

Lifestyle Behaviours in Women Undergoing In Vitro Fertilization (IVF) in Singapore: A Cross Sectional Survey

This article was published in the following Scient Open Access Journal:

Women's Health & Gynecology

Received January 12, 2016; Accepted January 29, 2016; Published February 05, 2016

Tan SQ*, Huang EY, Lau MSK, Viardot V, Teo S, Chan J, Tan HH and Nadarajah S

KK Women's and Children's Hospital, 100, Bukit Timah Road, Singapore

Abstract

Objective: With emerging evidence that lifestyle factors impact on fertility outcomes, proper pre-treatment counseling of patients is essential to optimize reproductive outcomes. We conducted a survey to look into modifiable lifestyle differences in women before an in-vitro fertilization (IVF) cycle, in hope to evaluate our current counseling process for IVF patients with regards to lifestyle modification.

Design: A cross sectional survey was performed at our IVF center in KK Women's and Children's Hospital. Survey forms were handed out to all women who were enrolled in the IVF program attending the pre-IVF counseling. Questions explored modifiable lifestyle habits in the past week, as well as five years ago.

Results: 106 women participated in our survey. 99 complete entries were analyzed. Prior to their IVF cycle, 35% exercised, 2% smoked, 14% drank alcohol, 73% drank caffeinated drinks, 26% consumed herbs and 10% underwent acupuncture. Compared to habits 5 years ago, 74% exercised, 5% smoked, 24% drank alcohol, 80% drank caffeinated drinks, 27% consumed herbs and 12% underwent acupuncture. There were statistically significant changes in lifestyle habits in the areas of exercise, alcohol and caffeine intake ($p < 0.05$).

Conclusion: Detailed lifestyle questioning should be integrated into IVF counseling sessions to facilitate public education on modifiable lifestyle habits before ART cycles, especially in the areas of exercise and acupuncture use in our local setting.

Keywords: IVF, Lifestyle habits, Herbs, Acupuncture, Exercise, Smoking, Caffeine

Introduction

With later marriages, Singaporeans are having their first child at a later age. There is an increasing trend for childless Singaporeans to turn to in-vitro fertilization (IVF). In 2006, IVF babies accounted for 1.3% of our total birth rate. The move toward government co-funding of IVF treatment cost in public hospitals in 2008 has led to a consequently higher uptake of IVF in our population.

Research has drawn light on many lifestyle habits associated with reduced IVF success rates, many of which are modifiable. A recent study on lifestyle behaviors in women undergoing IVF conducted in Boston by Domar, et al. [1] suggested that a surprising number of IVF patients continued with regular alcohol and caffeine use, with vigorous exercise and use of herbs against physician's recommendations. More counseling can be done with respect to modifiable lifestyle behavior habits of patients pursuing IVF in hope to maximize success rates.

Our study aims to identify modifiable lifestyle behaviors of women prior to an IVF cycle in our local population to critically evaluate our current counseling for IVF patients with regards to modifiable lifestyle habits.

Methods

This is a cross sectional study where a survey was distributed to all women scheduled to undergo an IVF cycle at our KK Women's and Children's Hospital IVF center during our study period between August to September 2012. There was no exclusion criterion. The survey questions were modeled after those done by Domar, et al. [1]. Lifestyle questions included areas with regards to exercise, smoking, alcohol consumption, sleep, caffeine intake, herbs, acupuncture and fruits and vegetable consumption. The same question set was asked for the current lifestyle in the last week, as well as 5 years before. A copy of the sample questionnaire is attached in the Appendix for reference.

*Corresponding author: Tan Shu Qi, Resident, KK Women's and Children's Hospital, 100, Bukit Timah Road, Singapore 229899, Tel: +65 6394 1062, Email: shuqitan@gmail.com

This study protocol gained ethical approval from the Singhealth Centralized Institutional Review Board.

Survey forms were handed out to patients at their pre-IVF counseling. Sample size estimation was not performed, as the primary objective of this study was to have a preliminary assessment of the lifestyle habits of women in our local population prior to an IVF cycle. Our target sample size was 100. The invitation was offered until our target sample size was achieved. It was clearly explained to the patient the data for the period in the past 5 years pertains to what the patient was doing 5 years ago, rather than an average over the last 5 years. No incentives were given for completing the survey, and the purpose of the survey was clearly explained to the participants. The participants' identities were anonymous, and the patients could return their survey forms at the front desk should they consent to being part of the study. As such, informed consent was assumed when they returned the completed survey forms. The results were subsequently analyzed.

