ORIGINAL RESEARCH

Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance

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Abstract

Aims. To report a descriptive study of fertility-awareness knowledge, attitudes, and practice of infertile women seeking fertility assistance.

Background. Previous research has suggested that poor fertility-awareness may be a contributing cause of infertility among women seeking fertility assistance at assisted reproductive technology clinics. The actual practices and attitudes towards fertility-awareness in this particular group of women are unknown.

Design. A cross-sectional questionnaire-based survey.

Methods. The study was conducted over 6 months, from 2007–2008, of women on admission to two assisted reproductive technology clinics in a major city in Australia.

Results. Two hundred and four of 282 distributed questionnaires were completed (response rate = 72·3%). Eighty-three per cent had attempted conception for 1 year or more, 86·8% actively tried to improve their fertility-awareness from one or more sources of the information, 68·2% believed they had timed intercourse mainly within the fertile window of the menstrual cycle in their attempts at conception, but only 12·7% could accurately identify this window. Ninety-four per cent believe that a woman should receive fertility-awareness education when she first reports trouble conceiving to her doctor.

Conclusions. Most women seeking assistance at assisted reproductive technology clinics attempt timed intercourse within the fertile window of the menstrual cycle. However, few accurately identify this window, suggesting that poor fertility-awareness may be a contributing cause of infertility.

Keywords: fertility-awareness, infertility, midwifery, natural family planning, nursing, primary health care, sub-fertility

Introduction

Infertility is an important health issue worldwide affecting an estimated 9% of couples (Boivin *et al.* 2009). The current trend in increased use of assisted reproductive technology (ART) is considered unsustainable leading to political decisions in some countries to limiting funding and therefore accessibility to treatment (Anderson *et al.* 2010). The extent to which infertility could be prevented in primary health care (PHC) by addressing modifiable lifestyle factors is unknown, but thought to be substantial (Macaluso *et al.* 2010).

The Australian Government is currently transforming Australia's healthcare system to emphasise PHC for its future success and sustainability in the long-term (Australian Government Department of Health and Aging 2010). There is strong evidence that a strengthened PHC system is associated with better population health, reduced healthcare costs and greater efficiency in healthcare systems (Starfield 2010).

Nurses and midwives are considered integral to developing and strengthening PHC systems (World Health Organization 1996, 2010). In Australia, the general practice nurse has been identified as a key stakeholder and provider of PHC services (Australian Government Department of Health and Aging 2010). Several government initiatives aim to support and extend the role of the practice nurse (Parker *et al.* 2010). Around 56·9% of general practices in Australia currently employ one or more practice nurses (Australian General Practice Network 2009). Peak nursing and medical organizations including the Royal College of Nursing, Australia (RCNA), Royal Australian College of General Practitioners (RACGP) and Australian Medical Association (AMA) all endorse the expanding role of the practice nurse (Phillips *et al.* 2008).

Much attention is being given to develop the role of the practice nurse to respond to identified needs of specific populations. Practice nurses in Australia are increasing their roles in chronic disease management, health promotion and preventive health activities (Parker *et al.* 2010). A science of self-care is considered foundational to nursing science. Within the concept of Orem's self-care framework, an important goal of nursing is to promote self-care agency through the acquisition of the necessary knowledge and skills that increase capacity for self-care and care of others (Denyes *et al.* 2001). This goal is congruent with the aims and philosophy PHC (Australian Government Department of Health and Aging 2010).

This article reports a descriptive study which was conducted to measure the fertility-awareness knowledge, attitudes, and practices of women having trouble conceiving.

The aim was to determine if these women have sufficient fertility-awareness (i.e. self-reliance) to optimize the chance of natural conception. Sub-optimal fertility-awareness in women having trouble conceiving could be ameliorated with an education-based intervention by practice nurses in PHC.

Background

Infertility is generally defined as when a couple fails to conceive after having regular unprotected intercourse for 12 or more months (Quinn 2005). The utility of this definition is to indicate the earliest time at which fertility investigations become appropriate to exclude the need for treatment, it does not necessarily indicate sterility (Blake *et al.* 1997).

