Dedication

This thesis is dedicated to my mother, Uma Mahajan, whose love and support made me tide over all rough waters and to be where I am today, and to the fond memory of my father, Naresh Mahajan, who opened up my mind to the world and instilled in me the drive to learn, achieve and excel.
Acknowledgements

I am privileged to have reached the stage in my candidature when I can acknowledge the contributions of all those who have helped me through different stages of my PhD. This thesis is the result of more than three years of devoted work in the field of infertility. During all these years, my supervisors, my family and several other people whom I associated with have guided and supported my work. But more than everybody else, I would like to thank God Almighty for providing me the opportunity to be associated with all these people and helping me on every step of my way.

I am deeply indebted to my supervisors Prof. Deborah Turnbull, Prof. John Taplin, Dr. Michael Davies and Dr Umesh Jindal for providing me their much-appreciated inputs at various stages of my PhD.

I would like to thank Professor Deborah Turnbull for her mentorship and her trust in my ability to accomplish the goals set for me throughout the doctoral program. Her trust in me and my desire to surpass her expectations has been the force driving this project. She always emphasized on sound scholarship, critical inquiry and objectivity, and this has added immensely to my development. This thesis is the outcome of the long hours that she has spent in making me understand the finer details at each stage of this project - from planning to reading of the final draft of the thesis.

I would like to thank Prof John Taplin for his stimulating suggestions and continuous encouragement. In spite of his understandably busy schedule, he always found adequate time to oversee my studies and to share his knowledge and expertise with me. He has always led me to believe in myself through his unfaltering trust in my work and me. I invariably looked forward to my supervisory meetings with him. His words of
appreciation for my work have instilled in me the courage of conviction and the desire to excel, and this I believe will go a long way in my life.

I would like to thank Michael Davies for reading the drafts of my thesis. I particularly appreciate him for raising important points and making valuable suggestions while reading my drafts.

I would like to thank Dr Umesh Jindal for all her support and guidance that she provided while I was in India for my fieldwork. She not only helped me with ethics approvals and data collection by providing access to the patients and hospital records, but also went several steps further in explaining me the details of the IVF medical protocol. She helped me in understanding patients’ ultrasound scans for follicular development, grading of their oocytes retrieved and the embryos transferred, and even allowing me to observe several IVF procedures in the laboratory and operation theatre. The level of insight that I have developed about the IVF procedures through my association with her is far beyond what I had anticipated.

I would like to thank Dr Nancy Briggs for providing me statistical support and consultation. The time that she has spent in rigorously analyzing the data for the four studies undertaken in this thesis (chapters 5 to 8) and explaining various statistical concepts to me was often beyond the normal protocol. This has substantially enhanced my ability to understand, interpret and report the results.

Apart from all these people, there are several others who have helped me in my endeavour to produce quality research. I would like to thank Dr. Kate Cadman and Dr. Christina Eira for initiating the process of scientific writing, which I pursued passionately even long after. I thank Phil Thomas for editing my final draft for grammatical and typographic errors and Nichola Bennett for formatting the thesis before the final submission.
I would like to specially thank Dr R.K Sharma, Dr G.K Bedi for providing me access to their patients. I am deeply indebted to all the participants who provided me with all the valuable personal information. I greatly appreciate the Nursing and the administrative staff at the infertility centers involved in this research for making the process of data collection easier.

I am grateful to the federal government of Australia for providing me with an International Postgraduate Research Scholarship (IPRS) and the University of Adelaide for providing me with the Adelaide University Scholarship for doing my Ph D.

Last, but not the least, I would like to thank all my friends and family who kept my spirits high whenever I was tired or low. They had never let me feel alone, even if I was far away from home, and their words of encouragement would often enlighten my path.
Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, so to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I give consent to this copy of my thesis being made available for loan and photocopying.

Neha Naresh Mahajan

September 2007
Abstract

The experience of difficulties in conception, the diagnosis of infertility and its treatment are frequently associated with anxiety and overall distress. However, current understanding regarding the determinants of variability in the levels of distress among women undergoing infertility treatment is limited; and the evidence of the significance of distress as a risk factor for assisted conception following IVF/ICSI is inconsistent. The thesis addressed both these issues.

Overall the thesis is informed by the biopsychosocial model of health and illness. Four studies were conducted. The data was collected in three IVF clinics in India. A consecutive sample of 85 infertile women about to commence IVF/ICSI cycle was recruited in the project at cycle baseline and followed through one treatment cycle. The first two studies examined this sample of women at baseline to identify the biopsychosocial factors associated with infertility related distress. The first study examined the degree of cognitive–behavioural adjustment to infertility, its treatment and treatment related eventualities, while the second study focused on the factors associated with affective aspects of infertility related distress such as increase in negativity and decrease in positivity. The third study examined the pattern of change in stress operationalized in terms of changes in Affect and State Anxiety in a sample of 74 infertile women during an IVF/ICSI cycle. The final study developed a prognostic model for evaluating the unique contribution of baseline distress as well as treatment related stress in estimating the odds of pregnancy following IVF based on a consecutive sample of 73 women.