Two sided t-tests were used to test for a statistically significant difference in results between reported behavior between the past week, and 5 years ago. The focus was on binary (yes/no) questions including exercise, smoking, alcohol, caffeine, herb use, participation in acupuncture, and daily consumption of five servings of fruits and vegetables. A *p* value<0.05 was considered statistically significant.

Results

A total of 126 women were approached, of which 106 survey forms were returned. This corresponded to a response rate of 84.1%. Seven survey forms were excluded because of incomplete response. The remaining 99 survey forms were analyzed.

Most of our respondents (82.8%) were within the 30-39 age groups. The majority was Chinese (73.7%), and had received tertiary education (48.5%). The characteristics of the participants are summarized in Table 1.

	n = 99	Percentage
AGE		
<30	8	8.1%
30-34	41	41.4%
35-39	41	41.4%
40-45	9	9.1%
RACE		
Chinese	73	73.7%
Malay	6	6.1%
Indian	13	13.1%
Others	7	7.1%
EDUCATION LEVEL		
Secondary	22	22.2%
Junior College or Diploma	29	29.3%
Degree and above	48	48.5%
EMPLOYMENT		
Yes	79	79.8%
No	20	20.2%
HOUSEHOLD INCOME (n = 100)		
< SGD 1000	3	3.0%
SGD 1001 – 2500	15	15.2%
SGD 2501 – 5000	38	38.4%
> SGD 5000	43	43.4%

Table 1: Characteristic of participants in the survey

While our sample size is small, we did find a few items for subjects which positively altered their important health behaviors prior to commencement of the IVF program. Comparing behaviors prior to starting IVF and 5 years before, we found a statistically significant decrease in exercise (*p*<0.001), alcohol use (*p*=0.004) and caffeine intake (*p*=0.023). No significant change was noted in areas of smoking, sleep, use of herbs and acupuncture, as well as fruit/vegetable consumption. The results are summarized in Table 2.

Behaviour	In the past 5 years N (% of sample)	In the past week N (% of sample)	P value
EXERCISE			
Have you exercised?			
Yes	73 (73.7%)	35 (35.4%)	<0.001
No	26 (26.3%)	64 (64.6%)	
Time spent on exercise each time			
0 min (no exercise)	26 (26.3%)	64 (64.6%)	
1-15 min	16 (16.1%)	9 (9.1%)	
16-30 min	36 (36.4%)	15 (15.2%)	
31-60 min	19 (19.2%)	7 (7.1%)	
>60 min	2 (2.0%)	4 (4.0%)	
Intensity of exercise			
1-5 (low)	56	29	
6-10 (high)	17	6	
SMOKING			
Do you smoke?			
Yes	5 (5.1%)	2 (2.0%)	0.248
No	94 (94.9%)	97 (98.0%)	
How many cigarettes do you smoke a day?			
0	94(95.0%)	97 (98.0%)	
1-5	3 (3.0%)	1 (1.0%)	
6-10	1 (1.0%)	1 (1.0%)	
11-15	1 (1.0%)	0 (0%)	
ALCOHOL			
Do you drink alcoholic beverages?			
Yes	24 (24.2%)	14 (14.1%)	0.004
No	75 (75.8%)	85 (85.9%)	
On average, how many drinks do you consume each day?			
0	75 (75.8%)	85 (85.9%)	
1	18 (18.2%)	10 (10.1%)	
2	3 (3.0%)	3 (3.0%)	
3	2 (2.0%)	1 (1.0%)	
>4	1 (1.0%)	0 (0%)	
SLEEP			
How many hours do you sleep on average?			
4-5	3 (3.0%)	3 (3.0%)	
5-6	16 (16.2%)	14 (14.1%)	
6-7	33 (33.3%)	37 (37.4%)	
7-8	37 (37.4%)	35 (35.4%)	
8-9	8 (8.1%)	8 (8.1%)	
>9	2 (2.0%)	2 (2.0%)	
CAFFEINE			
Do you drink any caffeinated drinks?			
Yes	79 (79.8%)	72 (72.7%)	0.023
No	20 (20.2%)	27 (27.3%)	
How many caffeinated drinks do you drink a day?			
0	20 (20.2%)	27 (27.3%)	
1	42 (42.5%)	41 (41.4%)	
2	31 (31.3%)	27 (27.3%)	
3	4 (4.0%)	2 (2.0%)	

