

BEHAVIOURAL MODEL BASED STRATEGIES FOR BETTER ADOPTION OF INFERTILITY TREATMENT

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Abstract

Infertility is a global crisis affecting 15% of global population. Rapidly declining sperm counts below critical levels demands immediate attention to make fertility treatment widely available; accessible and affordable; the triple aim in healthcare. Though fertility treatments have advanced in recent years manifold, unfortunately many are still away from accessing the available treatment due to various behavioural influences and biases. Infertility not only affects physical health, but also impacts mental, social and emotional health of individuals and society. Unawareness, guilt, shame and coping issues are some of the strong biases/influences that effect healthcare seeking action. Beneficial effects of behavioural economics (should vs would) has been well studied and applied in health policy and treatment interventions, especially in chronic diseases. A systematic understanding of behavioural stages patients go through during fertility treatment journey; from seeking treatment, adjusting to the multiple cycles of anticipation to welcoming a baby can greatly help individuals access available treatment sooner, in the appropriate way and accept the journey for better outcome with less burden. Providers too will be better equipped to help patients in an informed empathetic counselling once they understand the psycho-behavioural transitions of the patients throughout the journey. Fertility policies, patient education can be designed based on behavioural models that can make fertility treatment accessible at community level.

Keywords: Infertility, psychology, behavioural models, healthcare access, behavioural economics

Introduction

Infertility is a global health issue affecting reproductive age males and females. There are around 48 million couples and 186 million individuals facing the challenges of infertility making it one in every four couples facing this issue around the world according to world health organisation (WHO).¹ By 1967, WHO recognised infertility as a disease and anticipated an yearly addition of two million new infertile couples² and 15% of the couples are facing infertility issues worldwide. Globally it is the fifth highest serious condition and there is a yearly increment of infertility incidence by 0.370%. Declining sperm concentration in males which has increased from 1.2% (1973-2018) to 2.6% (2020 onwards) is a grave concern and looms large on declining fertility trend globally in coming times.³

Infertility is the inability of the couple to conceive after regular unprotected sexual intercourse for more than twelve months (WHO). The incidence varies from developing to developed countries. 15-20% couples of developing nation and 8-10% of the developed nation are having fertility issues. Southern Europe, Eastern Europe and Eastern Asia have the lowest fertility rates in the world.⁴ Fertility treatments have advanced significantly over past decade improving patient outcome. Unfortunately individuals aren't able to access⁵ already available treatments and avail its benefits. Behavioural models; behavioural economics plays a significant role in this barrier.⁶ If we understand this better patients, providers and

policy maker can adapt their respective roles accordingly and bring in better access of already available treatment options.

The aim and objective of this article is to throw light on the various behavioural models that can be used in patient management, so that providers (doctors) and policy makers can effectively communicate patients to seek right treatment in right time. These models will also help fertility clinics to better communicate the patients while on stressful treatment cycle so that the scientific benefits can be availed by them for better outcomes.

Psychosocial issues associated with Infertility:

Procreation and continuation of species is innate to human beings. Involuntary childlessness can be distressing and miserable condition in a couples' life. There are several factors which affect the infertility journey and the spectrum ranges from physiology to psychology.⁷

On individual basis certain behavioural factors like education, awareness, conditioning, belief system, social and cultural factors etc. are responsible for the poor fertility outcome. Education plays an important role. Person having lower educational qualifications lack knowledge and awareness. Contrasting to this women with higher education tend to postpone marriage and childbirth⁸ and face difficulty in conception due to age factor affecting their fertility. Many women lack fertility awareness⁹ also they have inadequate knowledge about the fertility window.¹⁰ People in rural areas lack knowledge and awareness about fertility and they believe that

it happens because of some kind of curse and god's wish and they don't go for treatment rather stick to alternate options. Usually women use their religious/spiritual beliefs to cope with crisis and find a meaning for their suffering.¹¹

