



NEW ZEALAND
COLLEGE OF
MIDWIVES (INC)

JOURNAL

If we don't know where we came
from we won't know where to go!

Breastfeeding in New Zealand from
colonisation until the year 1980: An
historical review

Nutrition and Pregnancy Weight Gain
for Optimal Birth Outcomes

Auscultation - The Action of Listening

Comment on the Wax et al., (2010)
meta-analysis of home vs. hospital birth

JOURNAL 43
November 2010



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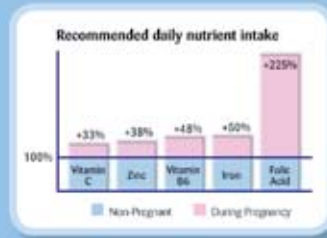
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Promote women's health issues as they relate to childbearing women and their families.
Promote the view of childbirth as a normal life event for the majority of women, and the midwifery profession's role in effecting this.
Provoke discussion of midwifery issues. Support the development and dissemination of New Zealand and international midwifery research.

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DESIGN AND PRODUCTION:

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The New Zealand College of Midwives Journal is the official publication of the New Zealand College of Midwives. Single copies are \$7.00
ISSN.00114-7870
Koru photograph by Ted Scott.
Views and opinions expressed in this Journal are not necessarily those of the New Zealand College of Midwives.

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If we don't know where we came from we won't know where to go!

Joan Skinner

It might be because I am just getting older but I have a new found fascination with history, a subject I couldn't bear at school, probably because I could never remember the dates. So now I'm enjoying finding out how things 'used to be' especially in reflecting on how we got to where we are. I have especially enjoyed reading Karen and Sally's book 'Women's Business' their account of the changes to midwifery in New Zealand over the last couple of decades.¹ Apart from the fact that it is a great read I also feel a bit nostalgic about the heady eighties and how we all learned to be aware, to be active, to work out what was important and to take some risks. Amazing to think that this generation of midwives had no experience of what things were like. One would hope that reading this story would raise awareness and help focus midwives on where to go. But perhaps you just had to be there and experience it. I hope not.

We have a couple of articles in this edition of the Journal which take an historical approach. We have Karen McBride-Henry and Jill Clendon reflecting on the history of breastfeeding in New Zealand and reminding us that authoritative knowledge on breastfeeding became, and still is, dominated by medical and scientific understandings with a wee glimmer of hope about the need to base our understandings firstly in the women's experience. Robyn Maude, Justine Lawson and Maralyn Foureur's article on the history of fetal auscultation is also a stark reminder of the unquestioned development of technology, this time in relation to listening to the fetal heart. We still have no real idea how best to do this or if listening regularly makes any difference at all. Meanwhile we spent decades strapping normal healthy childbearing women into beds attached to machines.

1. Guillard, K., Pairman, S. (2010) *Women's Business: The Story of The New Zealand College of Midwives 1986-2010* Christchurch, NZCOM.

So I often wonder what it is that we are doing now that women and midwives will look back in horror and say 'How could we have done that?' I know we now look back at the old 'enema, shower and shave' labour admission procedure with amazement. So what do you think we might be horrified at in 2030? I think (well I hope actually) that it will be with some horror on the part of midwives and childbearing women about going into a tertiary hospital to give birth. With any luck we will have much more sophisticated understandings and women centred environments. History can make us

new enthusiasm for birth and all that new energy to get up at night. (I really must be getting old!)

We have a practice article on nutrition in pregnancy in this edition, reminding us to attend to the nutritional needs of childbearing women. In protecting and promoting physiological birth it makes sense that we attend to physiology. We are what we eat. And lastly in this issue we have the first of what is going to be a new column for you; a section in which we will critique a piece of research. This strengthens the

I also feel a bit nostalgic about the heady eighties and how we all learned to be aware, to be active, to work out what was important and to take some risks

look at where we want to go and to see that real change is possible. So all you midwives and others who are looking at things historical, we would love to be able to share them in the Journal. We have a couple of good articles coming up in the next issue for you.

Talking of good articles I was very impressed by the calibre of presentations at the conference and would like to see submissions to the Journal from those midwife presenters. Thanks to all the hard work that went into organising the event. I think there was a great opportunity to be exposed to lots of new ideas and to be challenged about our way of thinking. I was especially moved, as I think we all were, by the number of students there; all that

Journal's research approach. Not only will we publish original research and research based commentary on clinical conditions, we now plan to include research critique which will add to our ability to understand how research works and to assess the useability of research. We welcome any articles that take this approach. So all you students of evidence based practice, and anyone else who wants to please help us. It would be great to see us growing this perspective. The research you comment on can be either a powerful driver for change or research that challenges how we are working.

Breastfeeding in New Zealand from colonisation until the year 1980: An historical review

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ABSTRACT

Understandings of breastfeeding have changed dramatically over the past one hundred and twenty years. This historical review of breastfeeding in New Zealand highlights how women prior to 1900 embraced their embodied knowledge about breastfeeding, and that this knowledge contributed to building communities where breastfeeding was practised as an art. However, as scientific knowledge, and the associated language that depicts and describes breastfeeding, gained prominence in the early twentieth century, women's embodied knowledge was silenced. The literature on this topic demonstrates how biomedical language about human lactation has held a privileged position over women's knowledge since. This review highlights how midwives, nurses and other health care practitioners need to examine taken-for-granted ways of working alongside breastfeeding women, and renew the focus on woman-centred ways of knowing and associated language.

KEYWORDS

Breastfeeding, history, colonisation, medicalisation, women's health.

INTRODUCTION

In this article, the history of how babies have been fed in New Zealand is explored from

pre-1900 to the 1980s. This historical review traces breastfeeding rates and the societal trends that influenced these across time. Prior to European colonisation in the nineteenth century, Maori history was primarily passed on through spoken word, and little has been written about the baby feeding practices of New Zealand's indigenous people (Apple, 1994; Kedgley, 1996). Therefore, this article focuses on the period from the late nineteenth century, approximately 1880, to the beginning of the twenty-first century, for which written history is available. The review demonstrates how women have had their embodied breastfeeding knowledge and associated language usurped by biomedical knowledge and its related language, essentially silencing the language that reflects women's embodied knowledge and experiences.

BREASTFEEDING PRACTICES IN NEW ZEALAND PRIOR TO THE YEAR 1900

Life in New Zealand prior to the late nineteenth century was pre-industrial, and English immigrants tried to establish lifestyles similar to those they had previously led. At that time in England, mothers were encouraged to follow the example of Queen Victoria and breastfeed their children, shouldering the responsibility of caring for them. Mothers who chose not to breastfeed were viewed as selfish (Yalom, 1997). These Victorian values informed the manner in which New Zealand immigrants viewed breastfeeding. There were no mass-produced commercial goods, and although artificial baby formula had been produced in Europe since the 1840s, and advertisements in New Zealand newspapers offered baby feeding bottles for sale from around the 1860s¹, artificial formula did not become available in Australia until the 1880s, and in New Zealand until the 1900s (Apple, 1994).

1. See for example advertisements for infant feeding bottles by 'Jonas Harrop, chemist and druggist' in various editions of the *Tuapeka Times* from 1868 and by 'F. Foster, Pharmaceutical Chemist' in various editions of the *Evening Post* from 1870. Both accessed 15 April, 2008 from <http://paperspast.natlib.govt.nz/cgi-bin/paperspast?a=p&p=home&e>

After birthing, women of European descent were typically encouraged to 'lie-in' to assist in the establishment of breastfeeding. Often a neighbour or midwife would assist the new mother during birthing and also by living-in with her for a few weeks, and it is reported that Maori women commonly assisted in teaching immigrants to become lay midwives (Kedgley, 1996). There was a clear sense of community responsibility for the nurturing of babies, and women's sphere of knowledge and expertise incorporated the art of infant feeding (ibid).

Unfortunately, another defining characteristic of the lives of New Zealand women in the late 1900s New Zealand was a relatively high infant mortality rate. In 1898, 19,000 babies of European descent were born in New Zealand. The death rate was 79 per 1000 live births prior to one year of age (Davidson, 1984). Although this rate was approximately half that of England, infant deaths would certainly have been very common by today's standards. Maori birth and mortality rates were not documented reliably until 1930 (ibid), although it has been estimated that the death rate was one in five babies before the age of one year, prior to European colonisation (Pool, 1991; Pool & Bedford, 1996). Most deaths, of both European and Maori babies, have been attributed to infectious diseases, in particular gastroenteritis resulting from inadequate sanitation (Davidson, 1984).

Towards the end of the nineteenth century the medical profession had taken the first steps towards medicalising infant health and feeding, in effect taking over part of the responsibility for overseeing the physical growth and nutrition of babies (Apple, 1994; Baumslag & Michels, 1995; Davidson, 1984). It was believed by many physicians that specialised knowledge of babies and infant feeding was required if the infant mortality rate was to be reduced (Apple, 1995; Baumslag & Michels, 1995; Ryan & Grace, 2001). This trend was illustrated with publication of the first book

addressing infant feeding, by Dr Saunders in 1892 (Davidson, 1984). Saunders strongly advocated for breastfeeding but suggested a recipe for artificial formula to be used in the event that a mother was unable to breastfeed and did not have access to a wet-nurse (ibid).

In England and the United States the medical fraternity and commercial manufacturers joined forces in the production and marketing of artificial formula (Baumslag & Michels, 1995). According to Baumslag and Michels (1995), their partnership was portrayed as intelligent men finally stepping in and helping comparatively uneducated women to raise healthy babies, which included how to best feed a baby. This value system began having an effect on New Zealand culture around the beginning of the twentieth century (Apple, 1994; Davidson, 1984).

1900-1920: BIOMEDICAL SCIENCE AND SURVEILLANCE

During the early twentieth century, New Zealand's infant mortality rate continued to concern government officials, which in part led to the founding of the Department of Health (Dow, 1999). The estimated mortality rate for European babies was between 62 and 100 per 1000 live births during the first decade of the twentieth century (Davidson, 1984; Dow, 1999). During the same period, it has been suggested that approximately half of all Maori babies died within their first year of life, which is described as a substantial increase over the estimated pre-colonisation mortality rate, although no statistics were actually recorded (Dow, 1999). At that time, it was noted that babies fed on artificial formula were more likely to succumb to illness than breastfed babies; therefore, doctors advocated once again for breastfeeding, while ardently debating the best formula for producing an artificial milk (Beckman, 1977; Davidson, 1984). Doctors began monitoring babies through regular surveillance in their medical clinics, prescribing particular baby-care regimes, including advice, if a mother was not breastfeeding, on formula mixtures (Davidson, 1984).