4	2 (2.0%)	1 (1.0%)	
5	0 (0%)	1 (1.0%)	
HERBS/ACUPUNCTURE/DIET			
Do you consume herbs or traditional Chinese medicine?			
Yes	27 (27.3%)	26 (26.3%)	1.000
No	72 (72.7%)	73 (73.7%)	
Do you use acupuncture?			
Yes	12 (12.1%)	10 (10.1%)	0.773
No	77 (77.8%)	79 (79.8%)	
No response	10 (10.1%)	10 (10.1%)	
Do you eat 5 servings of fruits and vegetable?			
Yes	37 (37.4%)	36 (36.4%)	1.000
No	52 (52.5%)	53 (53.5%)	
No response	10 (10.1%)	10 (10.1%)	

Table 2: Retrospective accounts of lifestyle behaviors recorded for the "last week" and "last 5 years" time frames (n = 99, 7 entries rejected, total 106 surveys)

Discussion

The impact of lifestyle behavior on IVF outcome has been well described in many papers. The huge emotional and financial burden on these IVF patients also fuels their interest as to which are the modifiable lifestyle habits they can work on to maximize the probability of a successful IVF cycle. It is logical to assume that this group of IVF patients would avoid lifestyle behaviors that would have adverse effects on IVF outcomes. Our results support this hypothesis, and reflect a reasonable change in lifestyle habits.

A significant number of women decreased their exercise frequency prior to IVF cycle ($p < 0.001$), which is not ideal. An active lifestyle in the preceding year seems to have a favorable impact on the IVF outcome [1]. The adverse effects of obesity and reduced exercise are well documented; with up to a 30% reduction in pregnancy rate and 30% increase in miscarriage rate [1]. More should be done at our center to promote exercise. The reason for reduced exercise frequency should be clarified to clear misconceptions that they should not be exercising. Nevertheless, among the women who exercise, most participated in low intensity exercise regimes (Table 2). This is beneficial for IVF cycles as it has been shown that vigorous cardiovascular exercise was associated with a 30% lower chance of successful live birth (OR 0.7) [2-4]. Our survey lacked BMI assessment, which would have been useful to assess correlation of the patient's weight to their exercise regimes. Morans, et al. [5] have shown that a nutritionally adequate high-protein weight loss diet coupled with a moderate exercise regimen resulted in a significant reduction of weight and waist circumference. This combination was associated with increased odds of pregnancy, and overall pregnancy rate of 53%. Proper assessment of our patient's personal profile should be integrated with suitable exercise advice prior to their IVF cycles to maximize their clinical pregnancy rates.

The smoking prevalence is low in our patient group. This is comparable to that of our Singapore population of 4% as shown through our National Health Surveillance Survey (NHSS) in 2007 [1]. Compared to 5 years ago, there was a decrease in number of cigarettes smoked a day. Cigarette smoking has been associated with adverse reproductive outcomes and higher risk of IVF failure rates [2]. A large Dutch retrospective cohort study (OMEGA study) [2] looked at 19 840 women who underwent IVF treatment between 1983 and 1995. It was found that women

who smoked had a significantly higher abortion rate than non-smoking women, and the effect of smoking was comparable to an increase in female age with 10 years, from age 20 to 30 years. As such, ESHRE group has suggested that smoking women need up to twice the number of IVF cycles to conceive as non-smokers [3]. Even though our study did not show any significant change in smoking habits ($p=0.248$), given the well-documented scientific evidence of the detrimental effects of smoking on pregnancy, reduction or even cessation of smoking could positively improve IVF outcomes. We attribute our data on cigarette smoking to be due to small sample size, leading to a small proportion of smokers in the study group. A statistically significant difference should be achieved with a larger study population in further studies. In addition, side stream smoking (second-hand smoking) has also been shown to negatively affect IVF outcomes. A Canadian study [2] in 2005 concluded that implantation and pregnancy rates were lower in mainstream as well as side stream smokers, compared to non-smokers. The detrimental effects of cigarette toxicants on poor IVF outcomes have been widely studied in both male and female reproductive functions. Deleterious effects on spermatogenesis, sperm function, oocyte quality, oocyte competence, decreased embryonic proliferation, cell attachment and suboptimal trophoblastic invasion have accounted for these poor outcomes. Further studies could be conducted to include family and partner smoking habits to better educate our couples prior to ART cycles [6-10].