Infertile couples go through the phases of grief, the feeling of stress, anxiety, depression, anger, guilt and a sense of loss of their social status.¹² They are isolated from their family, friends and society. Interpersonal relationships also get affected and couples stop sharing their problems. Men and women express their feelings in different ways, while females are more vocal about their problem, men can not express their feelings openly. Infertility treatment can place a strain on relationships, and it is common for couples to experience changes in their communication and interactions with each other during treatment. Couples fail to provide emotional support to each other and play blame game ultimately weakening their bonding. Many times it leads to marital conflicts and divorce. Though it is evident that males are equally responsible for the cause of infertility, still in society women face the major blame and there by widening the gender gap and which increases women's suffering from infertility. They face lot of discrimination and sometimes ostracised. They suffer physical and mental abuse. There is no bar of religion, cast and social standard when it comes to infertility.¹³

Another major barrier is the unavailability of specialist and needed infrastructure to manage infertility especially in developing countries.¹⁴ There are few training institutes

and trained reproductive medicine specialists. The cost of treatment also another barrier for the treatment which many people can not afford. Though assisted reproductive technique (ART) is available since last 40 years but still comprehensive treatments like in vitro fertilisation (IVF) are still inaccessible in most of the low and middle income countries in the world.^{1,15} In addition to this; lower priority given towards infertility by policy makers and government makes access even more difficult in resource poor environments.¹⁶ There is no insurance coverage for infertility treatment so many couple are unable to go for treatment with out of pocket expenses. There has been community efforts like "do it for Denmark"¹⁷ "dutch fertility paradox",¹⁸ in developed nations with lower fertility to boost fertility¹⁹ with mixed results. It is seen that economic support-oriented pattern and gradual-promotion pattern were preferable when promoting infertility-related policies.^{20,21}

Recent decade evidence shows the success of behavioural intervention in management of health and diseases. Infertility being a disease where physical, psychological and social factors playing important role, the application of behavioural intervention to manage infertility has immense possibilities.²²

Behavioural economics combines elements of economics and psychology to understand how and why people behave the way they do in the real world. It differs from neoclassical economics, which assumes that most people have well-defined preferences and make well-informed, self-interested decisions based on

those preferences.²³ Good works like “Predictably Irrational”²⁴; “Thinking, Fast and Slow”²⁵; and “Nudge”²⁶ have established even if people have information available with them, various biases and influences result in the decisions they end up with. When these behavioural models are considered in policy making, it results in better outcome.^{27,28}

The fertility journey can be imagined along with the evolution and life cycle of egg akin preplanning (awareness on egg preservation and time criticality of pregnancy), planning (timely seeking of treatment at appropriate centre), treatment (adherence to treatment protocol and coping) and pregnancy (coping). At every step of this journey there are three groups of stakeholders; individual(s), providers and the community/government/policy makers who are involved in appropriate decision making to make the journey optimal and for best outcome. We discuss in this paper application of behavioural model/economics by respective stakeholders during their decision making for optimal and frictionless fertility journey.

Behavioural models in infertility refer to the psychological and social theories and approaches that inform the practice of infertility counselling and to understand and address the behavioural and coping mechanisms that individuals and couples may adopt as well as to identify potential areas for intervention and support. We discuss the relevant models here.

Biopsychosocial model:

According to biopsychosocial model, to understand health and disease we have to

consider the biological, psychological and social factors rather than only the physical or biological factors affecting it.²⁹ In a similar prospective, to understand infertility, we have to take a holistic approach and consider the biological, psychological and social factors affecting it so that it will improve the understanding and communication skill of the couple and it also can impact the level of understanding and engagement for the treatment.

According to this model infertility is caused by different factors. The biological factors causing infertility are hormonal imbalance leading to ovulatory dysfunction, different anatomical abnormalities, infections, genetic causes or other associated underlying pathology. Psychological factors like stress, anxiety, depression can also have effect on the reproductive potential. Social factors like delayed age of child bearing because of late marriage and other societal obligations, specially in women reduces their chance of getting pregnant. Social infertility which is common nowadays e.g. single woman, homosexual couples, face challenges in bearing children. There comes the issues of third party reproduction where couples are concerned about the phenotypic similarity with parents, disclosure about donor conception, social perception and acceptance issues.³⁰ Other social factors like cultural norms, familial issues, interpersonal issues also play a role in infertility.