At approximately the same time Dr Truby King (medical superintendent of Seacliff Mental Hospital) was ardently studying science-based farming methods. The application of scientific methods to animal farming produced impressive results, and Dr King took a particular interest in dairy farming and milk production. This work profoundly influenced his views of baby health and feeding, and he began a publicity campaign that focused on educating parents

about baby health. To prove his claims, he cared for sickly babies in his own home, demonstrating that unwell children could survive on 'humanised' cows' milk (Davidson, 1984; Kedgley, 1996).

In 1907 King founded The Royal New Zealand Society for the Health of Women and Children, now commonly known as the Plunket Society after the Society's patroness, Lady Plunket. The organisation opened hospitals dedicated to caring for sick and premature babies, and training mothers in childcare. The Plunket Society also commissioned nurses to visit the homes of new mothers to monitor baby growth and development. Plunket nurses provided instruction on 'mother-craft', which attended to baby nutrition and regimens for both breastfed and formula-fed babies. For example, babies were to be fed at four-hourly intervals with no more than five feeds per day, and overnight feeding was expressly prohibited, a protocol that stemmed from King's research into dairy farming.

difficult for breastfeeding mothers to follow, and often resulted in weaning to artificial formula to adhere to the required schedule – resulting in a decline in breastfeeding rates over this period (Clendon, 2009). Despite the negative effect on breastfeeding, the mortality rate for babies of European descent did drop significantly following the Plunket Society's formation: the death rate fell from 73 deaths per 1000 live births in 1907 to 48 deaths per 1000 live births in 1917 (Apple, 1994; Davidson, 1984). However, it has been suggested that this was due primarily to improvements in sanitation and the end of the influenza epidemic in 1907 (Kedgley, 1996; Mein-Smith, 1997).

Because they lived primarily in rural areas, Maori babies fell outside the Plunket Society's sphere of influence, which was essentially urban (Davidson, 1984). No Maori births or deaths were registered until after 1920, which effectively made the plight of Maori babies invisible (Pool, 1991). However, it has been estimated that, prior to 1920,

The medical fraternity and commercial manufacturers joined forces in the production and marketing of artificial formula

These rules remained in place for 40 years, mirroring King's belief in a standardised, scientific approach to baby feeding (Apple, 1994; Clendon, 2009; Davidson, 1984; Kedgley, 1996).

Women's initial breastfeeding practices were also influenced by the formal registration of midwives in New Zealand in 1904, which coincided with the opening of the country's first maternity hospitals. The first of the St Helens Hospitals opened in Dunedin in 1905, and had a significant influence on midwifery education (Mein Smith, 1986). Registered midwives commonly advised new mothers on breastfeeding during the initial postpartum period, encouraging women to demand-feed their babies and suggesting special diets intended to increase milk supply (Kedgley, 1996). However, after this initial period, Plunket nurses assumed the task of advising women on issues such as baby feeding.

Plunket nurses based their baby feeding advice on a perceived need for strict scheduling of baby care. This approach was

approximately half of the Maori population was wiped out, and that approximately half of all Maori children died before the age of four (Davidson, 1984; Lange, 1999; Pool, 1991). The majority of the deaths during this period of time have been attributed to infectious diseases such as tuberculosis, but also malnutrition, and birthing difficulties (Dow, 1999; Durie, 2001; Lange, 1999; Pool, 1991; Ramsden, 2001). However, it was a widely held belief among European settlers that the high baby mortality rate amongst Maori was the result of parental ignorance and incompetence (Dow, 1999).

As noted above, by 1917 the mortality rate for European babies had fallen to 48 per 1000 live births; in contrast, by the 1920s, the mortality rate for Maori ranged between 107 and 160 per 1000 live births (Dow, 1999; Pool, 1991). Although these figures represent an improvement in the plight of Maori babies, they highlighted the continuing disparity between the health of Maori babies and those of European descent.

The emergence of the suffrage movement in the late nineteenth century, meant that New Zealand women had become increasingly politically active, lobbying not just for the right to vote but also to achieve autonomy as both citizens and women. As a result of this new-found sense of self-determination baby feeding practices were influenced because it became unfashionable for middle-class women to breastfeed during this period; mothers who chose not to breastfeed were expressing their personal right to freedom (Kedgley, 1996). Therefore, a language of freedom was introduced to baby-feeding practices.

The overarching message of the early decades of the twentieth century was that success at raising and feeding healthy babies required specialty language and knowledge that was the domain of health care professionals, whether they were registered midwives, doctors or Plunket nurses. In effect, women had lost some of their control over childcare, as their knowledge was no longer valued in relation to either child rearing or baby feeding (Beckman, 1977; Davidson, 1984; Kedgley, 1996; Ryan & Grace, 2001).

1920-1950: THE DEVELOPMENT OF A BIOMEDICAL BABY FEEDING LANGUAGE

The use of artificial formula became widely accepted during the 1920s in New Zealand; however, many women continued to breastfeed. The acceptance of artificial formula assisted the development of a formula industry in New Zealand, and in 1927 the Karitane Products Society was formed. The organisation embraced the term 'humanised milk' as an aid in marketing the formula developed by King, which proved to be an effective means of portraying formula as an acceptable substitute for breastmilk (Davidson, 1984). Proceeds from this company were used to support The Royal New Zealand Society for the Health of Women and Children (Davidson, 1984).

During the 1920s a dramatic shift in birthing practices took place. The perceived need on the part of medical practitioners to remove contamination from childbirth, as a means of reducing mortality rates for both babies and mothers, led to a rapid increase in the number of births occurring in hospitals (Kedgley, 1996; Mein Smith, 1986). In 1927 60 percent of births in New Zealand took place in a maternity hospital; by 1936, this rate had increased to over 80 percent (Apple, 1994). During a woman's fourteen-day stay in the maternity hospital, feeding regimes were highly structured, which significantly

influenced breastfeeding initiation. Women were allowed only limited access to their babies, feeding times were restricted, night feeds were prohibited, and babies were weighed after feeds to assess the amount consumed (Apple, 1994; Kedgley, 1996). This extraordinary shift to birthing in maternity hospitals contributed to the creation of birthing, mother care, and baby feeding as medicalised practices (Ryan & Grace, 2001). Furthermore, once a mother and child were discharged home, a Plunket nurse would take over the monitoring and instruction of the new mother, reinforcing the notion that women were incapable of caring for their babies without professional assistance (Apple, 1995; Kedgley, 1996). Therefore, the re-conceptualisation of motherhood and breastfeeding as medicalised scientific practices was solidified during this era (Ryan & Grace, 2001).

The 1930s also saw serious debate about the composition of artificial formula. A number of medical practitioners critiqued King's recommended formula, claiming it contributed to anaemia and other vitamin deficiencies (Davidson, 1984). However, by the 1940s the medical community had accepted that all artificial formula was of equal nutritional value to breastmilk (Ryan & Grace, 2001). A number of justifications for the use of formula rather than breastmilk were suggested during this era, including inadequate nutritional status for breastmilk, having fair skin, flat nipples, or a chronic illness. Babies also came under scrutiny in relation to their ability to breastfeed. At that time it was recommended that babies who were either large or small, had jaundice, or had a physical defect, should not be breastfed (ibid). Meanwhile, pressure from health care professionals for mothers to adhere to strict routines for both bottle-fed and breastfed babies also continued (Dignam, 2001).

Events of the 1940s had a significant influence on the role of women within the community. During the Second World War many men left New Zealand to fight in Europe or the South Pacific, leaving women to carry on much of the essential work outside of the home. During the period from 1940 to 1945 no breastfeeding statistics were kept; however, it has been suggested that approximately 70% of women initiated breastfeeding, with 44% of babies still being breastfed at three months and 21% at six months (Deem, 1945-1946, as cited in Davidson, 1984).

In relation to baby feeding, the 1940s were characterised by women's compliance with the mandates of the scientific and medical

discourses (Ryan & Grace, 2001). Ryan (1999) describes how women embraced a 'not for me' stance in relation to breastfeeding; breastfeeding was perceived as untenable because of potential difficulties and breastmilk's questionable quality. It has also been documented that when women were attempting to initiate breastfeeding, both they and their babies were handled roughly by midwifery and nursing staff, further discouraging women to breastfeed (Kedgley, 1996).

This ubiquitous ownership of baby feeding practices by health care professionals continued throughout the 1950s and into the 1960s; biomedical-language dominated descriptions of baby-rearing practices, and descriptions languaging women's opinions and experiences are noticeably absent (Apple, 1994; Clendon, 2009; Davidson, 1984; Dignam, 2001; Kedgley, 1996; Ryan & Grace, 2001). Ryan and Grace (2001) described the scientific, technological, and medical establishments' influence over baby feeding practices from the 1920s to the 1950s in the following manner: "It is difficult to illustrate the dominance of this knowledge source because it is so taken-for-granted, all-pervasive, and incorporated into every day understandings and language" (p. 492).

1950-1980: RESISTANCE TO MEDICAL LANGUAGING

In 1952, a group of women concerned about their birthing experiences in hospitals formed the Parents' Centre to facilitate antenatal education for women. The women involved with Parents' Centre were politically active, lobbying for women's rights during childbirth and actively encouraging women's unrestricted access to their newborn babies (Kedgley, 1996). Parents' Centre became a place where women could meet and discuss their experiences with birthing and mothering. Women were encouraged to listen to their instincts when caring for their babies and the use of strict routines was challenged as it prevented women from responding to their baby's psychological needs (Clendon, 2009; Kedgley, 1996). The establishment of community networks, such as the Parents' Centre, foreshadowed a major change in the way that women valued their own knowledge, which ultimately led to the feminist movement of the 1960s. Women's ways of knowing became valued in this setting, and they began to question the language used by the health care professionals that described breastfeeding as a solely biomedical phenomenon. A shift in the ideology of baby feeding was thus initiated by feminists, and the associated feminist movement birthed a language that described breastfeeding as an

art (Carter, 1995; Clendon, 2009; Ryan & Grace, 2001; Vares, 1992).

Despite changing perceptions amongst women, only 47 percent of babies were breastfed by the end of the 1960s (Davidson, 1984), as opposed to the 87 percent breastfed during the 1920s (Royal New Zealand Plunket Society, 1995). The drop in breastfeeding rates has been attributed in part to the practices of health care professionals in relation to baby feeding (Kedgley, 1996), as discussed in the previous section. However, during this era, Western societies viewed the breast as a sexual item rather than a functional part of a woman, which influenced perceptions of breastfeeding (Carter, 1995; Yalom, 1997). As a result, women felt embarrassed to 'expose' their breasts whilst breastfeeding, effectively relegating breastfeeding to the private sphere. Breastfeeding was, therefore, viewed as a perverse, indecent practice. These socially-prescribed understandings effectively left women who chose to breastfeed their babies isolated from public places (Kedgley, 1996).

