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Empirical Determinants of Development of Infertility Behavior in Indian Youth: A Bounded Rationality Perspective in Health Decision Making

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Abstract. Millennia's infertility-oriented behaviour has already been explored from individual perspective, institutional perspective as well as from organisational perspective, from social and dogmatic perspective as well. Each approach has its own merits and demerits. Ideally the construct's focus of study revolves around Millennia's own individual derived attributes, traits, inclinations as well as contingent supports and influences that shape up the phenomenon. The recent review of literature suggests that diverse factors, which are internal to Millennia's cognitions and contingent to Millennia's reproductive decision making collectively shape the phenomenon. The existing literature calls for emphasis on individual traits, aspects of traits, habits, misinformation, and lack of responsibility in behaviour. The aspect of 'triggered infertility' has gained currency on the notion that experienced inability to reproduce is self-made or self-triggered instead of imposed from outside the environment. The reported second major influence is from the 'perceptions' of natural environments and third from the vocational/work related, career driven, health and drugs, stress aspects, contingent influences, sexual and reproductive health communications. These are believed to shape reproductive self-efficacy which poses consequences for sustainability of current employability and respective family orientation. In nutshell, Millennia's triggered infertility behaviour identifies as a matter of intensive research across developed and developing economies alike. In this prospect, the current proposed research seeks to explore the vivid aspects, factors and dimensions that collectively see to shape up the phenomenon across contextual roots in Delhi/NCR and North Indian states.

Key Words: Triggered Infertility, *Bounded rationality, Health decision making, Identity Economics, Reproductive literacy, Regression modeling*

Background to research

Health decision making and health-based choice making constitutes the most critical exercise across adolescents and youth in any economy. Health decisions and access to all vital information itself identifies as a challenge (Dhami & Nowaihi, 2019). Either the incumbent lacks access to complete information, or exhibits short termism or fails to act in best interest of self-health on account of principal agency problems or on account of dismal and limited access to required information. Like other aspects of decision making, health too suffers on account of asymmetrical access to information, lack of control over self, irrational basis of decision making and cognitive deviations so shape end results. Interactions between disease dynamics and reproductive behaviors have been explored in many coupled behavior –disease models.

Cognitive effects such as risk perceptions, narrative setting, nudges, framing and subjective probabilities of adverse effects can be important and critical determinants of the infertility behaviors and represent subjective departure from the pure rational decision-making models in health perspective. Yet the impact of such cognitive effects in health decision making especially with regard to fertility and infertility has received very little research attention. Hence the need for consideration of behavioral aspects, prospect theory notions and irrational decision making in disease behavior model is rampant. In fact, in limited information environments, the human cognitive strengths and expertise is required. In view of health decision making, this is more required than desired. The current literature on human decision making with health focus is based on paradigm of perfect rationality and assumes that human decision making involves decision noise and employ stochastic choices. Yet human decision making especially with regard to health in uncertain environments has been observed to contain the elements of irrational, emotional and cognitive bursts and deviations. Processing imperfect information in limited time with bounded cognitions usually affects the individual decision making and health arena is no exception. Cognitive psychologists and behavioral economists have repetitively demonstrated such ramifications through numerous experiments across subject matter that human health decisions are subject to asymmetric information flows, limited narratives, framing and heuristics and short cuts.

Understanding Infertility as health decision

Infertility identifies as a state of reproductive health where bearing children is impossible without mechanical or clinical intervention. Infertility across the ages has been viewed as biological, religious and social stigma yet modern versions of infertility has more to do with the self-triggered ill responses and inactions and ill managed activities that are held acceptable under guise of modern thinking. The notion of 'triggered infertility' or self-made infertility as health decision is rather a new research concept and drawn tremendous research attention. Infertility as state of being infertile emerges more as a conscious health decision (Covington & Burns, 2006). The triggered infertility (Bogdan & Hoffman, 2015) identifies as comprising the deliberate human action or inaction to delay, deviate or constrain the fertility and ultimately transform the fertility prospects onto infertility. As per WHO, Infertility is triggered on account of failure of male or female reproductive system to lead to pregnancy after 12 or more months of regular un protected sexual intercourse. Such a problem has been prominent across a class of millennial who seem to engage in activities or set of activities that constrain human ability to reproduce on account of habits, pastimes, misinformation or false ideologies. This widely supports that under bounded rationality and informational constraints humans undertake decisions that constrain ability to reproduce. A large section of studies (Kalus & Cryzowska, 2022) concentrate on nature, on human body, on genetics and on the anthropological and on the racial attributes. Yet individual deficiencies, in competencies, lack of information about right conduct of human life, contextual occupational requirements, stress, rising digitalization and aspirations (Babieri, Domar, & Kevin, 2000); do interfere with infertility determination (Mascarenhas & Boerma, 2012).

