who received acupuncture had more normal births (less surgical births) [OR 0.76 (0.64, 0.91)], required less intrapartum analgesia [OR 0.74 (0.63, 0.86)], fewer components of an induction of labour [OR 0.74 (0.61, 0.91)] and a reduced length of a hospital stay [OR 0.91 (0.87, 0.95)]. The patients highly valued the availability of acupuncture within the maternity service as it enhanced their patient journey.

IMPACT STATEMENT

- **What is already known on this subject?** Numerous studies provide evidence for the effects of acupuncture in normalising pregnancy and birth. These effects include musculoskeletal preparation of the pelvis, cervical ripening, enhancing endogenous oxytocin release, and analgesic properties.
- **What do the results of this study add?** Our analysis shows that women who received birth preparation acupuncture had fewer surgical births, required less intrapartum analgesia, less components of induction of labour and had a reduced length of hospital stay, supporting the use of maternity acupuncture in normalising birth outcomes.
- **What are the implications of these findings for clinical practice and/or further research?** The findings show that acupuncture, by potentially normalising birth, may lead to reductions in costs of service. Further, additional research is required to see whether acupuncture is cost effective and could have an adjunctive role as a complementary therapy for improving birth outcomes and a woman's experience of childbirth.

KEYWORDS

Normal birth; acupuncture; NHS; maternity; labour; complementary medicine

Introduction

Acupuncture has been used historically in all areas of health in order to enhance physiology and physiological repair of illness (Plummer 1981). There is evidence to suggest that acupuncture is a safe intervention (Moon et al. 2019) that enhances emotional (Gould and MacPherson 2001; Carvalho et al. 2013; Ormsby et al. 2017) and physical resilience (Watanabe et al. 2014). The postulated neurophysiological mechanisms involve the activation of several cortical areas and descending inhibitory pathways (Takeshige et al. 1992), as well as endogenous opioids (Zhao 2008).

Pre-existing research shows that acupuncture may be beneficial in the treatment of the pelvic or back pain of pregnancy (Liddle and Pennick 2015). There is also promising data on its use for labour analgesia and some very small studies suggest a reduction in the length of labour (Chang et al. 2004; Rabl et al. 2001; Smith et al. 2011; Mucuk and Baser 2014). Acupuncture is known to promote homeostasis,

so using it for the induction of labour (i.e. stimulating a uterus into labour when it is not physiologically ready), is counterintuitive. However, evidence from the 2017 Cochrane Review indicates that acupuncture could contribute by promoting cervical ripening (Smith et al. 2017). In animal studies, this effect may equal the performance of prostaglandins (Gribel et al. 2011). Moreover, there is evidence that acupuncture-type interventions influence optimal foetal positions such as the resolution of the breech presentation (van den Berg et al. 2008; Li et al. 2009).

The Whittington Hospital (London, UK) has a Maternity Acupuncture Service run in partnership with the Asante Academy of Chinese Medicine; this project offers a non-pharmacological approach which aims to enhance pregnancy-related physical and emotional health. The service offers birth preparation acupuncture on a weekly basis in the last trimester of pregnancy. Historically, Traditional Chinese acupuncture for birth preparation postulates (on an empirical basis) improved birth outcomes (Duke and Don 2005).

There is a need to investigate methods of birth preparation and improve birth physiology to counterbalance the progressive rise in obstetric and potential offspring iatrogenic morbidity related to the increase of caesareans (Solheim et al. 2011; Einarsdóttir et al. 2013; Higgins et al. 2013; Mesquita et al. 2013; Feng et al. 2014; Vogel et al. 2015; Dominguez-Bello et al. 2016;).

Giving birth is a complex bio-psycho-social process, where continuous emotional support and home-like birth settings help (Birthplace in England Collaborative Group 2011; Hodnett et al. 2013; De Jonge et al. 2015). However, acupuncture could influence the psychobiological pathways possibly mediated via endogenous oxytocin mechanisms (Taylor et al. 2000; Lokugamage 2013). Physiological studies involving acupuncture have been seen to increase oxytocin levels (Uvnäs-Moberg et al. 1993; Zhang et al. 2012) and serotonergic mechanisms (Moazzami et al. 2010). There is scope within maternity care systems for improved emotional support for parents in the birth arena, as well as improved preparation of the musculoskeletal structures of the body for childbirth (Liddle and Pennick 2015).

We are aware that there is a limited but increasing amount of evidence for the use of acupuncture in women's health. However, this is not at odds with the general evidence levels behind the guidelines in obstetrics and gynaecology. Three separate analyses of the guidelines in the UK, USA and Canada (RCOG, ACOG and SOGC) demonstrate that they are underpinned by low levels of (grade A) high quality scientific data. Most recommendations are empirical and based on best practice opinion (Wright et al. 2011; Prusova et al. 2014; Ghui et al. 2016).