The breastfeeding support group La Leche League emerged during the mid-1960s in the United States, and shortly thereafter in New Zealand, with the express purpose of supporting and valuing women's knowledge of breastfeeding and baby care (Gordon, 1998; Kedgley, 1996). The women involved in La Leche League groups were vehement in their desire to re-position breastfeeding expertise within the realm of women's knowledge rather than that of health care professionals (Gordon, 1998). They believed that a mother had the right to actively participate in breastfeeding at birth, have unlimited access to her baby whilst in hospital, and that breastmilk was the best source of nutrition during the baby's first six months of life (Gordon, 1998).

The La Leche League were considered to be radical by health care professionals, as their ideas were completely contrary to the existing hospital practices of restricted access and regimented scheduling of baby feeding (Apple, 1994; Gordon, 1998; Kedgley, 1996). Conversely, La Leche League's positioning can be considered a re-discovering of embodied womanly language that describes the art of breastfeeding. La Leche League's success is reported to have stemmed from the organisation's foundational belief that women who are mothers are the experts in breastfeeding (Palmer, 1993).

La Leche League groups grew rapidly in New Zealand, especially during the 1970s. The League has been interpreted as primarily a white middle-class organisation; however, it

has been noted that the rise in the number of women choosing to breastfeed during the 1970s and 1980s mirrored the growth of the number of La Leche League groups (Gordon, 1998), suggesting their influence assisted a general change in attitude. Because of the work of organisations, such as the League, during the 1970s, women began to oppose the notion of strict baby routines, focusing instead on responsive mothering of babies (Ryan & Grace, 2001).

The resurgence of women-centred knowledge of breastfeeding freed women to make informed choices about whether or not to breastfeed their babies. During this decade, increasing numbers of women were initiating breastfeeding, and continuing to feed their babies for longer periods (Ford, Wild, Mitchell, & Tuohy, 1995; Msuya, Harding, Robinson, & McKenzie-Parnell, 1990; Royal New Zealand Plunket Society, 1995).

Ryan and Grace (2001, p. 493) describe how, during this era, women created a language about breastfeeding that included scientific-sounding depictions of breastfeeding, such as "infant-led feeding" and a baby being "positioned at the breast". This re-framing of breastfeeding assisted women to once again normalise breastfeeding. Health care professionals adopted this new breastfeeding language, incorporating it into research studies that supported what women had been asserting about the beneficial nature of breastfeeding (Ryan, 1999), and as such women played a role by developing their own discourse for breastfeeding. As a result, the catch phrase 'breast is best' became popular during the 1970s as research results supporting the superiority of breastmilk began to emerge (Anyon, 1976; Fergusson, Horwood, Shannon, & Taylor, 1978; Hood, Faed, Silva, & Buckfield, 1978; Kedgley, 1996; Kerr, 1981; Roberts, 1980; Ryan & Grace, 2001).

THE 1980S: BIOMEDICAL LANGUAGE AND RESEARCH

The research conducted during the 1970s clearly demonstrated the superiority of women's milk and breastfeeding, over bottle feeding with artificial milk. This research, coupled with the normalisation of breastfeeding, had a positive impact on breastfeeding rates, which continued to rise in the 1980s, with 78 percent of babies still being at least partially breastfed at three months of age (Ford et al., 1995; Royal New Zealand Plunket Society, 1995). This trend has been attributed to societal influences such as the positive portrayal of breastfeeding by the media, health care professionals ceasing to actively promote artificial formula, and

the activities of breastfeeding support groups (Msuya et al., 1990). However, breastfeeding rates had plateaued by the end of the decade (ibid).

During the 1980s, a number of New Zealand researchers addressed issues surrounding baby feeding (Davis, 1989; Flight & Adam, 1986; Ford, Schluter, & Wild, 1996; Gunn, 1984; Msuya et al., 1990; Perry & Trlin, 1985; Trlin & Perry, 1982), focusing primarily on the demographic trends of baby feeding. Their results created a new language around breastfeeding by highlighting many factors that influenced breastfeeding and bottle feeding rates, such as socio-demographic influences (Davies, 1989; Flight & Adam, 1986), ethnicity (Flight & Adam, 1986; Gunn, 1984; Perry & Trlin, 1985), health care professionals (Davies, 1989; Gunn, 1984; Trlin & Perry, 1982), insufficient milk due to complementary feeding practices (Davies, 1989; Gunn, 1984), and the availability of support for breastfeeding women (Flight & Adam, 1986; Gunn, 1984; Perry & Trlin, 1985; Trlin & Perry, 1982). It is interesting to note that the recommendations from the authors of these studies focused primarily on the role of the health care professional in increasing breastfeeding rates. However, a few studies acknowledge the role that social networks, including family members and La Leche League, had on women's breastfeeding success (Davies, 1989; Trlin & Perry, 1982).

DISCUSSION

This review highlights that the creation of breastfeeding "language" occurs over time, and has a significant impact on how breastfeeding is understood, and therefore, enacted. Furthermore, we have demonstrated that historically government-supported breastfeeding strategies have been based on biomedical research, often at the expense of the lived experiences of breastfeeding women. This review has highlighted that improving our understanding of the experience of breastfeeding may lead to strategies that work for women, rather than broad population-based strategies into which women must fit to receive support from well-meaning government officials and health care professionals. This is especially true for women of minority cultures whose needs may differ considerably from those of the prevailing majority.

History has demonstrated that health care professionals have essentially established and owned the language that describes both breastfeeding and breastfeeding success. The manner in which breastfeeding is articulated holds sway over how breastfeeding as a

concept is understood, and significantly influences how policies at both national and international levels are developed. For example, we understand standardised measurements for breastfeeding duration because it is externally defined by health researchers (Labbok & Krasovec, 1990). However, frequently the language that exists around breastfeeding is confined by boundaries set up by those external to an individual breastfeeding dyad. As a result, this language may dismiss women's understandings and individual definitions that characterise breastfeeding success.

It can, therefore, be argued that the language that contributes to the construction of breastfeeding is a language of exclusion, because it essentially ignores the language that describes the lived experience of breastfeeding. It is paramount that a language that accommodates women's experience of breastfeeding emerges, as this would facilitate meaningful understandings of the lived experience of breastfeeding women. There is also a need to embrace women's individual definitions of breastfeeding success, which will be influenced by historical narratives. If this is not achieved, breastfeeding goals and definitions of success will continue to be confined to arbitrary categories that only meet the needs of policy makers.

Well-meaning midwives, nurses and other health care professionals may be aware of the Ten Steps, but unless they have the insight and ability to meld them with women's needs and current research, breastfeeding statistics will not improve. Midwives, nurses and other health care professionals need to speak a language that reflects an understanding of the breastfeeding experience, not a language that simply reflects policy. There is a need to learn a language that can accommodate experiential knowledge and lifeworld-based research, as well as biomedical research. Only when research and experience become fused in a language that accommodates both forms of knowledge will breastfeeding be positively enhanced, promoted, and supported. A woman's reactions to the community environment, her body, and her baby have more bearing on her desire to continue breastfeeding than any policy, no matter what the source (McBride-Henry, 2004).

CONCLUSION

Prior to 1900, women owned and shared breastfeeding knowledge, thereby supporting one another to breastfeed. As biomedical knowledge of human lactation emerged as the dominant narrative or language, and artificially-contrived replacements were

proposed, women's knowledge of breastfeeding was usurped. Breastfeeding was re-interpreted as a purely biological act, leaving behind generations of women's knowledge that defined breastfeeding as an art.

Research has focused on biomedical understandings of breastfeeding, and this has formed the basis for international, as well as national, strategies to enhance, support and promote breastfeeding. Little has changed over the past 20 years. Despite accreditation of the majority of New Zealand's maternity units as Baby Friendly Accredited Hospitals, breastfeeding rates have not improved since 1998 (New Zealand Breastfeeding Authority 2009). A woman's personal experience of breastfeeding her baby will hold critical and meaningful sway over her decision to continue to breastfeed, regardless of external policy or strategy. And it is her experience that will dictate whether or not she will exclusively breastfeed her baby for the first six months of his or her life and beyond.

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Accepted for publication August 2010

McBride-Henry, K. & Clendon, J. (2010) Breastfeeding in New Zealand from colonisation until the year 1980: An historical review *New Zealand College of Midwives Journal* 43, 5-9.

Nutrition and Pregnancy Weight Gain for Optimal Birth Outcomes

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ABSTRACT

The importance of healthy nutrition in pregnancy and pregnancy-related weight gain is well-established, but many women may not be aware of the impact their nutritional status can have on the outcome of their pregnancy. Poorly nourished women can experience illnesses and complications of pregnancy and labour. Inadequate nutrition in pregnancy can compromise fetal growth resulting in intrauterine growth restriction and low birth weight babies. Gaining more or less than the recommended weight in pregnancy can have consequences on both mother and baby with the incidence of pregnancy complications being higher at the upper and lower extremes of weight gain. This article examines the effects of good nutrition and pregnancy weight gain on achieving optimal pregnancy outcomes, and the midwife's responsibility in assisting her client to strive for a healthy pregnancy and successful birth outcome.

KEY WORDS:

Nutrition, weight gain, pregnancy, birth outcomes.

INTRODUCTION

It is widely accepted among health professionals, lay-people and pregnant women themselves, that maternal nutritional status has an important role to play in a healthy pregnancy, and on determining the pregnancy outcome (Kramer, 1998). However, whilst it is clear that antenatal nutrition impacts on short- and long-term health, there are still many scientific questions surrounding the subject. This paper discusses the importance of healthy nutrition and pregnancy-related weight gain, how poor nutritional status can lead to complications for mother and baby, and the role of the midwife in

giving specific nutritional recommendations on how to achieve a healthy pregnancy outcome.

Pregnancy as a life event has always been associated with a gamut of 'old wives' tales', and in particular on the subject of food. Women were told that, for example, sour or acidic foods would ensure they had a baby with a 'sour' disposition but that eating ripe fruits would soothe their unborn child. Many of these myths originated due to a lack of understanding of the nutritional process and how the physiologic changes of pregnancy affect a pregnant woman's nutrient needs. Good nutrition supplies the energy and nutrients for the increasing blood supply, the enlarging placenta, the developing fetus, as well as increases in maternal tissues (Johnston, 1990). As midwives we can provide women with accurate and specific information on how to obtain the nutrients they require for an optimal pregnancy outcome.