Around 9% of couples fail to conceive within 12 months of trying (Boivin *et al.* 2009, Herbert *et al.* 2009) and increasingly these couples are being referred to ART clinics for fertility assistance. Between 2005–2009 ART treatment cycles increased in Australia by 48%, resulting in one in every 35 (3·2%) babies being born from ART (Wang *et al.* 2011). In some Nordic countries this figure is higher. Denmark is the only country with a national reporting system of all ART treatments; and there around 1 in 16 (6·2%) babies is born from ART. The trend in increased use of ART is expected to continue to rise (Andersen & Erb 2005).

ART-conceived pregnancies when compared with naturally conceived pregnancies are associated with higher perinatal morbidity and mortality for both mothers and babies (Hansen *et al.* 2005, Chambers *et al.* 2007, Fisher *et al.* 2008). Assisted reproduction is a known risk factor for postnatal mood disturbance and earlier parenting difficulties (Fisher & Hammarberg 2005). The cost per live birth of ART-conceived babies is significantly higher (Chambers *et al.* 2006) and so are the healthcare costs of these children up to 7 years old (Koivurova *et al.* 2007).

Not all couples who are having trouble conceiving can access ART or wish to utilize ART for religious, personal or financial reasons (Eshre Capri Workshop Group 2004). ART treatment is both expensive and stressful for couples and concerns are increasingly being raised about its possible over use and unnecessary or premature use in certain situations (Gnoth *et al.* 2002, Eijkemans *et al.* 2008, Haywood 2009). In addition, although the success of ART treatment has improved over the past three decades, it still remains relatively low. Recent Australian data have shown that only 17·2% of *in vitro* fertilization (IVF) cycles (the most common form of ART treatment) resulted in the birth of a live-born baby (Wang *et al.* 2011).

To date, little research has focused on the prevention of infertility. One area of contention in the literature is the role

of fertility-awareness in the PHC of women having trouble conceiving. Natural family planners advocate fertility-awareness to ensure accurately timed intercourse within the fertile window of the menstrual cycle. Studies have shown that this may reduce time-to-pregnancy (Wilcox *et al.* 1995) and help avoid unnecessary ART treatment (Frank-Herrmann *et al.* 2005, Scarpa *et al.* 2007). In contrast, the National Institute for Clinical Excellence (2004) states that '…people who are concerned about their fertility should be informed that sexual intercourse every 2–3 days optimizes the chance of pregnancy. Timing intercourse to coincide with ovulation causes stress and is not recommended' (National Institute for Clinical Excellence 2004, p. 8). This recommendation is based on only one study that has been critiqued as poor quality evidence (Hampton & Mazza 2009).

There are three methods of fertility-awareness; rhythm, temperature and mucus. The rhythm method is a poor method of fertility-awareness as it can only estimate the timing of the fertile window of the menstrual cycle, whereas the temperature and mucus methods are highly accurate (Wilcox *et al.* 1995, Stanford *et al.* 2002, Scarpa *et al.* 2007). The temperature method retrospectively indicates the timing of ovulation by a basal body temperature (BBT) rise of 0–0·5°C that remains elevated until next menstruation (Colombo & Masarotto 2000). The mucus method prospectively indicates the timing of the fertile window by the presence of fertile-type mucus at the vulva for an average 6 days ending on the day of ovulation (Fehring 2002).

Pregnancy is only a possibility with intercourse within the fertile window of the menstrual cycle (Wilcox *et al.* 1995). Despite this fact, only one study has previously investigated the fertility-awareness of infertile women seeking fertility assistance finding that 76% could not accurately identify the fertile window (Blake *et al.* 1997). The actual practices and attitudes towards fertility-awareness in this particular group of women are unknown.

The study

Aims

The aim of this study was to determine the fertility-awareness knowledge, attitudes, and practices of infertile women seeking fertility assistance.

Design

A cross-sectional survey was carried out using a self-administered questionnaire of infertile women on admission to two different ART clinics in a major city in Australia.