In standard obstetrics textbooks (Murphy 2017) the factors that influence the success of vaginal birth are the '*Power, Passage and the Passenger*' otherwise known as the '3P's' (Lokugamage 2016). It may also possible to add a 4th 'P' involving the psychobiological status of the patient. Power relates to the propulsion of the baby through the birth canal and may be associated with female empowerment. Passage refers to the pelvic dimensions and muscles, which can be impaired by musculoskeletal pain. Passenger is associated with the size and presentation of the newborn. Acupuncture may influence all '4Ps' at different stages during pregnancy (Table 1).

Materials and methods

This paper was designed as an enhanced clinical audit with adjustment of typical confounders. We used NHS Health Research Authority (<http://www.hra-decisiontools.org.uk>) tool which deemed that ethics approval was not required for this analysis.

The Whittington maternity acupuncture service is a free NHS service and women are made aware of it through hospital staff, other patients and online information. Women self-refer to the service for birth preparation and receive weekly acupuncture sessions from 37 weeks of gestation.

The acupuncturists were a team from the Asanté Academy of Chinese Medicine, who were at that time part of the Middlesex University teaching structure for Traditional

Chinese Medicine. Acupuncture point prescriptions were tailored according to the Traditional Chinese Medicine principles.

The data were collected from over 6000 Whittington Maternity Service users between 2012 and 2014. The data were anonymised following an initial postcode analysis of deprivation. The main aim of the analysis was to compare the birth outcomes between women who had received acupuncture during pregnancy and those who had not, taking into account their baseline characteristics. Routine electronic prospective data was collected for the maternity service audit purposes and also for information for service commissioners and the analysis is based on this observational cohort data from the hospital's maternity electronic database.

Additionally, service user experience data was collected through the form of an annual non-validated questionnaire collecting patient feedback on the Maternity Acupuncture service from 2014 to 2016. This questionnaire was offered over a 2-month period every autumn to patients who have had four or more sessions in the clinic. This represents a sample of around 5–15% of the patient population, with both qualitative and quantitative data being collected to assess the quality of the patients' journey.

Statistical analysis

The first set of analyses compared the demographics of women receiving and not receiving acupuncture, hoping to uncover potential confounders (Table 2). The unpaired *t*-test was used to compare the age of the two groups, whilst the Chi-square test was used to compare the parity and deprivation of the two groups (Table 2).

The second and main set of analyses (Table 3) compared birth outcomes between the two groups. There were five outcome variables in the study. Two of these, induction and episiotomy, were binary outcomes (yes or no). Another two outcomes were ordinal in nature. The pain relief was categorised as one of four categories, these being, in order: none, gas/air, regional anaesthetic and general anaesthetic. The type of delivery was also considered an ordinal outcome, measured as one of three categories: normal vaginal delivery, use of instruments, and caesarean. The final outcome was the postnatal length of stay. This variable had a positively skewed distribution and thus was given a logarithmic transformation before analysis.

All of the analysis was performed using regression methods. Logistic regression was used for the two binary outcomes, ordinal logistic regression was used for the ordinal outcomes, whilst linear regression was used for the length of stay.

The difference between women receiving and not receiving acupuncture was examined in several analyses for each outcome. First, the difference between the groups was examined without factoring in any potentially confounding factors. Subsequently, the differences were adjusted for the various confounding factors. Adjustments were made, in turn, for age, parity and social deprivation for all of the outcomes. In addition, a further adjustment for induction was made for the delivery outcome, whilst both the episiotomy and length

Table 1. Acupuncture role in 'Power, Passage and the Passenger'.

Aspect of childbirth	Evidence	Reference
Power	Empowerment of women by reduction of anxiety in childbirth	Hodnett et al. (2013) Lokugamage (2013) Taylor et al. (2000)
	Contributes towards release of oxytocin	Uvnäs-Moberg et al. (1993) Zhang et al. (2012)
Passage	Beneficial in pelvic/back pain of pregnancy Use as a labour analgesia Reduction of the length of labour Promotion of cervical ripening	Liddle and Pennick (2015) Smith et al. (2011) Mucuk and Baser (2014) Smith et al. (2017) Gribel et al. (2011) Rabl et al. (2001)
Passenger	Resolving breech position of foetus to reduce caesarean births	Li et al. (2009) Van den Berg et al. (2008)

Table 2. Demographics.