So biopsychosocial model emphasises the importance of the complex interplay of all these factors and to considered all of them

when managing infertility rather than concentrating only on the biological factors or any single factor.

Community education, inclusion of psychosocial issues in biology curriculum, public education campaigns etc. can be strategies based on this model.

Health belief model:

Health belief model (HBM) covers how an individual makes decision about their health.³¹ According to this model there are several factors like knowledge or belief system, perceived susceptibility and severity of the disease and the perceived benefits and barriers, which regulates the behavioural aspect of the individual towards his/her health condition.

Individuals who have knowledge about the risk factors, their susceptibility, resultant outcome seek help in time e.g. awareness about risk factors like age, co-morbid conditions like diabetes, hypertension, thyroid problems; lifestyle issue like obesity, smoking, alcohol makes them seek earlier treatment avoiding the risk factors like unhealthy lifestyle.^{32,33,34} There is increasing gap between the biological age and social age of child bearing, thereby limiting the time frame for conception. Couples are not aware about how their age is making them susceptible and increasing their risk of being infertile. But women who are in contact with health care system are aware about the age related fertility decline. People who are more than 40 yrs of age and require assisted

reproduction regretted their lack of knowledge and information about age related fertility decline and might have opted for treatment much before if they had that information.³⁵ On the other side of the spectrum individuals who perceive fertility treatment to be expensive (15.4%), and not natural (17.6%), stay away from seeking treatment.³⁶ Financial burden is the most common perceived barrier for fertility treatment.³⁷ Non availability of the treatment facility is another barrier. The perceived benefit of consulting doctor, which can increase their chance of conception and potential impact in improving the quality of life, may play role in taking decisions regarding their fertility care.

So, increasing awareness by educational intervention via mass communication can help people change their belief system and make them knowledgeable about their reproductive health. Also, government should make policies which can give financial aid to couples trying for conception which can overcome the financial barrier.

Trans Theoretical Model:

The Trans Theoretical Model (TTM) or "Stages of Change" model, proposes that individuals go through a series of stages as they move from not being ready to change to taking action and maintaining a new behaviour. This model can be used to understand and support individuals and couples as they navigate the decision-making process related to fertility treatment options. The stages of the TTM include pre-contemplation (not yet

considering change), contemplation (considering change), preparation (planning to change), action (actively working to change), and maintenance (sustaining the change).³⁸

TTM could be applied in understanding the stages individuals go through for fertility. For example, an individual in the pre-contemplation stage, is not aware about his/her condition, they feel that there is no problem with their fertility and may not yet be considering seeking medical treatment or making lifestyle changes to improve their fertility. In preparation stage they plan for taking action and gather information related to fertility, available treatment options, best facilities etc. from internet, friends or families, while someone in the action stage may be actively pursuing treatments such as in-vitro fertilisation (IVF) or making changes to their diet and exercise routine. Studies have shown TTM based approach can improve the decision making in women trying for conception.³⁹

However, it is important to note that the TTM is a general model and may not apply equally to all individuals experiencing infertility. People always do not maintain the stages in a linear fashion, they can exit following a successful cycle or following failure or they can recycle or repeat the stages.⁴⁰

Hence TTM can be a great tool for providers to personalise counselling based on the patient's TTM stages for better adherence and outcome. Mass communication also can be planned for persuading the pre-

contemplation to contemplation stage instead of one size fits all approach.

Social-ecological model:

The socio-ecological model is a framework for understanding the multiple levels of influence that shape health behaviours and outcomes. It suggests that individual behaviours and health outcomes are influenced by a combination of factors at the individual, interpersonal, organisational, community, and societal levels.⁴¹

In the context of infertility, the socio-ecological model can be used to understand the various factors like at individual level, interpersonal, organisational, community and social levels that may contribute to infertility and how they interact with each other. Both internal environment (anatomical, physiological) and external environment (psychological, relational, structural, social and organisational) plays an important role in conception.⁴²

At individual level, the factors can include health behaviours, and underlying health conditions etc. For example, individual-level factors that may influence fertility include age, as fertility generally declines with age. Medical conditions like polycystic ovarian disease, endometriosis, adenomyosis, fibroid, ovarian reserve can influence the fertility outcome. Health behaviours such as smoking, alcohol consumption, and drug use, underlying health conditions such as diabetes, obesity, and sexually transmitted infections can also impact fertility.