Sample

The two different ART clinics (one in inner and one in outer metropolitan) in a major city in Australia were chosen to represent women from diverse socioeconomic backgrounds. The outer metropolitan ART clinic compared with the inner metropolitan clinic was located in a socioeconomically disadvantaged area in terms of household income, education, occupation, and the proportion of non-English speaking background people (Australia Bureau of Statistics 2006, 2008).

All women on admission to the ART clinics were invited to complete an anonymous questionnaire (either onsite or at home and returned in a reply-paid envelope) by either the fertility nurse or the researcher between December 2007–July 2008. Exclusion criteria were: (i) no menstruation in the previous 6 months; and (ii) women who could not read English.

Based on Blake *et al.*'s (1997) rate of high fertility-awareness (26%) among infertile women ($n = 80$), we determined that a minimum overall sample size of 172 was required to obtain a 95% confidence level that less than 50% of women seeking fertility assistance at ART clinics could accurately identify the fertile window of the menstrual cycle (De Vaus 2002).

Data collection

With permission we refined the fertility-awareness questionnaire developed by Blake *et al.* (1997). Modifications to the original questionnaire were made to determine detailed knowledge and practice of the rhythm, temperature, and mucus methods. These additional questions were informed by the research evidence in this field (Colombo & Masarotto 2000, Fehring 2002, Gnoth *et al.* 2002, Frank-Herrmann *et al.* 2005). The questionnaire was also extended to determine attitudes towards fertility-awareness, use of the fertile period, and the socio-demographic characteristics of the study sample. Our modified questionnaire was then piloted by six women ($n = 6$) in a Melbourne women's health service; no changes were made as a result of the pilot study.

The 17-item questionnaire was divided into three sections. The first section gathered the socio-demographic characteristics of the study sample including age group, highest educational level attained, years tried to conceive, number of general practitioner, and fertility specialist appointments attended regarding trouble conceiving, infertility diagnoses, and average length of the menstrual cycle. The second section determined knowledge and practice of the three fertility-awareness methods and use of

the fertile window in their attempts at natural conception. The third section measured attitudes towards fertility-awareness by gathering information about attempts at improving their knowledge. Two 5-point Likert Scale statements (from strongly agree to strongly disagree) were used to measure their perception of the importance of the knowledge. The questionnaire and fertility-awareness scoring sheet are available on request.

Ethical considerations

Research Ethics Committee approval was obtained from the university ethics committee and from the participating hospitals. Informed consent was implied through the women's completion of the questionnaire.

Data analysis

All questionnaires were graded independently by two clinicians (a nurse and a general practitioner) for fertility-awareness using a predetermined assessment sheet. Where a discrepancy occurred, resolution was achieved through review and discussion between both clinicians. Table 1 shows the methods for grading fertility-awareness into one of four categories (none, poor, moderate or high). Only those graded with high fertility-awareness were considered to have sufficient knowledge to accurately identify the fertile window of the menstrual cycle. Data were analysed in Excel to determine the socio-demographic characteristics of the study sample, attitudes towards fertility-awareness and use of the fertile window. These attributes are expressed in percentages. A regression analysis was

Table 1 Methods for grading fertility-awareness into 1 of 4 categories.

Fertility-awareness categories	Methods
None	Answered: 'Never' aware of the fertile days of the menstrual cycle
Poor	Awareness of the fertile days was based on the rhythm method, perceived ovulation pain or poor knowledge of the mucus method
Moderate	Demonstrated accurate knowledge of the mucus method, but had not documented a minimum of three menstrual cycles with this method
High	Demonstrated accurate knowledge of either the mucus or temperature method and had documented a minimum of three menstrual cycles with either method or both methods

undertaken in SPSS (Statistical Package for Social Science Inc 1995) to determine the factors associated with high fertility-awareness; a factor with a p value of 0·05 or less was considered to be statistically significant (Pallant 2007).

Reliability

The questionnaire was tested for reliability with Kappa Measure of Agreement in SPSS (Stastical Package for Social Science Inc (1995)) to determine inter-rater agreement between the two clinicians who assessed each questionnaire for fertility-awareness, with a resultant value of 0·82. A Kappa value of 0·5 represents moderate agreement, above 0·7 represents good agreement and above 0·8 represents very good agreement (Pallant 2007).