Our study showed a statistically significant trend toward reduction in alcohol consumption prior to IVF cycle ($p=0.004$). This is heartening in view of emerging evidence to suggest that female alcohol consumption prior to IVF attempt adversely affects the oocyte retrieval and leads to lower pregnancy and higher miscarriage rates [2]. These effects are found to be dose-dependent and considerably greater when timing of consumption was closer to the IVF attempt. Rossi, et al. have also warned when both partners drank at least four drinks per week, there is a 21% lower odds of having a live birth compared with couples in which both drank fewer than four drinks per week [11]. The reduction in alcohol consumption prior to IVF cycles reflects positively on our counseling process. However, the overall alcohol consumption is still low in our Singapore population compared to Western society [6]. Interestingly, Rossi, et al. also compared the type of alcohol intake (white wine, red wine, hard liquor) in women and their IVF clinical pregnancy and live birth rates. It has been found that women drinking white wine weekly had 22% significant greater odds of failed implantation, and had significant fewer oocytes retrieved compared with non-drinkers of white wine [11]. However till date, there is no knowledge on the exact consequences on reproduction with different types of alcohol. We can only postulate that various types of alcohol may have different biologic influences on reproductive health. Further studies are required to establish a causal link between the different types of alcohol and poor IVF outcomes.

Of interest, there is also a statistical reduction in the consumption of caffeinated drinks prior to the IVF cycle in our population. Consumption of more than 2mg of caffeine a day is significantly associated with failure to achieve a live birth, even if the caffeine use was low [12]. Al-Saleh, et al. [13] suggested that the number of eggs retrieved decreased as caffeine serum levels increased ($p<0.011$). Although it is hard to quantify the

amount of caffeine in each drink, minimizing their caffeine intake is important during IVF cycling.

There is no change in the number of women who use herbs and traditional Chinese medicine (TCM). Boivin, et al. looked at the effect of concurrent use of complementary and alternative medicines (CAM) during IVF, and found that it was associated with 30% lower pregnancy rate that could not be explained by poor prognosis or other lifestyle factors [14]. Boivin's study encompassed a huge range of CAM methods including acupuncture, kinesiology, homeopathy, healing, herbal supplements or any other interventions, which may not be truly reflective of the effect of herbs and acupuncture on IVF alone. However, it highlights the importance of education about the possible antagonist effects of herbs with IVF. This is especially relevant in our population due to the high usage of TCM in our Chinese patients. Direct questioning on CAM use is encouraged, as it has been shown that less than 1% of fertility doctors enquire about its use [14]. In a review of CAM use in a British population, it has been shown that infertile patients in general have a greater CAM usage for their infertility compared to the general population [1]. The same study observed a higher use of CAM among women from private clinic, which may reflect the greater financial ability to afford the cost of CAM. However, this relationship of higher CAM use with higher income bracket was not seen in our study. Coulson, et al. [15] postulated that patients accessed CAM for sense of well-being in view of the ART treatment stress. While we agree that could be a contributing reason for TCM, our Asian culture remains to be a strong influence on TCM use.

Acupuncture use has been increasingly common worldwide to complement IVF treatment. The timing of use is crucial. A Cochrane review [16] has shown evidence of benefit only when acupuncture is performed on the day of embryo transfer (ET) on the live birth rate (OR 1.86, 95% CI 1.29 to 2.77). There is no evidence of benefit on pregnancy outcomes when it is performed two to three days after ET (OR 1.79, 95% CI 0.93 to 3.44), or when acupuncture is performed around the time of oocyte retrieval. A meta-analysis by Manheimer, et al. [17] concluded that 10 women would need to be treated with acupuncture to bring about one additional clinical pregnancy. Our study showed no statistical difference in the number of women receiving acupuncture in the past 5 years and prior to the IVF cycle. However, we acknowledge that there is no formal counseling on the acupuncture with the use or timing of IVF. Understanding the type of acupuncture use in our IVF population is important to aid education in this area, and a more detailed questionnaire needs to be formulated to address this deficiency in our counseling.