Collectively, the first two studies indicate that at the outset of the IVF/ICSI cycle, some women are more prone to distress than others, and that this variability is associated with their intrapersonal, interpersonal and sociodemographic attributes. These two studies
have identified a set of protective and vulnerability factors related to cognitive-behavioural and affective aspects of distress. The last two studies clearly indicate that the level of distress tends to rise during the treatment among the majority of infertile women. The rising trend continued to be significant even after controlling for variables known to somewhat influence infertility related distress such as age, education, occupation, employment, financial burden and etiological factors. Further, a prognostic model is developed that proposes that both baseline level of stress and treatment stress make a unique contribution in defining the odds of pregnancy outcome for the patients. In short the thesis clearly brings out the case for integrating psychosocial care with the routine medical interventions for infertility.
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<tr>
<td>AAS</td>
<td>Adult Attachment Style</td>
</tr>
<tr>
<td>AI</td>
<td>Artificial Insemination</td>
</tr>
<tr>
<td>AIDS</td>
<td>Acquired Immuno Deficiency Syndrome</td>
</tr>
<tr>
<td>ART</td>
<td>Assisted Reproductive Technology</td>
</tr>
<tr>
<td>ASRM</td>
<td>American Society of Reproductive Medicine</td>
</tr>
<tr>
<td>CBT</td>
<td>Cognitive Behavior Therapy</td>
</tr>
<tr>
<td>D.I</td>
<td>Dependent Variable</td>
</tr>
<tr>
<td>DI</td>
<td>Donor Insemination (using donor sperm)</td>
</tr>
<tr>
<td>DV</td>
<td>Dependant Variable</td>
</tr>
<tr>
<td>ET</td>
<td>Embryo Transfer (putting fertilized eggs back inside the uterus)</td>
</tr>
<tr>
<td>FSH</td>
<td>Follicle Stimulating Hormone (pregnancy indicating hormone that makes pregnancy tests register)</td>
</tr>
<tr>
<td>GIFT</td>
<td>Gamete Intrafallopian Transfer (fertilized egg is put in the tubes to travel to the uterus)</td>
</tr>
<tr>
<td>GnRH</td>
<td>Gonadotrophin Releasing Hormone</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immuno Virus</td>
</tr>
<tr>
<td>I- Religiosity</td>
<td>Intrinsic Religiosity</td>
</tr>
<tr>
<td>I.V</td>
<td>Independent Variable</td>
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<tr>
<td>ICSI</td>
<td>Intra-Cytoplasmic Sperm Injection (inject sperm directly in the egg)</td>
</tr>
<tr>
<td>IUI</td>
<td>Intrauterine Insemination (sperm is taken out of male and inserted into the female using a clinical device)</td>
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<tr>
<td>IV</td>
<td>Independent Variable</td>
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IVF  In-Vitro Fertilization (Eggs, usually with hyper stimulation, and sperm are removed from the female and male, put together in the lab, incubated, and then returned to the female)

M1  Mediator 1 (First mediator variable of the effect of an independent variable on the dependent variable)

M2  Mediator 2 (Second mediator variable of the effect of an independent variable on the dependent variable)

MOP-1  Meaning of Parenthood 1 (perception of children as natural expectation for the adults)

MOP-2  Meaning of Parenthood 2 (perception of children as natural expectation from marriage and necessary for its completion)

MOP-3  Meaning of Parenthood 3 (perception of children as necessary for sex role confirmation)

NA  Negative Affect

NK- CD56+  Natural Killer Cells

N-Preg.  Non-pregnant

OPU  Ovum Pick Up (surgical removal of eggs/ovum from the ovaries)

PA  Positive Affect

P-I-control  Perceived Internal Control

Preg.  Pregnant

SS-Fam  Social Support from Family

SS-FRI  Social Support from Friends

SS-SO  Social Support from Significant Others

St ANX  State Anxiety

STD  Sexually Transmitted Disease
<table>
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<th>Trait Anxiety</th>
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<tr>
<td>ZIFT</td>
<td>Zygote Intra Fallopian Transfer (fertilized embryo is placed in the tubes to travel and implant in the uterus)</td>
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Structure of Thesis

The large body of scholarship suggests that there is considerable distress and disruption associated with the event of infertility. Besides it suggests the inhibitory role of distress in natural and medically assisted conception. Most of our understanding in the field is based on studies conducted in Western and European settings. Relatively very few studies in this area have been done in non western settings especially India, notwithstanding that currently there are approximately 15-20 million infertile women in India alone and also that assisted reproductive technologies are rapidly gaining popularity.

Due to the emphasis of the Indian government on population control the voice of these women is neither visible in social research, nor in the mental heath research, nor in the public health system. However, such women are conspicuous in their families and the society at large given that at least one child after marriage is a cultural norm.