Results

Two hundred and four of 282 distributed questionnaires were completed providing a total response rate of 72·2%; 105 (51·5%) were completed in the inner metropolitan clinic and 99 (48·5%) were completed in the outer metropolitan clinic.

Demographic characteristics

Table 2 presents the socio-demographic characteristics and diagnosed causes of infertility in the study sample; 89 (43·6%) were 36 years or more, 124 (60·8%) had completed a university degree and 170 (83·3%) had attempted conception for 12 months or more. Two hundred (98·1%) had attended at least one general practitioner appointment about their fertility problem, 125 (61·8%) had attended at last two or more fertility specialist appointments and 161 (78·9%) had been given a diagnosis for their infertility.

Fertility-awareness knowledge and practice

One hundred and seventy-seven (88·1%) believed they were either often aware or sometimes aware of the fertile days of the menstrual cycle. Table 3 summarizes knowledge and practice of the three fertility-awareness methods showing that all were poorly understood and poorly applied. Twenty-six (12·7%) combined accurate knowledge of either the temperature or mucus method with documentation of a minimum of three menstrual cycles and were therefore graded as having high fertility-awareness; most were graded as having either no fertility-awareness (11·8%) or poor fertility-awareness (52·5%) (Table 4). Inter-rater agreement was high with Kappa = 0·82.

Table 2 Socio-demographic characteristics and diagnosed causes of infertility in the study sample.

	N = 204	%	Number missing
Site			
Inner metropolitan ART service	105	51·5	
Outer metropolitan ART service	99	48·5	
Age			
25 years or less	4	2	
26–35 years	111	54·4	
36 years or older	89	43·6	1
Highest level of education attained			
Completed primary school	2	1	
Completed secondary school	55	27	
Completed a trade course	21	10·3	
Completed a university degree	124	60·8	2
Average length of menstrual cycle			
26 days or less	26	12·9	
27–35 days	148	73·3	
>35 days	12	5·9	
Irregular	16	7·9	2
Years tried to conceive naturally			
<1 year	28	13·7	
1–2 years	100	49	
3 years or more	70	34·3	6
General practitioner consultations attended			
1 only	99	48·5	
2–3 times	76	37·3	
4 times	25	12·3	4
Fertility specialist consultations attended			
1 only	77	37·7	
2–3 times	84	41·2	
4 times	41	20·6	2
Infertility diagnoses			
Yes	161	78·9	
No	38	18·6	5
Diagnosed causes of infertility (respondents could tick one or more diagnosed causes)			
Combined male and female factor problems	141 (161)	87·5	
Male Factor	59 (161)	36·6	
Unexplained	38 (161)	23·6	
Blocked fallopian tubes	29 (161)	18·0	
Poly cystic ovaries (PCOS)	28 (161)	17·3	
Endometriosis	29 (161)	18	
Other (poor organ development, no fallopian tubes, ovarian malignancy, abnormal ovarian reserve, previous ectopic pregnancy, mumps, vasectomy, lupus erythematosus, tubal ligation, and carriers of genetic disorders)	16 (161)	0·09	

Table 3 Knowledge and practice of fertility-awareness methods in infertile women.

	N = 204	%	Missing data
Rhythm-based approach			
Perceived awareness of the fertile days either often or sometimes	177	88·1	2
Mucus method			
Often aware of mucus changes	58	28·4	23
Knew the mucus type that indicates the fertile time	48	23·5	
Could describe the mucus change that indicates the beginning of the fertile time	44	21·5	
Could describe the mucus change that indicates the end of the fertile time	26	12·7	
Had documented a minimum of three menstrual cycles with the mucus method	26	12·7	
Temperature method			
Ever used the temperature method	72	35·2	29
Knew the temperature change that indicates the occurrence of ovulation	11	5·3	7
Knew the fertile time of the menstrual cycle based on the temperature change	14	6·8	2
Had documented a minimum of three menstrual cycles with the temperature method	50	24·5	

Use of the fertile period

One hundred and twenty-two women (68·2%) believed they had timed intercourse mainly within the fertile window of the menstrual cycle in their attempts at conception.