Variable	Category	No acupuncture Mean (SD)	Acupuncture Mean (SD)	p Value
Age	–	30.9 (6.0)	33.8 (4.6)	<.001
Variable	Category	No Acupuncture N (%)	Acupuncture N (%)	P-value
Parity	0	2763 (48%)	426 (71%)	<.001
	1	1706 (30%)	148 (25%)	
	2	668 (12%)	24 (4%)	
	3+	595 (10%)	5 (1%)	
Deprivation	1st quintile (least deprived)	1080 (19%)	187 (31%)	<.001
	2nd quintile	1092 (19%)	160 (27%)	
	3rd quintile	1147 (20%)	124 (21%)	
	4th quintile	1179 (21%)	77 (13%)	
	5th quintile (most deprived)	1215 (22%)	5 (9%)	

The bold values represents statistically significant.

Table 3. Intrapartum and birth outcomes.

Outcome	Adjustments	Odds ratio (95% CI)	p Value
Intrapartum pain relief	Unadjusted	1.00 (0.86, 1.17)	.97
	Age only	0.96 (0.80, 1.09)	.40
	+ parity	0.74 (0.63, 0.87)	<.001
	+ deprivation	0.74 (0.63, 0.86)	<.001
Induction	Unadjusted	0.90 (0.74, 1.09)	.29
	Age only	0.81 (0.67, 0.98)	.04
	+ parity	0.75 (0.61, 0.91)	.004
	+ deprivation	0.74 (0.61, 0.91)	.004
Delivery (normal vs. surgical)	Unadjusted	1.08 (0.91, 1.26)	.38
	Age only	0.93 (0.79, 1.10)	.38
	+ parity	0.72 (0.60, 0.85)	<.001
	+ deprivation	0.71 (0.60, 0.84)	<.001
	+ induction	0.76 (0.64, 0.91)	.003
Episiotomy	Unadjusted	1.71 (1.41, 2.07)	<.001
	Age only	1.84 (1.51, 2.24)	<.001
	+ parity	1.18 (0.96, 1.45)	.11
	+ deprivation	1.18 (0.96, 1.45)	.12
	+ type of delivery	0.94 (0.70, 1.26)	.69
Outcome	Adjustments	Ratio (95% CI)	p Value
Postnatal length of stay	Unadjusted	0.91 (0.87, 0.96)	<.001
	Age only	0.90 (0.86, 0.95)	<.001
	+ parity	0.86 (0.82, 0.90)	<.001
	+ deprivation	0.86 (0.82, 0.90)	<.001
	+ type of delivery	0.91 (0.87, 0.95)	<.001

The bold values represents statistically significant.

of stay outcomes were additionally adjusted for the type of delivery.

Additional analyses examined the effect of social deprivation upon the induction and delivery outcomes. The non-

validated questionnaire data was reported without being subjected to further descriptive analysis (Table 4).

Results

Birth preparation

The first of the analyses (Table 2) examined the differences between the two groups in terms of their demographics, and the results have been summarised in Table 3. The figures presented for age are the mean and standard deviation, whilst for parity and deprivation the number and percentage in each group have been reported. The *p* values have been reported and statistical significance has been emphasized using bold text. The results indicated that there were highly significant differences between the women obtaining and not obtaining acupuncture for all three factors.

The mean age of women undergoing acupuncture was almost 34, compared to a mean age of almost 31 for the group not undergoing acupuncture. Over 70% of women receiving acupuncture were having their first baby, compared to only half of the non-acupuncture group. Over half of the acupuncture group came from the first two social quintiles.

Regression methods were used to examine the association of acupuncture upon various birth outcomes, and the results are summarised in Table 3. For the first four outcomes, the differences between acupuncture and non-acupuncture

Table 4. Service feedback data.

Question	Response	2014	2015	2016
Respondents		29	22	30
How did you feel acupuncture affected your health?	Greatly benefitted	83%	73%	77%
	Slightly benefitted	17%	18%	23%
	Made no difference	0%	9%	0%
	Made it worse	0%	0%	0%
How did acupuncture affect your wellbeing?	Helped a lot	83%	77%	77%
	Helped slightly	17%	18%	20%
	Made no difference	0%	5%	3%
	Made it worse	0%	0%	0%
How did the acupuncture service affect your journey/patient experience through your pregnancy at the Whittington?	Positively affected	97%	100%	100%
	Made no difference	3%	0%	0%
	Negatively affected	0%	0%	0%
Did the availability of maternity acupuncture influence your choice of hospital?	Yes	10%	23%	30%
	Indifferent	4%	36%	47%
	No	86%	41%	23%
Would the acupuncture service influence your choice of hospital in the future?	Yes	100%	95%	100%
	Indifferent	0%	5%	0%
	No	0%	0%	0%

The bold values represents statistically significant.

groups are reported in terms of odds ratios. For induction and episiotomy, these represent the odds of the outcome for women having acupuncture compared to those not having it. For pain relief and delivery, the odds ratios represent the odds of being in the next highest category with the use of acupuncture. For length of stay, the differences are presented in the form of ratios, indicating the length of stay in the acupuncture group relative to the length of stay for the non-acupuncture group. *p* Values have been reported and statistical significance has been emphasized with bold text.