At the interpersonal level, relationship factors (e.g., communication, intimacy, and support) and social support from friends and family can impact fertility as social support system plays an important role.⁴³ Organisational factors such as access to quality healthcare and infertility treatment may also play a role. Community-level factors such as cultural and societal attitudes towards fertility and reproductive health may also impact fertility. Finally, societal-level factors such as policies and laws related to reproductive health and infertility treatment can have a significant influence on an individual's ability to access fertility care.

Overall, the socio-ecological model helps to understand the complex and interconnected factors that can influence fertility and highlights the importance of addressing these factors at multiple levels in order to address infertility and improve reproductive health outcomes. It's important to formulate policies at community level (state/ organisation etc.) based on social ecological model to make it sustainable.¹⁹

Social cognitive model:

Social Cognitive Theory (SCT) describes the influence of individual experiences (thought, beliefs, attitude), the actions of others, and environmental factors on individual health behaviours.⁴⁴ The unique feature of this model is the emphasis of social influence and its emphasis on external and internal social reinforcement. According to this model, individuals who have more negative or distorted thoughts about infertility and lack

social support may be more likely to experience negative emotional and behavioural responses, such as depression, anxiety and hard time to cope with it. They may develop negative beliefs, such as feelings of shame or stigma, which can lead to avoidance of seeking medical treatment or support. On the other hand, individuals who have more positive or accurate thoughts about infertility and have a strong social support system, may be more likely to cope better with the experience and have a better outcomes.⁴⁵

The social cognitive model also suggests that social and cultural factors can influence an individual's thoughts, beliefs, and attitudes about infertility.⁴⁶ For example, some cultures may place a greater emphasis on having children, which can lead to more negative reactions to infertility. Additionally, social support and communication with a partner, friends, and family can play a role in how individuals cope with infertility. Individuals who have a supportive network of friends and family may be more likely to seek treatment and feel more positive about the fertility process.

It is also suggested that education and information about infertility can help to reduce negative beliefs and promote more adaptive coping strategies. Providers can design effective personalised counselling based on this model.

Social contagion model:

The social contagion model is a psychological model that proposes that an individual's

behaviours and attitudes can be influenced by the behaviours and attitudes of those around them. According to this model, an individual's social environment can "contagiously" transmit certain behaviours, attitudes, or emotions through social interactions and communication.⁴⁷

In the context of infertility, the social contagion model suggests that an individual's likelihood of seeking fertility treatment or their coping mechanisms in response to infertility may be influenced by the behaviours and attitudes of their neighbours, social network, including their partner, family, and friends. As human beings are social creature, interpersonal interaction plays a role in their fertility decision making.⁴⁸ Research shows a statistical significant influence of society on birth rate.⁴⁹ For example, if an individual's social network is supportive and encouraging of seeking fertility treatment, they may be more likely to pursue treatment themselves. On the other hand, if an individual's social network is unsupportive or stigmatising of fertility treatment, they may be less likely to seek treatment or may adopt coping mechanisms that differ from those of their social network.

This model can be a useful tool for understanding and addressing the social influences on an individual's behaviours and attitudes related to infertility. Patient support groups are good example of utility of this model. Providers can form patient support groups where patients with past experience can share their journey to motivate new

patients. However, it is important to note that the model is a general theory and may not fully capture the complexity of the social influences on an individual's fertility-related behaviours and attitudes. Studies have found that, there is difference in the effectiveness of social pressure and support depending on the age of the person.⁴⁹

Social learning theory:

Social learning theory proposes that individuals learn new behaviours and attitudes through observing and imitating others, as well as through the reinforcement or punishment of those behaviours. According to this theory, individuals are more likely to adopt a new behaviour or attitude if they see others around them engaging in that behaviour and receiving positive reinforcement for it, or if they receive positive reinforcement for engaging in the behaviour themselves.⁵⁰