According to Kaiser and Allen (2008) among the key elements to a healthy pregnancy are appropriate weight gain; appropriate physical activity; consumption of a variety of foods in appropriate amounts to allow adequate, but not excessive, maternal weight gain; appropriate vitamin and mineral supplementation; avoidance of alcohol, tobacco and other harmful substances; and safe food handling. In general, women who typically eat three meals daily consisting of several servings of vegetables, fruits, whole grains, low fat dairy products, and a few sources of protein are likely to have adequate nutrition. Unfortunately, many women do not follow healthy nutrition plans before or during pregnancy and this can lead to a nutritional intake that does not meet caloric, vitamin or mineral requirements (Vause, Martz, Richard & Gramlich, 2006). As leading health professionals involved in maternity care, midwives need to ensure that they provide their clients with evidence-based information on the affects of appropriate nutrition and weight gain in pregnancy, and also provide them with specific tools and information on how to obtain the nutrients they require for optimal outcomes.

The Ministry of Health (MOH) have produced guidelines giving recommendations for healthy pregnant women based on nutrient reference values (NRVs) for Australia and New

Zealand (MOH, 2008). They describe four food groups, advise on the number of servings per group, together with an indication of the nutrients supplied by the foods (Table 1). Protein requirements increase in pregnancy to support maternal tissue synthesis and fetal growth, with the fetal/placental unit consuming approximately 1 kg of protein. According to the Institute of Medicine (2006) pregnant women are advised to consume 1.1 g/kg/day of protein and should eat at least two servings of lean meat, poultry, seafood, eggs, nuts and seeds or legumes per day. Low protein diets are associated with adverse outcomes of pregnancy. Protein intakes of less than 75g per day have been associated with low birthweight and birth length (Institute of Medicine, 2002). Carbohydrates make up the largest energy source and are important in pregnancy to ensure adequate glucose for maternal brain metabolism and for the fetus (MOH, 2008). Pregnant women in New Zealand are likely to meet requirements for carbohydrate and dietary fibre without specifically increasing their intake from foods such as bread, vegetables, potatoes, kumara and breakfast cereals.

| Food Group | Nutrients | Amount advised p/day |
|--|--|---|
| Fruit & Veg | Carbs, Fibre, VitA,C, folate, magnesium, potassium | 1 potato, 1 tomato, 1 cup veg, 2 fruit, |
| Breads & Cereals | Protein, Carbs, Fibre, VitB,E, magnesium calcium, zinc, iron, selenium. | 6 servings eg. bread, muffin, porridge, pasta, rice. |
| Milk / Milk products | Protein, Fats, Vits B12,A,D, calcium, phosphorus, zinc, iodine. | 3 servings, eg. milk, yoghurt, cheese, ice cream. |
| Meat/Eggs/ Poultry/ Nuts&Seeds. | Protein, Fats, Carbs, VitB12, niacin, iron, thiamin, zinc, mag, copper, potassium, phosphorus, selenium, iodine. | 2 servings eg. 1 egg, 2 slices meat, fish, 1 chicken leg. |

Table 1: Food and Nutrition Guidelines for Healthy Pregnant and Breastfeeding Women (Adapted from Ministry of Health, 2008.)

The increase in maternal blood supply greatly increases iron demands, important for both fetal and placental development, and means that a woman requires an extra 700-800mg of iron over the course of her pregnancy (Fagen, 2000). Some excellent sources of iron include beef, chicken, fish and lentils but it can be difficult to meet iron requirements through diet alone, and a supplement is often required. Although most studies agree that iron supplementation significantly decreases the prevalence of maternal anaemia at delivery it is less clear whether iron supplementation in well-nourished pregnant women improves birth outcome (Pena-Rosas & Viteri, 2006). Iron-deficiency anaemia has been linked to low pregnancy weight gain, premature delivery and low birth weight (Vause, Martz, Richard & Gramlich, 2006). Adequate amounts of folic acid can also be difficult to achieve through diet alone, though natural sources of folate can be found in legumes, leafy green vegetables, citrus fruits, juices and whole wheat bread. A deficiency can lead to neural tube defects and women are advised to consume 400ug per day for one month prior to conception and for the first two to three months to ensure that vitamin levels are adequate at the time of neural tube closure (Wolf, Witkop, Miller & Sayed, 2009). In addition to initial folic acid supplementation, pregnant women should have a nutritional increase of 100ug/day throughout their pregnancy to help prevent megaloblastic anaemia (Williamson, 2006).

Calcium is required during pregnancy to help maintain the mother's bone integrity as well as for the skeletal development of the fetus and the production of breast milk. The recommended amount of calcium for pregnant women aged 19 years and over is 1000 mg per day, and for women aged 14-18 years it is 1300 mg per day and can be sourced from milk, cheese, bread, nuts, canned fish with bones, green leafy vegetables and dried fruit (Goulding, 2002). Adequate intake of calcium may be protective against hypertensive disorders in pregnancy (MOH, 2008). Other essential nutrients whose requirements are slightly increased during pregnancy include selenium, zinc and magnesium and essential fatty acids. Zinc deficiency in pregnancy is associated with an increased risk of congenital abnormality, low birthweight and other complications such as impaired development and premature birth (Velie et. al., 1999; Keen et. al., 2003). The main sources of zinc are beef, veal, bread, milk, vegetables, grains and pasta. The requirements of essential fatty acids (EFA) are increased during pregnancy to meet the needs of the growing fetus, especially in the third trimester, and are important for fetal neurological and visual development. A pregnant woman who is well advised and follows nutrition

recommendations from the four food groups should meet the requirements of these essential nutrients from their diet alone.

Maternal weight gain, which strongly influences birth weight has its basis in the mother's nutritional status. According to the Ministry of Health (2008) energy requirements increase in pregnancy by about 12% and are higher in later pregnancy. Where there is lower energy intake the pregnancy may still be sustained due to the body's ability to adapt and compensate. However in under-nourished women her nutrient needs are prioritised and can therefore compromise fetal growth (Wallace, Bourke, Da Silva & Aitkin, 2001). Over 17 million infants are born annually with low birth weight (LBW), with poor maternal nutrition being cited as a principal cause as well as being responsible for intrauterine growth retardation (Shannon, Mahmud, Asfia & Ali, 2008). According to these authors poor nutrition during pregnancy not only leads to high maternal morbidity and mortality, but also results in high perinatal, infant and child mortality rates. In their study of pregnant women in rural Bangladesh where maternal malnutrition and levels of low birth weight are amongst the highest in the world, half of all women are classified as underweight.

Najman, and Lawlor (2009) birth weight has a major impact on neonatal morbidity and mortality. Schieve et al. (2000) found that women with low or average pre-pregnancy weights who gained minimal weight in pregnancy were at increased risk for delivery before 37 weeks. Preterm birth rates were much higher in women with low pre-pregnancy BMI and low maternal weight gain, and even women with a high pre-pregnancy BMI and low or average weight gain still had increased rates of pre-term birth. This demonstrates that even women with a high pre-pregnancy BMI need to gain an appropriate amount of weight during their pregnancy.

The incidence of pregnancy complications is higher at the upper and lower extremes of weight gain. Although the importance of weight gain is well-established, more than 50% of women gain too little or too much weight during pregnancy (Tse & Macones, 2010). In 2009 the Institute of Medicine revised their recommendations for weight gain in pregnancy and adopted the World Health Organisation's criteria for defining weight categories, recommending that all women try to be within the normal BMI range when they conceive. The Ministry of Health (2008) uses slightly

Poor nutrition during pregnancy not only leads to high maternal morbidity and mortality, but also results in high perinatal, infant and child mortality rates

Almost all women reported experiencing at least one illness episode during pregnancy, and many experienced multiple illness episodes. Common complaints were chronic tiredness/generalised weakness, reproductive tract infections, hypertension, diarrhoea, lower abdominal pain, iron deficiency anaemia and generalised anaemia.

During the 'Dutch Hunger Winter' in 1944-5 in the Netherlands, caloric intake dropped to 450 cal/day and in 1947 pregnancies that occurred during this period were noted to have an average birth weight that was decreased by approximately 250g (Cunningham et al., 2001). Gaining less weight than recommended during pregnancy can have many consequences on both mother and baby, and an average gain of less than 9 kg has been associated with increased numbers of preterm birth and small for gestational age (SGA) infants. According to Mamun, O'Callaghan, Callaway, Williams,

different cut off points for BMI categories (Table 2).

| BMI | RECOMMENDED TOTAL WEIGHT GAIN |
|--------------------|-------------------------------|
| Low < 19.8 | 12.5 - 18.0 kg |
| Normal 19.8 - 26.0 | 11.5 - 16.0 |
| High 26.0 - 29.0 | 7.0 - 11.0 |
| Obese > 29.0 | 6.0 |

Table 2: Weight gain recommendations in pregnancy (Ministry of Health, 2008.)

In their study looking at the influence of gestational weight gain on pregnancy outcomes Viswanthan et al., (2008) found that there was evidence of increased risk of caesarean delivery with increasing weight gain and a consistent effect of low gestational weight on preterm birth. There was strong evidence of an association between gestation weight and birth

weight and of high gestational weight being associated with greater risks of macrosomia. There was also strong evidence that low gestational weight gain is associated with greater risks of having a small for gestational age infant.

The optimum amount of weight gain for overweight/obese women is debated. However, obesity during pregnancy is associated with numerous maternal and perinatal risks, including intrapartum risks. Evidence suggests that obese women have longer labours, that induction of labour is more common, that vaginal birth following caesarean birth is less successful in obese women and that obesity increases the probability of both elective and emergency caesarean section rates (Davies, Maxwell & McLeod, 2010). These women are also at greater risk of intrapartum complications related to macrosomia such as shoulder dystocia, malpresentation, haemorrhage and 4th degree perineal laceration. Maternal obesity has also been associated with neonatal death, largely from pregnancy complications or disorders leading to preterm birth (Chen, Feresu, Fernandez & Rogan, 2009).