This suggests the need to understand, how infertile Indian women manage their distress and disruption. Though social and technological changes are markedly evident in the country, some areas of life are not very different from what they were before. Cultural ideology and practices with regards to marriage, family and childbearing have not reflected a substantial change. These still remain predominantly influenced by the religious faith and practices. Most of the religions (e.g. Hinduism, Sikhism, Islam and Christianity) consider motherhood as a sacred duty of married women. Thus the socio-cultural norms mandate childbearing after few years of marriage (usually two years).

Thus the present thesis aim to identify biopsychosocial factors associated with infertility related distress among Indian women who are due to commence infertility treatment i.e.
an IVF/ICSI cycle, and further to understand the pattern of change in stress across the various stages of one treatment cycle, and to evaluate the role of stress in defining the odds of pregnancy following one IVF cycle. The thesis is an attempt to reduce the gap in the current research, knowledge and understanding to inform the clinical practice and health policy.

The thesis is structured into nine chapters. The outline and function of each chapter is described below:

**Chapter 1: Introduction**

This chapter is structured into two parts. The first part provides the overall background and introduces the concept of infertility, its definitions, types and epidemiology. Besides, the chapter discusses the private harm resulting from infertility and role of religious beliefs, societal attitudes and culture in determining the nature and extent of distress experienced by infertile couples.

The second part of this chapter looks into the different problem solving actions that the infertile couples usually take. Such couples may decide to adopt a child or accept a childfree lifestyle or undergo treatment in an attempt to resolve their infertility crisis.

**Chapter 2: Psychosocial dimensions of Infertility**

This chapter presents the historical development of trends in infertility research. The chapter is sectioned into three parts. The first section reviews the classical psychogenic model of infertility that evolved between 1940s and 1960s. This model emphasized the functional role of psychological conflicts and pathologies in the etiology of infertility. Both the emergence as well as the decline in the popularity of the classical model is discussed.
The second section reviews research that identifies infertility as a major life crisis and explores the nature as well as the role of infertility in causing distress and psychopathologies. The emergence of this hypothesis during early 1970s to late 1980’s over-lapped with the decline of the classical psychogenic model.

The third section of the chapter reviews and summarizes the literature on the influence of psychosocial variables on treatment outcomes. This line of research is becoming more and more popular with rapid advancements in reproductive endocrinology, diagnostic instruments and assisted reproductive techniques. This represents the most recent line of research.

**Chapter 3: Influence Exchange Model: Psychosocial Stress and Infertility treatment outcome.**

This chapter exclusively focuses on the infertile couples undergoing treatment and attempts to integrate the findings of previous research that investigated a link between psychosocial stress and outcomes of infertility treatment (primarily IVF/ICSI).

The first section brings out the Biopsychosocial nature of infertility and the psychological morbidity associated with infertility. Further it recommends the application of the biopsychosocial model in infertility care.

In the later section, an integrative model is developed that underscores the psychosocial factors, more particularly, the intrapersonal, interpersonal, lifestyle and socio-demographic factors that influence the dimensions of the experience of infertility related stress as well as its treatment and vice versa. The model also illustrates the way stress manifests at the behavioural, psychological and physiological level and the mechanism by which it can influence the treatment outcomes.

In the last section, the rationale and the broad aim of the current thesis is lineated.
Chapter 4: Methodology

This chapter provides the detailed methodology used in the thesis. The clinical setting in which the research was done, how the patients were recruited, how the data was collected and the instruments used for data collection have been described in detail.

Chapter 5 & 6: Study 1 and study 2

The next two chapters constitute the first two studies of the thesis. Both studies have investigated the association of biopsychosocial factors with infertility related distress. While the first study focuses on the cognitive dimensions of infertility related distress among women undertaking IVF/ICSI, particularly the degree of cognitive behavioural adjustment to infertility and its treatment related eventualities, the second focuses on affective dimensions of infertility related stress. Both studies are complete in themselves and presented in chapter five and six respectively.

Chapter 7: Study 3

This chapter presents the third study of the thesis. The third study focused on identifying the pattern of changes in both positive and negative affect as well as the changes in state anxiety as the patients progress in their infertility treatment through IVF/ICSI. The assessments were done at two important stages of the treatment, i.e. before egg retrieval also known as ovum pick-up (OPU) stage and before embryo transfer (ET) stage.

Chapter 8: Study 4

Chapter 8 presents the fourth and final study of this thesis. This study explores the unique role of treatment stress (change in stress during treatment) in defining the odds of pregnancy. Further, the study tests the role of treatment factors such as quality of
oocytes, embryos and the number of embryos transferred in explaining the phenomenon responsible for the impact of treatment stress on the odds of pregnancy outcome.

Chapter 9: Contributions of the Thesis

This chapter briefly summarizes the four studies undertaken in this thesis and highlights the important findings, the implications of the thesis for health care professionals involved in infertility care and public policy and new research agendas that have emerged from the studies undertaken in this thesis.