In the context of infertility, social learning theory may be used to understand how individuals and couples learn about and adopt behaviours and attitudes related to fertility, such as seeking fertility treatment or adopting healthy lifestyle behaviours. Studies have shown that social learning has a significant positive impact on women's desire for fertility.⁵¹ For example, if an individual or couple observes others in their social network seeking fertility treatment and experiencing positive outcomes, they may be more likely to seek treatment themselves. Similarly, if an individual or couple receives positive reinforcement for adopting healthy

behaviours related to fertility, such as exercising or eating a healthy diet, they may be more likely to continue engaging in those behaviours.

Social learning theory can be a useful tool for understanding and influencing individuals' fertility-related behaviours and attitudes, but it is important to consider the complex and multifaceted nature of fertility and the potential for other factors, such as personal beliefs and values, to influence behaviour. Provider initiated patient support portals and groups can be a good way of motivating individuals.

Cognitive behavioural model:

Cognitive behavioural model/theory (CBT) that focuses on the role of thoughts, feelings, and behaviours in a person's ability to cope with difficult situations is considered as a treatment modality for childless couples. Infertility is a difficult and stressful experience and negative thoughts and beliefs can often lead to unhealthy behaviours. Stress and anxiety can have a negative effect on the fertility potential.⁵² Also during fertility treatment, stress is perceived as the most important parameter for premature discontinuation of treatment.⁵³ CBT focuses on helping individuals identify and change negative thoughts and behaviour that may be contributing to their infertility. This can include addressing issues such as stress, anxiety and depression as well as providing coping strategies to manage the emotional challenges of infertility. Studies have shown beneficial effect of CBT in reducing stress and

anxiety⁵⁴ and also improving their fertility. CBT include techniques such as relaxation and mindfulness, cognitive restructuring, biofeedback, behavioural training, stop thinking and assertive training etc., which can help individuals better manage their emotions and improve their overall outcome.⁵⁵ Psychological interventions have shown to improve fertility. Studies have shown that CBT can be a reliable alternative to medications for treating depression in infertile patients.⁵² This may involve individual or couples therapy, mindfulness practises, relaxation techniques and other evidence-based interventions. Another technique is goal setting where couples can set specific, achievable goals related to fertility treatment and/or adoption, and can take steps to work towards these goals. Also couples develop strategies for managing the emotions that may arise when fertility treatments are not successful, or when adoption plans do not work out. Group CBT based counselling is also found to be effective in infertile women.⁵⁶

CBT can be an effective treatment for anxiety when it is conducted by a trained and experienced therapist.⁵⁷ It is usually provided in a series of individual or group sessions, and may be combined with other treatments, such as medication or fertility treatments.

Captology:

Captology is the study of computers as persuasive technologies, or technologies that are designed to change individuals' attitudes or behaviours. Captology approaches often involve the use of persuasive design, or the

use of specific design elements to influence an individual's attitudes or behaviours.⁵⁸

In the context of infertility, captology approaches may be used to develop persuasive technologies or interventions that are designed to influence individuals' fertility-related behaviours or attitudes. For example, a captology-based intervention may involve the use of a persuasive mobile app or website to encourage individuals to track their fertility signs, adopt healthy behaviours related to fertility e.g. weight loss and maintaining it,⁵⁹ maintain physical fitness⁶⁰ or seek fertility treatment. But it is important to consider the ethical implications of using persuasive technology to change individuals' attitudes and behaviours.⁶¹ Additionally, it is important to ensure that captology-based interventions are evidence-based and are informed by a thorough understanding of the psychological and social factors that can influence fertility.

Captology is the basis of popular digital health (mobile apps and chatbots) based interventions where the ubiquitous smartphone can be utilised for personalised life style modification, treatment adherence as well as a virtual counsellor. Providers can utilise this medium to provide a virtual assistant to their patients for most part of the journey.

Behavioural economics:

After its introduction, behavioural economics has been increasingly defining consumer engagement with growing businesses. This can be used to understand and predict individuals' and couples' decisions related to

fertility treatment and to identify potential barriers or incentives that may influence those decisions.