Considering the many ways in which nutrition and gestational weight gain can impact on both maternal and fetal health in the long and short term, as well as the affects on the birth outcome, the question should be asked if enough emphasis is placed on this in the course of antenatal assessment and care. According to Vause, Martz, Richard and Gramlich (2006) many women who are seen pre-conception or during early pregnancy are given little or no nutritional guidance, with healthcare providers simply telling women to eat a healthy diet and gain appropriate weight during pregnancy without guidance as to how to achieve this. As midwives we need to have better screening tools in place, for example a self-administered questionnaire prior to our booking interview to review a woman's typical diet (ACOG, 1996), followed by a more stringent nutritional history taking. The physical examination should screen for signs of nutritional and vitamin deficiency as well as assessment of the BMI and discussion and guidance on optimal weight gestational weight gain. Any history of eating disorders, diseases (e.g. Crohn's), special diets (e.g. vegan) or anything that could pose nutrition-related health risks to the woman and her fetus, should have multi-disciplinary involvement, in particular with a dietitian, for specialist advice. The midwife's discussion should address substance abuse, which can affect achieving a balanced diet, use of vitamin, mineral or herbal supplements, food-borne illnesses and safe food handling. It may also be necessary to examine a woman's ability to access food resources to achieve a healthy diet. An investigation by Boland and Gibbons (2009) into the cost of

healthy eating for pregnant women found that the guidelines by the Ministry of Health (2008) may not be realistic or affordable for many New Zealand women in this economic climate. It suggests that midwives may need to 'be creative' in their advice for more cost effective nutritional recommendations where there are resource limitations.

Midwives have a responsibility to ensure they have good knowledge of pregnancy-related nutrition, gestational weight gain and their potential impact on both mother and baby. Armed with this knowledge and using skills of screening and education they can help their clients have a better understanding of how to achieve a healthy pregnancy, successful birth outcome and, perhaps even improved long-term health for themselves, their babies and their families.

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Accepted for publication October 2010

Payne, J. (2010) Nutrition and Pregnancy Weight Gain for Optimal Birth Outcomes. *New Zealand College of Midwives Journal* 43, 10-12.

Auscultation – The Action of Listening

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Reprinted with permission from the editor of Birthspirit Midwifery Journal Maude R, Lawson J & Foureur M. (2010) Auscultation – The Action of Listening. Birthspirit Midwifery Journal, Issue 5, 9-17

BACKGROUND AND INTRODUCTION

Intermittent auscultation (IA) of the fetal heart during labour is the recommended monitoring modality for well women with uncomplicated pregnancies. Monitoring of the fetal heart is an important component of the midwifery care of women in labour. The purpose is to monitor changes in fetal heart rate (FHR) that provide alert signals, or in other words, FHR monitoring is a screening tool for the detection of FHR abnormalities. Today, IA is recommended as the method of fetal monitoring that should be offered to women who are healthy and have had an otherwise uncomplicated pregnancy (NICE 2001; RANZCOG, 2006; NZCOM, 2005; SOGC, 2007; MIDIRS & the NHS centre for reviews & dissemination, 2003; AWHONN, 2006).

This article describes the history of auscultation and the ability to listen to the fetal heart beat as

a means of determining fetal well-being. It is the beginning story of what we now understand in the 21st century as fetal surveillance. Although any discussion of fetal surveillance must include reference to the advent of the era of electronic fetal monitoring (EFM), it is not our intention, beyond briefly touching on the randomised controlled trials (RCTs) comparing EFM with IA during the 1980's, to provide any detail on this form of fetal surveillance. We explore a timeline beginning in Europe in 1650 up to the present day, to reveal that listening to the fetal heart beating in order to be reassured that the fetus is alive and well, is possibly the earliest and most enduring clinical practice-skill of maternity carers.

A review of the development of listening to the fetal heart is significant as it shadows other developments in the modern history of maternity care. Developments such as asepsis, electronic technologies (ultra-sound and electronic fetal monitoring), hospitalisation of the woman during labour and birth, antibiotics, induction of labour of the post-term pregnancy, training and education programmes for nurses and midwives and increasing improvements in perioperative midwifery, nursing and medical skills and equipment. It is important for the 21st century lead maternity carer (LMC) to understand where practice rituals and behaviours originated and the development of empirical research-based knowledge and how this has impacted on fetal monitoring strategies now utilised.

METHODOLOGY

An integrative literature review was undertaken to explore historical developments to the process of listening to the fetal heart from the initial discovery of the fetal heart sound in 1650 and its rediscovery again in 1818.

The literature search strategy included the location and appraisal of midwifery and obstetric texts and original journal articles from 1903 to 1975. This literature constituted the primary source material on which the review is based. Historical primary source texts were sometimes difficult to obtain, as they were scattered throughout public and private libraries

in centres throughout New Zealand (NZ) and overseas. As a research tool, the internet was also utilised to extend the literary search for historical texts located outside of the usual libraries such as Wellington Hospital Nurses Library, New Zealand Nurses Organisation Library, Otago School of Medicine (Wellington) Library, the Victoria University of Wellington Library and the National Library of New Zealand. Some publications were difficult to obtain as they were reference-only material held in libraries outside of the Wellington area. In addition, searches of the electronic databases of the Cochrane Library, Medline, and CINAHL were conducted to identify more recent publications. Search terms used were: intermittent auscultation, fetal heart rate monitoring, fetal surveillance, intrapartum care, and these were not limited by publication date. Literature that related to electronic fetal monitoring only, was excluded. The review was restricted to literature available in English. All identified documents were examined and those that were relevant were retrieved for inclusion in the review. Reference lists of retrieved documents were then scanned to identify any additional articles of interest. Practice guidelines from NZ, Australia, United States of America (USA), United Kingdom (UK), and Canada were also appraised.

AUSCULTATION – THE ACTION OF LISTENING

We begin the review of the history of listening to the fetal heart sounds by defining auscultation. Auscultation is the action of listening to the noises inside the body. Originally described by Hippocrates, 'immediate auscultation' - direct application of the ear to the patient was the method of listening and was used as part of the assessment of the patient which included the comprehensive physical diagnostics of inspection, palpation, percussion and auscultation (IPPA) (Sureau, 1996). This assessment framework was used throughout many aspects of medicine and is still taught in midwifery and obstetrics. 'Mediate auscultation' meant listening through an instrument.

THE ORIGINS OF THE STETHOSCOPE

Rene-Theophile-Hyacinthe Laënnac (1781-1826), a professor at the Charite hospital and the College de France in Paris, is credited with the invention of the stethoscope in 1816.

It is said that he was examining a young female patient and was embarrassed to place his ear to her chest. Laënnac had observed two children playing in the courtyard of the Louvre with the ends of a long stick close to their ears listening to the transmitted sound when they tapped it. With these thoughts in mind he rolled up 24 sheets of paper, placed one end to his ear and the other end to the woman's chest. He was delighted to discover that the sounds were not only conveyed through the paper cone, but they were also loud and clear. From then on, whenever he was concerned with preserving the modesty of ladies he listened to their chests through a rolled up sheet of paper and so the monaural stethoscope was born (Sureau, 1996). Later Laënnac devised a straight wooden tube for listening to breath sounds and used an adaptor to listen to the heart. A hobbyist wood turner, Laënnac made the first stethoscopes himself. The cylindrical stethoscope was made with three parts fitted together by a wood screw thread and brass tube fitting, with an overall length of 12.6 inches and a diameter of 1.5 inches. Laënnac described his invention in his book

Laennec, R. (1819). De l'Auscultation Médiate ou Traité du Diagnostic des Maladies des Poumons et du Coeur. Paris: Brosson & Chaudé, (O'Dowd & Philipp, 1994).

The development of the obstetric stethoscope permitted the determination of the average fetal heart rate (Sureau, 1996) and it was hoped that auscultation of the fetal heart rate (FHR) would be an effective technique for detecting alterations to fetal health (Parer & King, 2000). Historically, intermittent auscultation meant a very irregular check of the fetal heart beat and the auscultated fetal heart rate was described as a single number in beats per minute i.e 136bpm (Goodwin, 2000). Characteristics of the normal FHR set in the latter part of the 19th century remained virtually unchanged until the 1950's. The same period saw interest and research into the significance of meconium staining of the amniotic fluid as a means of predicting fetal wellbeing. During the first half of the 20th century, auscultation of the FH during labour became a universal 'standard of care' in Europe. In the nearly two centuries that have elapsed since the development of auscultation of the fetal heart, no randomised controlled trials

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(RCT) have been carried out regarding the efficacy of auscultation (Parer & King, 2000) or of the most favourable frequency, timing and duration.

INTERMITTENT AUSCULTATION

The technique of IA, sometimes referred to as periodic listening, generates information by listening to and counting the fetal heart sounds through the maternal abdomen, for a specified number of seconds at a specified time, in relation to uterine contractions (Goodwin, 2000). IA is conducted with either a fetal stethoscope (fetoscope) or a hand-held ultrasound device. Non-electronic auscultation, such as the application of a Pinard's fetoscope to the maternal abdomen for periods of up to one minute or more, allows practitioners to hear the sounds associated with the opening and closing of the ventricular valves in the fetal heart, via bone conduction, with each fetal cardiac cycle. With this type of device, the midwife can hear the actual fetal heart sounds, including any abnormal heart beat rhythms. Electronic devices such as the hand held Doppler applied to the maternal abdomen use ultrasound technology to listen to the reflected and amplified sounds of the motion within the fetal heart, such as the moving heart walls or valves (Feinstein, Sprague & Trepanier, 2008) The information received by the Doppler device is converted into a sound that is heard and displayed as a representation of the fetal cardiac cycle (Goodwin, 2000).

AUSCULTATION OF THE FETAL HEART - THE TIMELINE

1650-1819

Doctors introduced the stethoscope into use for midwifery practice very soon after its introduction by Laënnac in 1819. Previously there had been only two accounts of anyone listening to the fetal heart sounds, and these accounts were not written by the people who had listened. During the 1650's a group of French physicians from Niort, in their local

dialect, wrote satirical poetry, regarding the role and activities of the fetus during pregnancy. One of them, Philippe Le Goust, a physician, made fun of his colleague Marsac, an obstetric colleague, for claiming to hear the heart of the fetus beating 'like the clapper of a mill' (Pinkerton, 1969; O'Dowd & Philipp, 1994).

1818

Nearly 150 years later, François Mayor, a forensic physician in Geneva, rediscovered the technique of immediate auscultation. 'Like the ticking of a watch' is the description of the fetal heart sounds first described by Mayor in the 1818 publication *Bibliothèque Universelle des Sciences et Arts*, Geneva, Switzerland (Mayor, 1818) cited in (Baskett, et al., 2007; Acierno, 1994) when he announced that the pulsation of the fetal heart could be heard in advanced pregnancy by the ear being applied to the abdomen of the mother (Acierno, 1994). He had discovered that he could recognize with certainty, when term is near, whether the infant was alive or not, by applying the ear to the mother's belly. He asserted that if the child is alive the beats of its heart could be heard quite clearly and were easily distinguishable from the mother's pulse (Pinkerton, 1969 & O'Dowd & Phillip, 1994).