Attitudes to fertility-awareness

One hundred and ninety-one (94·5%) either agreed or strongly agreed that a woman should receive fertility-awareness education when she first reports trouble conceiving to her doctor and 150 (75·4%) either agreed or strongly agreed that timing intercourse within the fertile window of

Table 4 Number and percentages of infertile women graded into 1 of 4 fertility-awareness categories.

Fertility-awareness categories	N = 204	%
None	22	11·8
Poor	106	52·5
Moderate	49	24
High	26	12·7

the menstrual cycle can help some infertile couples to conceive naturally. One hundred and fifty-eight (86·8%) actively tried to improve their fertility-awareness using information from one or more sources. Table 5 lists the sources and shows the number of different sources individual women had accessed. A regression analysis shows that those women with high fertility awareness had accessed several fertility-awareness information sources (P = 0·001) (95% CI: 0·177–0·714). No association was found with the location of the ART clinic (inner or an outer metropolitan Melbourne), age, years tried to conceive, number of general practitioner or fertility specialist appointments attended, highest educational level attained, diagnosed cause of infertility or any one source of information.

Discussion

In this study we measured attitudes towards fertility-awareness in women having trouble conceiving, reported on their attempts at improving their knowledge and compared perceived fertility-awareness against actual fertility awareness in these women. Not only did most women have poor fertility awareness, most also significantly over estimated the little knowledge they had. Both of these situations can have implications for women's capacity for family planning self-care (Frank-Herrmann *et al.* 2005).

Table 5 Fertility-awareness information sources and the number of sources individual women accessed.

	N = 204	%	Number missing
Actively tried to improve their knowledge			
Yes	158	86·8	
No	24	13·2	22
Sources of the information			
Internet	101	49·5	
Book	89	43·6	
General practitioner	63	30·0	
Friend	54	26·6	
IVF clinic	37	18·1	
Other	6	2·9	
Natural fertility teacher	10	4·9	
Number of information sources individual women accessed			
1	48	23·5	
2	45	22·1	
3	35	17·2	
4 or more	29	15·2	

Women having trouble conceiving by and large had positive attitudes towards fertility-awareness with most wanting to know and understand this aspect of their reproductive capacity and be sure of timing intercourse correctly within the fertile window. Why only 31·9% sought the information from their doctor and most looked to other sources (particularly the internet and books) is unknown. However, current guideline recommendations combined with poor knowledge of the temperature and mucus methods among general practitioners (Stanford *et al.* 1999) may in part explain this. The role of the practice nurse in providing this education has not previously been explored. However, fertility-awareness education fits well with nursing practice in general because of its holistic and educational focus in promoting patient health (Fehring 2004). Promoting capacity for self-care agency is a critical element of Orem's theory of self-care (Denyes *et al.* 2001).

The fact that the greater majority (86·8%) actively tried to improve their fertility awareness from one or more sources of the information, but only 12·7% could accurately identify the fertile window, raises questions about the quality and accuracy of the information sources women are accessing and also the fact that the educational needs of women to integrate fertility-awareness information into knowledge and practice is not being addressed. In contrast, 80% of women who were having trouble conceiving and who had attended a trained teacher of fertility-awareness methods could identify the fertile window of the menstrual cycle (Blake *et al.* 1997). Education of doctors (particularly general practitioners) in fertility-awareness methods and greater utilization of trained teachers by doctors and fertility specialists for women having trouble conceiving may ameliorate this discrepancy.

Although intercourse 2–3 times per week (as the current guideline recommends) will probably result in one to two acts of intercourse occurring within the fertile window, this regimen may be difficult for some couples to maintain and unsatisfactory for others for a number of reasons (Scarpa *et al.* 2007). In the ideal health system which promotes health literacy, self-care and prevention in PHC, all couples having trouble conceiving who wish to time intercourse within the fertile window should be supported to attain high fertility-awareness and only be referred on to ART clinics after applying this approach in a minimum of six menstrual cycles, as this is necessary to optimize the chance of natural conception (Wilcox *et al.* 1995, Colombo & Masarotto 2000, Stanford *et al.* 2002).