People are emotional and impulsive and are influenced by their surrounding environment and circumstances in contrast to the traditional economic models where it is considered as people are focused on their goals and have a lot of self-control and can make occasional random errors. There are various theories that can be taken into consideration while approaching the infertile couples. Starting with "Nudge" which emphasises the way to manipulate people's choices to lead them into making specific decisions. Nudging is a powerful tool for health promotion.⁶² In the case of infertility, nudges could be used to encourage couples to seek treatment or to make healthier lifestyle choices that may improve their chances of conceiving. Also small modifications like providing information on fertility clinics and treatments in a more prominent or easily accessible location, or making it easier to schedule appointments with specialists can help the infertile couples in getting treatment.

Tversky and Kahneman's "Availability heuristic" theory which is basically a cognitive bias where people usually often rely on the data which they can easily recall/access rather than the actual data.²³ Infertile couples rely more on the success/failure stories of other couples than visiting a fertility clinic and evaluating their own chances of success. Also according to "Bounded rationality", people have limited cognitive ability for information

and time and do not always make the correct choices even if information is available that point them towards a specific course of action. Bounded rationality may limit infertile couples decision while considering for the treatment. This could include limited knowledge about options, costs, or risks, as well as emotional or psychological factors that can affect decision-making.

Fertility care is expensive and considered as a possible barrier for treatment. Financial condition of the individual significantly affects the probability of going for fertility treatment. Not only the economic burden but also the impact of the time cost that is there during travelling for their treatment and also loss of wages indirectly affects their decision in seeking treatment. All most 142 hours are spent while pursuing fertility care and majority (73 hrs) of this is time spent in provider visits.⁶³ Moreover, it is expected that the infertility treatment requirement is going to increase due to ongoing sociodemographic and lifestyle changes.⁶⁴

Behavioural economics model may be used to understand how individuals and couples weigh the costs and benefits of different fertility treatment options, and how their perceptions of those costs and benefits may be influenced by psychological biases or heuristics, such as overconfidence or loss aversion. "Loss aversion theory" suggests that people are more likely to take greater risk to avoid loosing than gaining something. Loss aversion is the key to "prospect theory". In the context of infertility, this theory suggests

that people may experience a greater emotional impact from the loss of the ability to have biological children than they would experience pleasure from adopting or using other methods to start a family. As a result, individuals and couples experiencing infertility who are weighing the different modalities of treatment, may be more motivated to pursue treatments such as in-vitro fertilisation or surrogacy, even if these options are more costly. Patient education programs, policy campaigns for masses, as well while counselling by providers, knowledge of behavioural economics can help in making the content more motivational, prospect oriented and making it available with easy recall. However, it is important to recognise that health decision-making is complex and influenced by a wide range of factors, and that behavioural economics approaches should be used in combination with other behavioural frameworks and research methods to fully understand and address the challenges of infertility.

Conclusion:

Increasing trend of infertility is a big concern for present day world at large. Advances in fertility research and availability of newer forms of interventions is a positive sign in this regard. However it's unfortunate many can not still access the available treatment due to various influences or biases at individual to societal level. Approaches that can ensure higher adoption of available treatment with meaningful engagement with patients stays the focus of the providers, payers and society. Behavioural model based approaches have

been driving better engagement and outcome for consumers and patients in chronic diseases. Behavioural model based approaches can be effectively deployed to formulate policy at society level, to educate individuals and their social network for appropriate health seeking behaviour, to design personalised empathetic counselling by providers for best possible outcome. Timely access of appropriate treatment can also address the high cost and demand supply challenge bringing efficient in care delivery. Hence behavioural model based approaches can help all the stakeholders in infertility management towards a holistic improved in fertility care.

As there is enough evidence regarding the success of behavioural intervention in management of health and disease, infertility being a disease where psychological, behavioural, social, interpersonal and economical factors play a very important role, the application of behavioural models and interventions can help to manage infertile patients in a better way by the health care providers and policy makers to achieve a higher success rate and better outcome. In summary insights from this article will make available treatment options accessible for infertility patients.

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