Understanding infertility from lens of bounded rationality

From the lens of bounded rationality, various aspects are decided under state of bounding of human rationality (Hernandez & Perez, 2019). This literally translates into state of cognitions where human capacity to decide is restrained and decision is often based on pieces of information that are readily accessible or are mental short cuts. In terminology of bounded rationality this means the rational powers to decide gets bounded to narrow or specific set of ideas that are generally leading to dismal state of affairs and generally represent a wrong choice making mechanism. Infertility as health decision under state of bounded rationality thus can be interpreted as involving the thrust on limited decision making with limited knowledge (Funk & Bansal, 2015). As in real terms, it is not possible to verify all the possible alternatives, hence the rationality gets bounded (Bergstrom & Hanage, 2023). Like other spheres of life, health decisions especially those of infertility faces similar scope (Bedson & Skrip, 2021). Incumbents differ substantially in available opportunities and desires with regard to scope of fertility or infertility-based decision making and hence the development

of infertility.

Research objectives and need

The problem definition for research focuses on exploration of impact of individual, occupational and contextual factors as leading to a triggered state of infertility in vulnerable "millennial population". The problem assumes significance as traditional family setups were particularistic about family planning at an initial age in life terminology yet the modern families are delaying the same till thirties (Kar,Singh, Choudhary, 2015). The problem definition for research hence focuses on: What individual, occupational and contextual factors seem to lead to a triggered state of infertility(as health decision under bounded rationality) in vulnerable "millennial population"?

Research hypothesis and literature

Bounded rationality generated fertility knowledge and reproductive health literacy identifies as common occurrence in age of technology determinism and excessive information flows (Bogdan,Hoffman, 2015). The propensity of information available across smartphones, internet, Google, social media and other channels of transmission has rather increased the screen time and lesser usage of neurotics and mental capacities (Ball, 2022). Cognitive biases with regard to fertility knowledge and reproductive health literacy seem to bound the youth's rationality and cloud their choice making impetus with regard to fertility (Rutstein & Shah, 2004). Hence, we propose these research hypotheses:

H1A: There is significant impact of dismal fertility knowledge on behavioral coping
H2A: There is significant impact of reproductive health literacy on behavioral coping
H1B: There is significant impact of dismal fertility knowledge on cognitive errors
H2B: There is significant impact of reproductive health literacy on cognitive errors

Work behavior and work attributes related disorders, biases, mental stress, work life style, poor health and imbalanced life style equally shape the prospects for cognitive biases formation, irrational beliefs, scope for cognitive error making and behavioral disengagement with regard to matters of health and fertility advancement. Especially in age of technology determinisms (Malarcher, 2010), the incorporation of technology at work decisions and persona life decisions is on the rise (Maung, 2018). Technology based products, services, apps and digital intervention is equally shaping the individual choice architectures (Albishri & Zamzami, 2021). Technology intervention in decision making is especially on rise on account of android apps, websites, social media and gamification (Evans, 2020). This equally influences the health-based choice making and respective decisions regarding fertility advancement as well. Hence, we propose these research hypotheses:

H3A: There is significant impact of shift work disorder on behavioral coping
H4A: There is significant impact of poor health and life style on behavioral coping
H3B: There is significant impact of shift work disorder on cognitive errors
H4B: There is significant impact of poor health and life style on cognitive errors

Behavioral disengagement coping and cognitive errors equally shape the perceptions of infertility development in youth (Larsen, 2005). As per health decision making models and disease based behavioral change models, the cognitive errors are vital predecessors to infertility-based health decisions (Turk,Ercis, 2017). Ever since Simons introduced the concept of bounded rationality and cognitive errors in decision making in health perspective, the concept has gained wider acceptance and circulation across literature (Uprety,Song, 2018).