We confirm that most women seeking fertility assistance cannot accurately identify the fertile window of the menstrual cycle (Blake *et al.* 1997). We also confirm that there

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What is already known about this topic

- Infertility is an important health issue worldwide.
- Couples having trouble conceiving are increasingly more likely to be referred on to assisted reproductive technology clinics.
- Assisted reproductive technology treatment is expensive and associated with increases in morbidity and mortality for both mothers and babies.

What this paper adds

- Most women who are having trouble conceiving attempt timed intercourse within what they believe to be the fertile window of the menstrual cycle.
- The majority of women attending assisted reproductive technology clinics cannot accurately identify the fertile window of the menstrual cycle.
- Fertility-awareness education is lacking in primary health care.

Implications for practice and/or policy

- Greater emphasis should be placed on educating women about fertility-awareness when they first report trouble conceiving to their doctor. This may be a potential role for practice nurses in primary healthcare services, as the Australian government has identified practice nurses as future key providers of preventive health activities.
- The educational preparation of practice nurses to provide fertility-awareness education is unknown, but thought to be poor.
- Determining their educational requirements and designing a programme of education is the next step to developing a new model of care with the aim of reducing infertility in primary health care.

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is no association between high fertility-awareness and socio-economic status (Sievert & Dubois 2005). Fewer women in our study compared with Blake *et al.*'s (1997) study were diagnosed as having unexplained infertility (23·6% vs. 57%) and significantly more as having a male factor fertility problem (36·6% vs. 8%). Another notable difference was that 68·2% attempted timed intercourse in our study compared with only 15% in Blake *et al.*'s (1997) study. The demographic characteristics of our study sample are similar to those reported in previous studies of infertile women seeking fertility assistance in Australia with a statistically significant proportion (43·6%) being 36 years or

more and most being well educated (60·8% had a tertiary degree) (Hammarberg & Clark 2005).

Addressing modifiable lifestyle risk factors such as the poor fertility-awareness of sub-fertile women in PHC is one way to optimize the chance of natural conception. It may reduce the risk of unnecessary ART treatment and the increased health risks for mothers and babies associated with its use (Mourad *et al.* 2008). It is also one way of providing a safe, low cost, self-help intervention for optimizing natural conception with the added benefits of it being compatible with those who choose not to utilize ART treatment or cannot access ART treatment (Stanford *et al.* 1999, Eshre Capri Workshop Group 2004, Zinaman 2006).

Implications for nursing practice

In alignment with the underlying philosophy of Orem's self-care theory, greater emphasis should be placed on educating women about fertility awareness when they first report trouble conceiving to their doctor. This may enable this group of women greater self-care agency in managing their sub-fertility. This may be a potential role for practice nurses to embrace in PHC services, as the Australian government has identified practice nurses as future key providers of preventive health activities. However, the educational preparation of these nurses to provide fertility-awareness education is unknown, but thought to be poor. Determining their educational requirements and designing a programme of education is the next step to developing a new model of care with the aim of reducing infertility in PHC.

Limitations

Our findings are limited by the quantitative nature of our data and the fact that we limited our sample to two metropolitan ART clinics in a major city in Australia. We were also unable to measure the clinical significance of sub-optimal fertility awareness in these women. Additional research is necessary in a well designed clinical trial to measure the impact of high fertility-awareness on time-to-pregnancy and therefore risk of infertility and unnecessary ART treatment.

Conclusions

Most women seeking assistance at ART clinics attempt timed intercourse within the fertile window of the menstrual cycle. However, few can accurately identify this window, suggesting that poor fertility-awareness may be a contributing cause of infertility. It would appear that a gap exists between what women desire in relation to fertility-awareness education;

with the knowledge and understanding of those immediate health professionals with whom this group of women first approach. Additional research and development is required in the field of fertility-awareness education to enable practice nurses to provide appropriate care and support in assisting these women to achieve greater self-care agency.

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Conflict of interest

No conflict of interest has been declared by the authors.

Author contributions

All authors meet at least one of the following criteria (recommended by the ICMJE: http://www.icmje.org/ethical_1author.html) and have agreed on the final version:

- substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;

- drafting the article or revising it critically for important intellectual content.

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