1821

It has been acknowledged that the era of modern obstetrics started in 1821 with the discovery of the use of auscultation by Jean Alexandre Lejumeau, Viscomte de Kergaradec. Kergaradec, who was a friend of Laënnac - the inventor of the stethoscope - was the first doctor to use the stethoscope for auscultation of the fetal heart sounds. He thought he would hear the noise of water inside the uterus of a pregnant woman and be able to identify the position of the placenta. With the new-found technique of identification of the fetal heart sounds via mediate auscultation he theorised on the practical possibilities that could be derived

from auscultation of the fetal heart (Sureau, 1996). Kergaradec is quoted as follows:

One day whilst examining a patient near term and trying to follow the movements of the fetus with the stethoscope I was suddenly aware of a sound that I had not noticed before; it was like the ticking of a watch. At first I thought I was mistaken, but I was able to repeat the observation over and over again. On counting the beats I found that these occurred 143 – 148 times per minute and the patients pulse was only 72 per minute (Pinkerton, 1996, p. 20).

However it was not until 1821, that Jean de Kergaradec read his memoir on auscultation as applied to the study of pregnancy to the Academie Royale de Medecine in Paris. He publicly asked the question: *‘Would it not be possible to judge the state of health or illness of the foetus from the variations in the strength and frequency of the foetal heart beat?’* (O’Dowd & Philipp, 1994, p. 32).

With the identification of the fetal heart came the reality that the fetus was no longer simply an object; it became a ‘subject’, with its health, interests and needs. It can be stated that ‘fetal medicine’ or the concept of the fetus as a patient began with this discovery. Over subsequent decades, new data gathered from fetal heart rate auscultation were of clinical, patho-physiological, and legal importance. From the clinical perspective, the development of the obstetric stethoscope permitted the determination of average heart beat frequency. It also allowed the discovery of a lack of relationship with the maternal heart rate and made it possible to diagnose fetal life or death and in twins, the determination of fetal presentation and position (Kergaradec cited by O’Dowd & Philipp, 1994).

1825

William Stokes published his book, ‘Introduction of the use of auscultation’, in 1825’ in which he discusses the uses of the stethoscope. Auscultation of the fetal heart was not mentioned in Stokes’ book but the second edition of Laënnac’s Treatise was translated into English by Dr John Forbes in 1827 and contained Kergaradec’s observations on auscultation of the fetal heart (O’Dowd & Philipp, 1994).

1827-1833

John Creery Ferguson, a friend and fellow student of Stokes, developed an interest in auscultation. He travelled to Paris where he met both Laënnac and Kergaradec and on his return to Dublin, Ferguson was the first to use mediate auscultation of the fetal heart in the British Isles, in November 1827. On the instigation of Ferguson, fetal auscultation was

introduced and developed in the Rotunda Hospital Dublin, during the Mastership (1826-1833) of Robert Collins. During that time Nagle (1830), who was one of Collins assistants, reported to the Lancet on the diagnosis of twins by Laënnac’s stethoscope (O’Dowd & Philipp, 1994).

1833

O’Brien Adams, also of the Rotunda Hospital, referred to the almost daily employment of the fetal stethoscope in the hospital (Adams, 1833 cited by Dunn, 1994). Collins, aided by his assistant, O’Brien Adams, was a pioneer in introducing fetal auscultation into obstetric practice. Dunn (1994) attributes the following words taken from his Rotunda obstetric report to Dr Robert Collins (1801 – 1868): (Dunn, 1994)

I know of no case where the advantage derived from the use of the stethoscope is more fully demonstrated, than in the information it enables us to arrive at with regard to the life or death of the foetus, in the progress of tedious and difficult labours. It is, in my opinion, one of greatest improvements that has been made in the practice of midwifery; and what adds much to its value is, that an acquaintance with its application is not so very difficult of acquirement to any one, whose hearing is unimpaired – it being only necessary the ear should be accustomed to the sounds for some time, to be able to apply it with advantage. Heretofore, we were in a great measure ignorant of the time at which death took place; and the practitioner, imagining the child alive, from want of satisfactory evidence of its death, delayed interfering, until his patient was in the greatest possible danger; whereas, had he been assured the child was dead, he would have delivered her before life became actually hazarded, and thus prevented her not only enduring for hours, but even days in some instances, the most torturing pain, the result of which continued suffering was not infrequently death, or what was perhaps worse than death, extensive sloughing of the urethra or of the recto-vaginal septum, establishing a communication between these two cavities, reducing the misfortunate sufferer to a state of extreme misery... I cannot, therefore, too strongly impress on the mind of the junior practitioner, the absolute necessity of making himself acquainted with the use of the stethoscope, considering it, as I do, of the most utmost importance in these cases. I can safely say, I should feel most unhappy without it, in any attendance, where the labour was protracted or severe; I am satisfied there is no mode of diagnosis more truly useful, and feel convinced, that all

who accustom themselves to its application, will eventually agree with me in this opinion” (Dunn, 1994, pp 67-68).

1843

The clinicians of the time saw the development of mediate auscultation as beneficial for determining fetal life and foetal demise. Evory Kennedy was the successor to Robert Collins as ‘Master of the Rotunda’ in 1833 at the age of 27. His mastership was notable for the significant role he played, with Creery Ferguson and Collins, in introducing the stethoscope (first brought to the attention of British Medicine by William Stokes in 1825). Kennedy, cited in Gunn and Wood (1953), was the author of several publications on the fetal heart one of which was published in the British Medical Journal (BMJ) in 1834 (Kennedy, E. (1834), *“Obstetric Auscultation, or Means of Detecting Life or Death of a Foetus before Birth.”*). He lamented in 1843 that for two decades little was heard of the use of the stethoscope in obstetrics. He stated that had auscultation in pregnancy met with more opposition, the more it would have attracted the attention of the profession which was all that is required to establish its utility.

1847

John Moir, a medical officer and teacher of midwifery to nurses and doctors, introduced the practice of foetal auscultation to The Edinburgh Lying-in Hospital after being impressed by its practicality by Fergusson and Kennedy in Dublin.

Those who practised auscultation were faced with obstruction and hostility by those who opposed them

Not all practitioners embraced the change to and popularity of mediate auscultation. There were those who challenged the practice of auscultation. In some areas, those who practised auscultation were faced with obstruction and

hostility by those who opposed them. An elderly obstetrician in Edinburgh, at the time of Moirs' introduction of the practice to the Edinburgh Lying-In hospital was recorded as stating it was a 'new-fangled and ridiculous plaything' and '...these toys of ignorance should be abandoned...they [are] truly prejudicial to science' (O'Dowd & Philipp, 1994, p.98). Despite the challenges, the advocates for auscultation faced, the practice was widespread by the 1850's.

FETAL HEART RATE FINDINGS

According to Sureau (1996), the development of the obstetric stethoscope facilitated a greater understanding of the fetal heart rate, including the relationship between accelerations of the fetal heart rate and fetal movements, as well as the lack of influence of maternal efforts such as those associated with ascending a staircase (i.e. the step test). It was further recognised that maternal tachycardia and fever could be linked with fetal tachycardia and that an abrupt fall in the maternal blood pressure could have adverse consequences on the fetal condition. Perception of heart tones constituted an argument in favour of post mortem caesarean section.

Fetal distress was recognised as early as the second half of the 19th century (Sureau, 1996). The different degrees of deceleration were considered 'dangerous' when synchronous with intense contractions or were delayed decelerations, or a progressive or permanent bradycardia, announcing fetal death. Van Geijn and Copray (1994) quote Depaul's notion of the 'physiological' deceleration of the fetal heart rate during labour (DePaul, 1847): "*The compression of the cord, the one of the placenta, the irregular and almost spastic contractions of the uterus finally lead to an identical result, a kind of asphyxia, and the heart is one of the first organs to be exposed to its deteriorative influence*". These notions of DePaul arose out of observations and discussions of Kennedy's work in 1833 describing a link between fetal head compression and fetal heart rate decelerations (O'Dowd & Philipp, 1994). The timing of fetal heart rate auscultation during labour eventually changed over time from being performed during a contraction to being performed from the end of a contraction with an understanding that a decrease in or slow return of the fetal heart to the normal baseline rate after a contraction was more problematic.

The 'modern era' of fetal surveillance was heralded in 1906 with the first fetal electrocardiographic recording by Cremer. For around 50 years, little further progress was made, and the recordings, through the maternal abdominal skin of either fetal ECG's or acoustic signals, remained anecdotal (Sureau, 1996).

The phrase 'fetal distress' was introduced in 1908 in Dublin by Hastings-Tweedie and Wrench (1908). Between the introduction of auscultation in 1830 and 1908 there were other significant discoveries in the identification of differing types of fetal heart rates and correlations between those and the outcomes at birth. In 1833, Evory Kennedy identified that an abnormal heart rate pattern indicated poor fetal health; John Moir in 1836 wrote of the effects of contractions on the fetal heart rate; 1843 Bodson described fetal heart irregularities; 1848 Kilian defined the range of what is normal for fetal heart rates, this being between 100 to 180 beats per minute, with purity of tone and with no intermission of tone, (Chalmers, Enkin & Keirse, 1997). In 1855 John Y. Simpson described the slowing of the foetal heart; 1866 at the Rotunda, Fleetwood Churchill used forceps, that he designed and made, to deliver babies with good neonatal outcomes, when there was a weakening of the fetal heart; 1876 McClintock, at the Edinburgh Lying-In, observed poor outcomes in those fetuses with slowing fetal hearts; 1886 Galabin in London observed good outcomes with those fetuses whose heart rate increased 20 beats per minute with movements compared with those whose heart rates did not increase; Jaggard correlated fetal bradycardia following Braxton Hicks contractions with a "puny foetus" in 1888. (O'Dowd & Philipp, 1994). In 1889 Van Wickel refined Kilian's guidelines of normal fetal heart ranges to suggest that fetal heart rates of less than 120bpm and greater than 160 bpm were indicative of distress (Chalmers, Enkin & Keirse, 1997). All of these significant discoveries are aspects of fetal monitoring that we in the 21st century take for granted as events that have known outcomes.

later epidemiological thought and clinical measurement rose in prominence, established in the 1920's by way of antenatal clinics, followed in 1946 by the British Perinatal Surveys.

Attention was drawn to the correlations between maternal physical health, social and economic wellbeing and fetal outcome. Today we utilise this seemingly obvious approach to determine the fetus at risk.