H5A: There is significant impact of behavioral coping on perceived infertility
H5B: There is significant impact of cognitive errors on perceived infertility

The assessment of moderating impact of materialism and marketized mindset could also be subject matter of extensive research (Turk,Ercis, 2017). As per identity economics axioms, the youth usually make choices (health based in this case) on basis of monetary incentives (Hovermann,Bielinski, 2021), market influences and identity-based similarities (Akerlof & Kranton, 2000).

H6A: There is significant moderating impact of materialism on behavioral coping -perceived infertility relationship

H7A: There is significant moderating impact of marketized mindset on behavioral coping- perceived infertility relationship

H6B: There is significant moderating impact of shift work disorder on cognitive errors- perceived infertility relationship

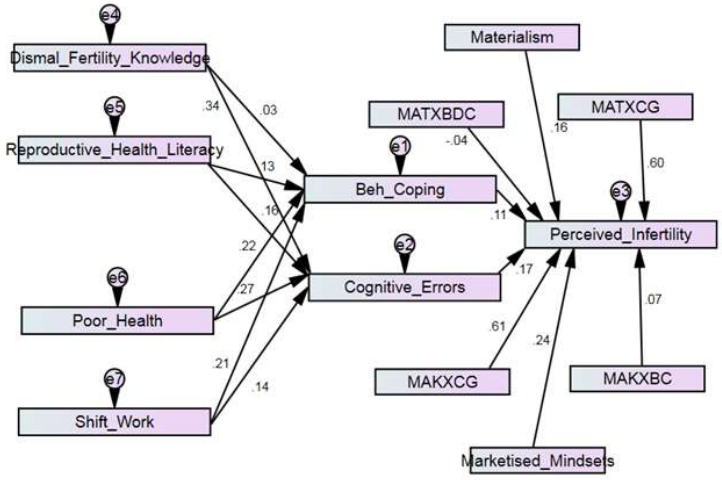
H7B: There is significant moderating impact of poor health and life style on cognitive errors- perceived infertility relationship

Instrumentation

Dismal fertility knowledge assessment (Mu, 2017)**,** Materialism in life, Poor health and lifestyle (Choi & Feinberg, 2021), Shift Work disorder (Albishri & Zamzami, 2021)**,** Reproductive Health Literacy (Debussche & Osborne, 2018)**,** Behavioral disengagement coping (Quansah & Sachack, 2022), Marketized Mindset, Cognitive errors, Impact of event, Perceived development of Infertility, Irrational Beliefs-behavioral coping were assessed with respective items borrowed form pre validated scaling instruments. The unit of analysis comprised the young millennial who are in age group 18-25. The target for the research comprised the young technology savvy and technology determinism driven young population who are apt at incorporating technology-based work behavior. Such niche segment believes largely in do it yourself, largely novice in health-based decision making, in the cusp of adolescence, lacks formal sex education and rarely have prior formal, institutional or proper sex education orientation and mentoring or counseling. The aforesaid research was conducted across October 2023 to March 2024.The study harnessed an empirical research approach. Hingin's methodology was leveraged for the scale development and scale refinement and measurement model formulation. As such non probability sampling approaches can be applied and such approaches are appropriate for exploratory, descriptive and cross-sectional research studies in behavioral health and bounded rationality perspective. Hence purposive sampling was relied upon for the collection of primary data. The study examines the select psychological factors by applying the theory of bounded rationality and identity economics to 426 youth in North Indian perspective. Extractive factor analysis, confirmatory factor analysis and factor structure determination with structural equation modeling were used to determine the relationships and for probable vindication of research hypothesis. The structural equation modeling assists in determination of the linkages across the input and the output variables. The regression weights as achieved across the AMOS output help interpret the pattern of relationships across the constituent variables in current research activity. The path analysis of the structural equation modeling revealed the mechanisms behind the core psychological cognitive factors both the individual and work related as influencing the perceived development of infertility and moderating effect of marketization and materialization.