Conclusion

Our study, though small, highlights areas of modifiable lifestyle habits which can be improved in our patient IVF counseling. The retrospective approach of this study subjects our data to recall bias. However, the current lifestyle habits are our primary concern. Detailed lifestyle counseling should be integrated into

IVF sessions to facilitate public education on modifiable lifestyle habits before ART cycles. This is especially relevant to correct generalized public misconceptions, especially in the areas of exercise and acupuncture use.

References

1. Domar AD, Conboy L, Denardo-Roney J, Rooney KL. Lifestyle behaviors in women undergoing in vitro fertilization: a prospective study. *Fert Steril*. 2012;97(3):697-701.
2. Evenson KR, Calhoun KC, Herring AH, Pritchard D, Wen F, Steiner AZ. Association of physical activity in the past year and immediately after in vitro fertilization on pregnancy. *Fertil Steril*. 2014;101(4):1047-1054.
3. ESHRE Task Force on Ethics and Law, Dondorp W, de Wert G, et al. Lifestyle-related factors and access to medically assisted reproduction. *Human Reprod*. 2010;25(3):578-583.
4. Morris SN, Misser SA, Cramer DW, Powers RD, McShane PM, Horstein MD. Effects of lifetime exercise on the outcome of in vitro fertilization. *Obstet and Gynecol*. 2006;108(4):938-945.
5. Moran L, Tsagareli V, Norman R, Noakes M. Diet and IVF pilot study: Short-term weight loss improves pregnancy rates in overweight/obese women undertaking IVF. *Aust N Z J Obstet Gynaecol*. 2011;51(5):455-459.
6. Statistics Singapore Newsletter, Personal Health Practices - Different patterns in males and females, 2009, Epidemiology & Disease Control Division, Ministry of Health.
7. Dechanet C, Anahory T, Mathieu Daude JC, et al. Effects of cigarette smoking on reproduction. *Human Reprod Update*. 2011;17(1):76-95.
8. Linsten AM, Pasker-de Jong PC, de Boer EJ, et al. Effects of subfertility cause, smoking and body weight on the success rate of IVF. *Human Reprod*. 2005;20(7):1867-1875.
9. Neal MS, Hughes EG, Holloway AC, Foster WG. Side stream smoking is equally as damaging as mainstream smoking on IVF outcomes. *Human Reprod*. 2005;20(9):2531-2535.
10. Nicolau P, Miralpeix E, Sola I, Carreras R, Checa MA. Alcohol consumption and in vitro fertilization: a review of the literature. *Gynecol Endocrinol*. 2014;30(11):759-763.
11. Rossi BV, Berry KF, Hornstein MD, Cramer DW, Ehrlich S, Missmer SA. Effect of alcohol consumption on in vitro fertilization. *Obstet and Gynecol*. 2011;117(1):136-142.
12. Klonoff-Cohen H, Bleha J, Lam-Kruglick P. A prospective study of the effects of female and male caffeine consumption on the reproductive endpoints of IVF and gamete intra-fallopian transfer. *Human Reprod*. 2002;17(7):1746-1754.
13. Al-Saleh, El-Doush I, Griselli B, Coukun S. The effect of caffeine consumption on the success rate of pregnancy as well various performance parameters of in-vitro fertilization treatment. *Med Sci Monit*. 2010;16(12):598-605.
14. Boivin J, Schmidt L. Use of complementary and alternative medicines associated with a 30% lower ongoing pregnancy live birth rate during 12 months of fertility treatment. *Human Reprod*. 2009;24(7):1626-1631.
15. Coulson C, Jenkins J. Complementary and alternative medicine utilization in NKS and private clinic settings: a United Kingdom Survey of 400 infertility patients. *J Exp Clin Assist Reprod*. 2005;2:5.
16. Cheong YC, Hung Yu Ng E, Ledger WL. Acupuncture and assisted conception (Review). *Cochrane Database Syst Rev*. 2011;(4).
17. Manheimer E, Zhang G, Udoff L, et al. Effects of acupuncture on rates of pregnancy and live birth among women undergoing in vitro fertilization: systemic review and meta-analysis. *BMJ*. 2008;336(7643):545-549.