WHAT WERE MIDWIVES TAUGHT IN TEXTBOOKS FROM THE 1900S ONWARDS?

There were few educational texts available for students of midwifery at the turn of the 20th century. Jellett, Chairperson of the Rotunda, Dublin, is quoted in his 1903 text for students of midwifery (meaning at this time medical students studying obstetrics and midwifery) as asserting the optimal mode of detecting the fetal heart is over whatever part of the fetal body is most closely in contact with the anterior uterine wall (Jellett, 1903).

Jellett described the process of auscultation as being carried out either through the intermediary of a stethoscope or by placing an ear directly on the abdomen (which, Jellett suggested, had been covered with a silk or linen handkerchief). He gave no indication as to the frequency or indications for auscultating the FH, other than to determine intra-uterine fetal life. In both 1903 (Jellett, 1903) and 1910 (Jellett, 1910) editions of Jellett's work, there are detailed descriptions regarding the patterns and sounds of the FH and obstetric incidents that may result in some change in FH, but no stress was placed upon the need to further monitor the FHR.

In 1932 Corkill published, 'Lectures in Midwifery and Infant Care: A New Zealand Course' (Corkill, 1932). It is the first text for

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1920s-1946

As soon as the frequent listening of fetal heart sounds commenced in the mid 19th century then the observation that there were irregularities to the heart rate also began to be observed. The term the 'fetus at risk' was one used first by Hippocrates in 430BC (O'Dowd & Philipp, 1994) when he related fetal outcome to the time of year, using epidemiological reasoning. One thousand five hundred years

New Zealand (NZ) students of nursing and midwifery, written in NZ, for the NZ setting. As with Jellett, it remains unclear from reading Corkill (1932), as to how often auscultation of the FH was recommended during suspected episodes of fetal distress nor if action such as a caesarean section was performed in other than a significantly obstructed labour.

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the first change in 150 years. Green (1966) described the fetal electro-cardiogram as very reliable in diagnosing the presence of one or more fetal heart sounds. Green reassured, 'how harmless it is to the mother'. Green described the equipment as an ordinary electrocardiograph machine with a powerful amplifier and that the recording must be made in a room lined with metal to keep out electrical interference. This architectural requirement would place restrictions on the accessibility and availability of such a diagnostic tool.

Green described in detail the techniques and timing of FH auscultation. In his 1966 New Zealand text for nurses and midwives he wrote;

"...the FH should be listened to every half hour if the patient is awake. It should occasionally be recorded during a contraction, slight slowing of the FH usually occurs; marked slowing or failure of the rate to return to normal a few seconds after a pain indicate serious interference with the placental circulation. Any rate outside the limits 120 – 160 must be regarded as abnormal. As a graphic record is far more easily interpreted than a list of figures, the foetal heart rate should be recorded on a modified temperature chart (Green, 1966, p.79).

In 1967, Caldeyro-Barcia et al (Day, Maddern & Wood, 1968) introduced a revised method of counting the fetal heart sounds described as follows: "The counting is begun during or immediately before a contraction, and is continued until two minutes after the contraction, the count being taken over 15-second periods with 5 second intervals. This technique might involve the observer in making as many as 10 separate counts (Day, Maddern & Wood, 1968, p.422)".

In an American text titled 'Maternity Nursing', Bleier (1969) provided more explicit interpretations of auscultation (similar to the instructional training guide for midwifery students from the Royal Women's in Melbourne discussed below), showing that there was some recognition of FH patterns following the administration of medications and during contractions and it is clear from the details of the text that it is an expectation that FHR auscultation is the work of the midwife/nurse.

The 1972, 'Notes for Student Midwives' from the Royal Hospital for Women in Melbourne, contained a section 'to observe the progress of labour – condition of the fetus'. These notes were more prescriptive, instructing midwives in the following way:

It is clear from the details of the text that it is an expectation that FHR auscultation is the work of the midwife/nurse

The fetal heart must be recorded hourly early in labour, increasing to ½ hourly and more often as labour advances. Changes in the rate (above 160 or below 120) or rhythm (irregular) are a sign of fetal distress and should be reported immediately. Abnormalities of fetal heart rate and rhythm may be first detected immediately after a contraction.

Second stage of labour

Maternal pulse rate is checked every ¼ hour. Fetal condition must be closely supervised by fetal heart checks each ¼ hour until the head comes on view when the heart rate must be checked after each contraction (and charted at least ¼ hourly" (The Royal Women's Hospital, 1972 p.30).

Myles writing in 1975 is very clear about the role, responsibilities and professionalism of midwives and the duties they must perform (Myles, 1975). Comparing the content of the work and role of the midwife by Myles to that of the Nurse-in-maternity-care by Bleier (1969), one would be hard pressed to reconcile the two. Myles' text is accompanied by copious photographic illustrations, portraying the work of the 'modern' midwife and the equipment she uses'. The use of the Pinard's and the electronic bi-aural stethoscope are photographically depicted (unlike previous texts reviewed). Myles also states clearly the antenatal requirements of FH monitoring - "They (FH sounds) should be listened for at every visit after the 20th week of pregnancy".

THE METHODS OF AUSCULTATION INSTRUMENTATION

One piece of equipment commonly in use today is the Pinard's aluminium fetal stethoscope, despite evidence that this is not as accurate as a hand held Doppler for determining the fetal heart rate, based on the papers by Day, Maddern and Wood (1968) and Mahomed, Nyoni, Mulumbo, Kasule, & Jacobus (1994).

THE FREQUENCY, TIMING AND DURATION OF FETAL HEART AUSCULTATION

In the studies comparing IA with EFM, most used a fetoscope or Doppler device with a 1:1 nurse-to-fetus ratio for evaluating the fetal heart characteristics. Assessments are generally conducted at 15 minute intervals throughout the labour, regardless of the risk status, and at 5 minute intervals during the second stage of labour. Although it is not clear what training was received in preparation for the studies, a research nurse generally conducted the IA. Professional organizations have considered protocols used in these studies when making recommendations regarding the use of IA. Some studies recommend that IA should be the primary fetal assessment method for low-risk pregnant women during labour (Feinstein, Sprague & Trepanier, 2008).

THE EVIDENCE

The introduction and use of EFM has led to intermittent auscultation (IA) being used less, and IA now is used less frequently than EFM (Dildy, 1999). The value and efficacy of IA compared to EFM has been questioned and examined in RCTs and meta-analyses (Mahomed et al., 1994; Dildy, 1999; Thacker, Stroup & Petersen, 1998). Cumulatively, studies of these two methods provide evidence that the use of IA and EFM results in similar neonatal outcomes for low risk women.

CONCLUSION

This article has tracked the discovery of the ability to hear the fetal heart sounds during pregnancy and labour and the significance of having this knowledge. Listening to the fetal heart sounds during labour is an important way to determine fetal well-being. Today, professional evidence-based guidelines recommend intermittent auscultation as the appropriate fetal heart monitoring for well women with uncomplicated pregnancies. Although IA has been used for many years, the introduction of EFM in the 1960's resulted

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in decreased use or elimination of IA for fetal heart monitoring over time and is a factor effecting how often or whether auscultation is used as a primary method of monitoring fetal well-being during labour in many health care facilities. As a result, practitioners' experience and comfort level with the IA technique may vary from setting to setting and from individual to individual.

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Comment on the Wax et al., (2010) meta-analysis of home vs. hospital birth

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Systematic reviews aim to 'identify, evaluate and summarise the findings of all relevant individual studies' (Centre for Reviews and Dissemination, 2008, p. v). A systematic review is often considered level one evidence as it reviews all known randomised controlled trials on the subject and synthesises the findings. When done well a systematic review can provide a reliable estimate of the effectiveness of any particular type of intervention because combining results of several similar studies can provide more evidence than one study alone.

As with any research project a systematic review needs to be undertaken in a particular way so that the review question, the search strategy, the population, interventions, comparators, outcomes and study designs are clear and the review could be easily replicated. Any knowledge claims need to be clearly based on evidence found in the review, as such there is a need to minimise bias, and ensure objectivity when undertaking reviews.

A recently published systematic review in the American Journal of Obstetrics & Gynecology has raised questions about homebirth. The paper in question – Maternal and newborn outcomes in planned home birth vs planned hospital births: a meta-analysis by Wax, Lucas, Lamont, Pinnette, Cartin, and Blackstone (2010) provides a systematic review and meta-analysis of homebirth. It claims that home

birth results in less medical intervention for the mother but is associated with a tripling of the neonatal mortality rate.

We have identified several issues with this paper leading us to question the motivation of the researchers, the assumptions taken into the review and the validity of this systematic review. In this paper we critically appraise this systematic review and outline our concerns.

PHILOSOPHY AND ASSUMPTIONS

Politics is a term that we most commonly associate with government and political parties. However the term can also be used when considering how groups, whether corporate, academic or religious, interact and behave and the methods and tactics they use to exert power and authority. Clough and Nutbrown (2002) argue that all social research is political in nature because the researchers set out from a particular position and with a specific purpose in mind. The researchers have their own philosophy and assumptions about the world and the resulting papers are attempts by the researcher to persuade the readers of the significance and claims to truth of their research project (Clough & Nutbrown, 2002). So when considering any research papers we need to consider the background and philosophies of the researchers, the reasons for their interest in the research questions and what assumptions they are taking into the research as well as the research methods that have been used and the resulting knowledge claims.

The authors of this systematic review of homebirth are medical doctors working within the department of Obstetrics and Gynecology of the Maine Medical Centre in the USA. A minority of women in America have a homebirth with only 1 in 200 women (0.5%) giving birth at home. The American Congress of Obstetricians and Gynaecologists (ACOG) have a policy statement which - whilst acknowledging childbirth as a normal

physiologic process and the right of a woman to make an informed decision – does not support programmes or individuals who provide home births. It states unequivocally that a woman is putting herself and her baby's health and life at risk when they birth at home (American Congress of Obstetricians and Gynecologists, 2008).

So then when we consider the assumptions that these researchers have taken into the research it is probable that they consider home birth unsafe. In the first paragraph of the report the authors state that they consider that the risks of home birth have been underestimated in the majority of cohort studies because of the intrapartum transfer to hospital for women planning to give birth at home, meaning that any subsequent intervention or perinatal death would be attributed to the hospital birth.

THE SYSTEMATIC REVIEW – WAS THE SEARCH STRATEGY ADEQUATE AND APPROPRIATE?

The aim of this review was to determine the 'relative merits of planned home vs planned hospital birth' using meta-analysis of existing research results. The authors identified 12 studies from a variety of countries including the United Kingdom, the United States of America, Switzerland, the Netherlands, Australia, Sweden and Canada and then undertook a meta-analysis of specific outcomes.