Analysis

The figure below captures the research outcomes and categorically projects the serious and statistically significant impact of individual youth cognitions and work behavior on coping and error making scope and respective perceptions of infertility. The decision making was observed as moderated significantly by marketization of mindsets and materialism as well. The respective model fit indices were observed satisfactorily as CFI=0.903, NFI=0.915 and PFI=0.904 with RMSEA as 0.04.



	Research Hypothesis Statements	Path (>.1)	Results	
Youth's health cognitions and scope for irrationality	H1A: There is significant impact of dismal fertility knowledge on behavioral coping	0.03	Not Accepted	Significant impact of individual reproductive cognitions on coping and cognitive error making
	H2A: There is significant impact of reproductive health literacy on behavioral coping	0.13	Accepted	
	H1B: There is significant impact of dismal fertility knowledge on cognitive errors	0.16	Accepted	
	H2B: There is significant impact of reproductive health literacy on cognitive errors	0.22	Accepted	
Youth's work behaviors and scope for	H3A: There is significant impact of shift work disorder on behavioral coping	0.21	Accepted	Significant impact of individual's work behavior on coping and cognitive error making
	H4A: There is significant impact of poor health and life style on behavioral coping	0.22	Accepted	
	H3B: There is significant impact of shift work disorder on cognitive errors	0.14	Accepted	
	H4B: There is significant impact of poor health and life style on cognitive errors	0.27	Accepted	
Irrationality and infertility	H5A: There is significant impact of behavioral coping on perceived infertility	0.11	Accepted	Coping and error making derived irrationality as shaping infertility perceptions
	H5B: There is significant impact of cognitive errors on perceived infertility	0.17	Accepted	
Moderation by market	H6A: There is significant moderating impact of materialism on behavioral coping -perceived infertility relationship	0.04	Not Accepted	Moderating impact on behavioral coping and cognitive
	H7A: There is significant moderating impact of marketized mindset on behavioral coping- perceived infertility relationship	0.07	Not Accepted	

	H6B: There is significant moderating impact of materialism on cognitive errors(irrational beliefs) -perceived infertility relationship	.60	Accepted	error making -perceived infertility relationship
	H7B: There is significant moderating impact of marketized mindset on cognitive errors(irrational beliefs)- perceived infertility relationship	.61	Accepted	

'Perceived infertility' as function of 'coping' and 'irrational beliefs'(cognitive errors making) stands vindicated. The aforesaid results were assessed in linear regression modeling and yielded R value of 0.327 and R square measure of .107. The respective standardized beta coefficients for behavioral coping and cognitive error making were observed as .129 and .266 .The respective equation was hence deduced as

Perceived Infertility= f (coping, irrational beliefs)= Constant+ .246(Behavioral Coping)+ .256(Cognitive Errors)

Behavioral Coping as function of function of 'dismal fertility knowledge', 'reproductive health literacy', ' shift work disorder' and 'poor health' stands vindicated. The aforesaid results were assessed in linear regression modeling and yielded R value of 0.408 and R square measure of .167. The respective standardized beta coefficients for 'dismal fertility knowledge', 'reproductive health literacy', ' shift work disorder' and 'poor health' were observed as .027, .140, .180 and .346 .The respective equation was hence deduced as

Behavioral Coping= f (dismal fertility knowledge', 'reproductive health literacy', 'shift work disorder' and 'poor health')= Constant+ .027(Fertility knowledge)+ .140(Reproductive health literacy)+ .180 (Poor health)+ .346(Shift Work); signaling weak regression weights only across fertility knowledge

Cognitive error making indeed as function of function of 'dismal fertility knowledge', 'reproductive health literacy', ' shift work disorder' and 'poor health' stands vindicated. The aforesaid results were assessed in linear regression modeling and yielded R value of 0.519 and R square measure of .270. The respective standardized beta coefficients for 'dismal fertility knowledge', 'reproductive health literacy', ' shift work disorder' and 'poor health' were observed as .598, .349, .436 and .453.The respective equation was hence deduced as

Cognitive Error making= f(dismal fertility knowledge', 'reproductive health literacy', 'shift work disorder' and 'poor health')= Constant+ .598(Fertility knowledge)+ .349(Reproductive health literacy)+ .436 (Poor health)+ .453(Shift Work); signaling strong regression weights across fertility knowledge as well.