The results have indicated that, once age, parity and deprivation and type of delivery (where appropriate) were adjusted for, there were significant differences between women who did and did not have acupuncture for all outcomes, with the exception of an episiotomy (Table 3).

The results for pain relief indicated that there was no unadjusted difference between the two groups, or when age was accounted for. However, after factoring in parity, the difference was statistically significant. The odds of progressing to the next form of pain relief for women who had acupuncture were three-quarters of that of women who did not have acupuncture.

After adjusting for age and further confounding factors, there was a statistically significant difference. The odds of induction were three-quarters of that of women who had acupuncture compared to those who had not had acupuncture. The delivery analyses also indicated a significant difference between groups after adjustments for the confounding factors. The odds of being the next highest delivery category were only three-quarters as large for women who had acupuncture. There were significant differences in postnatal length of stay between groups in all analyses. The women who received acupuncture stayed in hospital for 9% less time than women who did not undergo acupuncture.

Service feedback data

The data also took the form of comments which had a very positive theme throughout. To summarise, the pregnant

women were grateful for the availability of maternity acupuncture at Whittington Hospital and many highlighted the acupuncture service as one of the best parts of the maternity care they received. A surprising result was that the positive experience of this service will make them think more carefully about their future choice of hospital.

Together with the quantitative data, there is evidence to suggest that the acupuncture service enhances the patient journey for maternity service users (Table 4).

Discussion

This observational routine data suggests that birth preparation acupuncture in the third trimester may help to normalise birth by increasing the normal birth rate, reducing the requirement for additional pain relief and reducing the number of steps required in the induction of labour process. It seems that the women accessing this service are older, more nulliparous and more affluent, hence, the adjustment for these potential confounders. Women whose labour is induced may have a reduced chance of normal delivery compared with women who go into spontaneous labour (Zhao et al. 2017) – this is why the analysis of mode of delivery is adjusted for induction of labour in addition to the aforementioned potential confounders. Another possible confounder is that women who had acupuncture would have had some degree of continuity of care by the acupuncture team in their third trimester. This study has the flaws of all observational data, such as data entry error into the database and not being able to adjust for other unknown confounders, but we have adjusted for the main known factors. Similarly, the limitations of analysing routine hospital dataset data include unknown confounders, limitation of data coding and access to hospital datasets. Furthermore, large organisations such as the Health Technologies Assessment Unit, UK (Raftery et al. 2005) or the Royal College of Obstetricians and Gynaecologists (Royal College of Obstetricians and Gynaecologists 2019) use routine hospital data for assessing

trends and identifying areas worthy of further study with better experimental methods.

Our findings have identified that acupuncture may improve physiological birth rates so point to the need for better experimental epidemiological studies such as a randomised controlled trial (RCT) or prospective cohort study. However, it should be noted that there is a debate regarding complex interventions and the appropriateness of RCT design for acupuncture research. Smith *et al.* say that 'exploring new research methods, especially those which explore the woman's experience with acupuncture, are also key to defining a role in the future' (Smith and Dahlen 2009).

The approximate costs of birth based on the Health Resource Group HRG (NHS Improvement 2017) for patients with a complication and comorbidity score of 0 are: a normal birth is £1808; an assisted delivery with an epidural or induction is £2753; and an emergency caesarean is £4300. There is some evidence that maternity acupuncture is a cost-effective intervention for pelvic pain (Butel *et al.* 2016). Acupuncture may be safe and cost effective as an intervention due to its potential to improve physiological birth rates whilst also improving women's experience of pregnancy and childbirth. Any further evaluation of this area should include a health economic analysis.

Conclusion

We feel that the data that we have presented should be viewed with an understanding of the flaws of routine data but also that it points to clinical and physiological areas that could be further evaluated in research designs which are less vulnerable to error and bias, such as prospective studies. Considering potential physiological birth with birth preparation acupuncture in the third trimester may lead to cost savings and improve patient experience of childbirth.

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Disclosure statement

AL is on the Board of Directors of the International MotherBaby Childbirth and is a company director of a small publishing company called Docamali Ltd. SXX is the Principle of the Asante Academy of Chinese Medicine and a provider of acupuncture services to NHS organisations. VAIE, DP and TA have no declarations of interest.

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