When considering which studies to include in a systematic review, a research protocol is set up so as to minimise bias and errors in the study selection process. Due to the difficulties of randomisation for homebirth, the review included large cohort studies comparing outcomes, some of which included data from as far back as 1976. Needless to say things were different then, with high levels of hospital births, large variations in socioeconomic status; and professional skills and knowledge were philosophically and

culturally different, both in medicine and in midwifery. The inclusion of these older studies is of concern as changes in practice are not taken into account.

The non-randomised studies in the meta-analysis were not matched for confounding risk factors. The authors retrieved and considered 47 studies for this analysis but only included 12 in the final analysis; the other 35 are not identified nor are the reasons provided for why they were excluded. The exclusion criteria in any systematic review needs to be explicit and provide information as to why studies have been excluded. The lack of explicit detail suggests selection bias in the study inclusion/exclusions.

WERE APPROPRIATE STEPS TAKEN TO MINIMISE BIAS AND ERRORS IN THE DATA EXTRACTION PROCESS?

Some of the included studies did not define the timing for when the 'plan' to birth at home had been determined. There is a risk when a definition is not used with the possibility that 'unplanned' homebirths are misclassified and included. The studies included data from many different countries without considering the philosophy and structure of the maternity services in each country. Women giving birth are strongly affected by the philosophy of the country and how maternity services are provided within that country. This may also have an impact on the definition of 'planned' home birth as well as on who provides the care or whether there is any professional health care provision for home birth. One third of women (30%) have their babies at home in the Netherlands (de Jonge et al., 2009), 3% in the UK, (<http://www.birthchoiceuk>), approximately 6% in New Zealand (Dixon et al., 2010) and only 0.5% in the USA (Wax et al., 2010). The experiences, expectations and infrastructures are completely different in each country meaning that – whilst they may appear to be a homogenous group – there are very likely to be significant intercountry differences.

THE META-ANALYSIS

The extent to which conclusions can be drawn in a meta-analysis is partly determined by the homogeneity (similarities) and the heterogeneity (differences) amongst the included studies (Higgins & Thompson, 2002).

A key critique of this meta-analysis is that maternal and neonatal outcomes were related to the planned place of birth, not the ACTUAL

place of birth. For example, the planned home birth group had a low caesarean section rate. Obviously no caesareans were performed at home, but the caesarean section outcome data were matched to the PLANNED place of birth. Therefore women who had planned a homebirth but then gave birth in hospital have had their data included within the analysis and the change in condition that caused the change in place of birth has not been considered. The authors consider this a strength of their paper as they argue that serious adverse events that occur in hospital following intrapartum transfer are unfairly attributed to hospital births.

The other vitally important variable that has not been addressed is the ease of transfer, and length of time involved in an intrapartum transfers. As midwives we understand that a transfer from rural areas takes longer and requires earlier decision making than those from urban areas (Patterson, 2007). The length and timing of transfer can have profound implications on the outcomes.

A sensitivity analysis was undertaken but those studies analysed in this way were not identified and the quality assessment is not reported for the 12 papers included. It is also not clear as to whether the authors of the 12 papers included in the study provided the original data to the Wax team. Uncertainty in the coding of data is possible when data are not checked with the original authors. This reduces the validity of a review of this nature where data sets are pivotal to the conclusions drawn.

FINDINGS – DO THE AUTHORS' CONCLUSIONS REFLECT THE EVIDENCE THAT WAS REVIEWED?

The findings from this paper state that women who planned home births had significantly fewer medical interventions such as epidural anaesthesia, electronic fetal heart rate monitoring, episiotomy and operative births. They had fewer infections, third degree perineal tears, post partum haemorrhage and retained placenta. They were also less likely to have premature babies or low birth weight babies but more likely for the pregnancy to be more than 42 weeks gestation. Perinatal mortality was similar by intended birth place. The major difference was the neonatal death rate which was almost twice as high in planned homebirth when compared to planned hospital birth and three times as high among nonanomalous neonates (we assume this means babies with no congenital abnormalities). The authors describe this finding as discordant and indeed it would appear to be counter-intuitive – how can there

be a higher neonatal mortality rate but the same perinatal mortality rate? In New Zealand the perinatal mortality rate is defined as a fetal death (including terminations of pregnancy and stillbirths) and early neonatal death (up to 7 days of age) per 1000 babies born at 20 weeks gestation or beyond (Perinatal and Maternal Mortality Review Committee, 2009). However, definitions of perinatal mortality are variable and dependent on the country. The authors do not present the variety of definitions used in the perinatal death data and some of the 12 papers included do not provide their definition of perinatal or neonatal mortality, making interpretation of these findings difficult.

When perinatal mortality alone was measured along with nonanomalous infants the rates were in fact similar for planned home and hospital births. Between 200-400 adverse events are required to be confident that a systematic error in the data has not occurred and that misleading conclusions are not drawn. However, in this study only 64 neonatal deaths were reported, 37 for non-anomalous neonatal deaths. Women who had babies with congenital abnormalities (anomalous infants) were not excluded from the analysis; this raised the so called effect of homebirth on neonatal death from double to triple. What the studies do not clarify is whether congenital problems were known before labour or not. Some women when they have this knowledge may decide to seek a homebirth anyway, and some may not have had scans in the first place or undertaken any antenatal screening for abnormality. This too is not reported. There is overall inadequate description and analysis of the primary research papers included in the analysis, and the reasons for their inclusion are not identified clearly. A forest plot may have been more useful in examining the different numbers presented in the text.

PROLONGED PREGNANCY

The meta-analysis included planned home births that progressed to 42 weeks gestation or beyond 42 weeks gestation. The authors stated that "planned home births more often progressed to 42 weeks or greater" (Wax et al., 2010 p. 243. e3). An ongoing review published by the Cochrane Library concludes that a policy of labour induction after 41 completed weeks or later, compared to waiting for labour to begin spontaneously with no induction of labour is associated with fewer perinatal deaths and meconium aspiration syndrome. Although the Cochrane reviewers state that the absolute risk is extremely small they do suggest that induction at >41 completed weeks should be offered to

low-risk women (Gülmezoglu et al., 2006). The risks of post dates pregnancies are an issue for practice that is becoming well supported by the evidence and therefore has implications regarding the generalisability of this meta-analysis when this 'postdates sub group' is included. It is also not clear if the homebirth group women had accurate EDDs and had dating scans within the 1st trimester. There may have been more postdate women in the homebirth group and they may have declined postdate management or pregnancy scans. This has not been addressed in the analysis.

The authors suggest that the main reason for the higher neonatal mortality rate is intrapartum asphyxia which was implicated in two of the research papers. They continue that whilst there were a limited number of neonatal deaths which had sufficient detailed descriptions provided, in those that did provide descriptions it appeared that death was due to respiratory distress and failed resuscitation (four papers). The authors failed to analyse the data dependent on presence/absence of a health professional and who the health professional was. In one paper the midwife attendant information was missing for 4801 of the sample (Janssen, 2010) and only 75% of the home births were recorded as attended by a doctor or midwife implying that 25% were not attended by any health professional (ibid). It is unclear whether the women chose to birth unassisted or the birth attendant was unable to provide timely assistance. Adverse outcomes in relation to this variable needed to be teased out before generalisations were made.

It has to be acknowledged that many other variables need to be explored in an analysis of this nature. The numbers alone do not provide the definitive answer to such a complex area of practice. Despite the above observations this study claims that: "This finding is particularly robust considering the homogeneity of observation across studies..... women...of similar and often lower obstetric risk than those planning hospital births" (Wax, et al., 2010, p. 243.e3). In contrast, Janssen et al (2009) found in their Canadian study that homebirth attended by a qualified and registered midwife was actually associated with a very low rate of perinatal death as well as reduced obstetric interventions when compared with the hospital birth attended by a midwife or doctor. This Canadian study has added to the recent growing body of evidence provided by large cohort studies supporting the relative safety of homebirth.

Another area of contention not explored was whether the choices made by women were

supported by their caregivers. The paper does suggest that homebirthers are self selected and therefore may not heed advice regarding need to birth in a hospital setting. A recent, as yet unpublished paper by Professor Mavis Kirkham in the UK has examined in detail the circumstances of perinatal death and UK based independent self employed midwives. She has found that women who book homebirths with self employed midwives in the UK, where hospital birth and lack of midwife continuity is the norm, make choices that may put themselves and their children at potential risk in order to avoid medicalisation (personal communication, 2010).

Wax et al.'s (2010) meta-analysis concludes that homebirth is linked with a higher neonatal mortality. The authors state that less medical intervention during planned homebirth is associated with a tripling of the neonatal mortality rate. The assumption here is that if women had more intervention the baby may have 'survived'. The implication is that low intervention births, such as seen at home, are associated with higher neonatal mortality rates. It is important to remember that this systematic review has reviewed large cohort studies – as such it cannot provide a proven association of cause and effect. It has however asked an important question that now requires further investigation by more robust and reliable research studies.

As midwives we need to be able to look at any research such as this and ask critical questions such as those we have identified in this paper. This systematic review will hold authority for many obstetricians and we need to be able to discuss the validity of the findings. We also need to question whether the inclusion of data from the last thirty years is still relevant or whether the contemporary practices of the times may have had some influence on outcomes. The validity of this meta-analysis is highly questionable and contrary to what the authors claim, it cannot be generalised. We suggest that the purpose of this paper has been to validate the authors' assumptions about home birth and to support the American obstetric standpoint on homebirth. However, it has little external validity and has not provided any new insights into how health professionals practise at a homebirth. A consistent and logical argument to link homebirth with tripled neonatal mortality rates is absent. We argue that this systematic review is fundamentally flawed and as midwives we should continue to counsel women on the safety of homebirth – unless or until we get more reliable evidence to the contrary.

Population studies and audits with professional mandatory data collection on all births are being compiled, along with clear peer agreed documentation, in countries such as Canada, New Zealand, United Kingdom and the Netherlands. These are countries in which a woman's choice takes precedence and maternity services have midwives supporting women in those choices. The Birthplace in England Research Programme aims to compare different birth locations and their outcomes, the results of which are due later this year. In NZ midwifery database statistics such as those provided by the New Zealand College of Midwives and Maternity and Midwifery Provider Organisation should be examined as a way of exploring and providing reliable outcome data to inform practice. Until then midwives need to remain vigilant and be ready to scrutinize and critique studies such as this, which at first glance appears to hold authority and therefore the power to change practice. Midwives are increasingly rising to the challenge.

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