Impact of individual cognitions and knowledge was equally observed as considerable. Individual cognitions were sought to impact coping as .174 times and respectively the irrational error making as substantially at 0.574 times. This translates into larger role of individual cognitions into irrational error making.

Impact of work behaviors was equally observed as considerable as work behaviors impacted coping at least .251 times and cognitive error making as .437 times. This points to significant and larger impact of work behaviors on breeding of irrational behaviors and respective error making instances across period of study.

Moderation effect of marketization and materialism was equally observed as critical in shaping the infertility perceptions.

Theoretical Implications

The sustainable and engaged reproductive decision making is absolutely essential for self and social well-being. Health

decision making especially the aspects of reproductive health and reproduction related decisions needs proper framework and aspects in view of rising threats to time and individual well-being. Especially in evolving digital environments where the technology determinism is vibrant, technology is witnessing rising usage across workplaces and across all contours of life, the technology-based information asymmetries are on the rise; the instance of bounded rationality in health wide decision making are on the rise (Larsen, 2005). The result affirms support for information sciences and human user interfaces as shaping behavioral paradigms of decision making. Computer(app) assisted decision making and app-based attempts at ensuring active and seamless engagement of users while seeking health knowledge, knowledge more about reproduction, work-based technology drive; all seems to drive some illusion in sharing the real and meaningful reproduction health-based knowledge (Rutstein & Shah, 2004). The resultant cognitive errors and coping inefficiencies seem to collectively point to scope for rise in bounded rationality driven infertility. Youth worldwide are witnessing the cognitions led failure and impetus to deviate from real agenda and entrapping in false reproduction knowledge. App based choice architectures and dark patterns often seem to lead to state of dismal cognitions formations and study-based outcomes vindicate support for behavioral economics, bounded rationality and Simon's decision-making paradigms (Kalus & Cryzowska, 2022). Thus, one core implication is with regard to rising and potential widening role of cognitive technologies in shaping reproduction knowledge and perceptions. This literally translates into the app interventions as buoyant on human decision making and as influencing the youth's cognitive resources inventory and health-based perceptions (Leridon, 2015). Apps and online information infrastructure does intervene and impact the health information seeker's resource accessibility, perceptions of reproduction, knowledge regarding reproductive health and engagement with norms and practices. Artificial intelligence and machine learning in manifold ways possess implications for distorting or narrowing youth's fertility knowledge, reproductive health literacy (Krebs, 2009), stress management and life style knowledge and information. In association, the research offers viable insights and information to policy makers in public and private sector bodies regarding reproduction awareness, planning and population control in sequential manner. In retrospect the research possesses profound implications for reproductive health and hygiene product marketers (Bedson & Skrip, 2021). The study-based findings provide a reference point for the establishment of scientific reproduction knowledge management experiment and mechanism to aid youth in undertaking sound health decisions. In fact, overcoming the bounded rationality in health decisions is a serious research challenge (Babieri, Domar, & Kevin, 2000). The study-based outcomes affirm the wider assumption that Apple/Google API are seemingly supposed to intervene in wider spheres of human life and widen canvass of decision-making involving matters of health and reproduction (Krebs, 2009). The legitimate advantage that the digital actors have in the sphere of the production of digital goods provides them with illegitimate role in shaping health decisions especially reproduction and consequences in form of infertility (Karabulut, Ozkan, & Oguz, 2013).

Directions for future research

The further research can be conducted across areas of ICT generated bounded rationality and digitalization as inducing confusion and irrational emotional heuristics. The future research can be conducted across aspects of cognitive biases and health-based decision making under environments of AI, virtual reality and augmented reality. Individual's susceptibility to misinformation regarding fertility information can be area of research.

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