

Re-examining Psychometric Properties of Fertility Problem Inventory: A Clinic-Based Study from India

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ABSTRACT

Background: The fertility problem inventory (FPI) is one of the most widely used measures that tap the diverse psychological problems faced by infertile couples. Research on translated versions of FPI has also reflected its high clinical significance. **Aim:** This research aimed to explore the psychometric properties and the clinical validity of the original 46-item FPI in an Indian sample. **Study Setting and Design:** This cross-sectional study was conducted in a tertiary hospital setup of a medical college. **Materials and Methods:** The original FPI was translated and pilot tested. The translated FPI was taken by 205 consenting infertile patients (113 women and 92 men). The psychometric properties of FPI were thus explored. **Statistical Analysis:** Exploratory factor analysis with minimum residual method of extraction followed by oblimin rotation was performed. Perceived Stress Scale was used to establish the convergent validity of the newly developed FPI-Kannada version (FPI-K). A cut-off score for the FPI-K was obtained separately for males and females using ROC analysis in which hamilton anxiety scale was used as the gold standard. **Results:** Only 32 items of the original FPI had factor loadings above 0.3 and overall six factors explained these items with a cumulative percentage variation of 32%. Overall Cronbach's alpha for FPI-K was 0.671 and it had a good convergent validity. **Conclusions:** The new FPI-K had 6 sub-domains and the clinical utility of same is discussed.

KEYWORDS: Distress, fertility problem inventory, India, infertility, men, women

INTRODUCTION

Globally, infertility is known to affect 15% of couples of reproductive age.^[1] Infertility affects nearly 4% to 17% of the Indian population^[2] and is known to have an impact on the interpersonal aspects of one's life.^[3] The fertility problem inventory (FPI) is one of the most widely used measures that tap the diverse psychological problems faced by infertile couples.^[4] It covers five different areas of infertility-specific stress (ISS) namely, social concerns (SOC), sexual concerns (SEX), relationship concerns (REL), need for parenthood (NFP) and rejection of a childfree lifestyle (ROCFL). All of these areas combine to contribute to the total ISS on the scale. FPI is also considered to be superior than other

collateral measures of ISS.^[5,6] Known for its clinical utility the FPI has been translated into different languages and validated for use among people belonging to diverse ethnic backgrounds.^[5-8] Research on the various translated versions of FPI has also reflected that modified versions of the inventory improved its psychometric properties as well as clinical significance.^[5-8]

Socio-cultural differences are known to impact the lived experience of infertility and its distress.^[3] Research on treatment-specific experiences of urban women in India

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reflects that intrapersonal factors such as ‘the desire for a child’ have more importance in the entire adjustment process than interpersonal factors.^[9,10] However, a large number of couples also resort to extrinsic and intrinsic religiosity, meaning-based coping, social support, improving marital bonds and sexual satisfaction to cope with ISS.^[9] A recent Indian study concluded that ISS was as high in milder procedures such as intrauterine insemination (IUI) as it was in *in vitro* fertilisation (IVF) in both men and women. Females reported high stress related to NFP, SOC, SEX domains of ISS than their male counterparts.^[11] In India, ISS was interconnected with a plethora of medical, financial and emotional issues, experience of exploitation from the health-care sector, and low societal acceptance of involuntary childlessness.^[12] Furthermore, secrecy associated with undergoing third-party reproductive programmes in India was high, as these were at large perceived as socially unacceptable for violating the common cultural concepts of family, marriage, and kinship.^[13] To address these diverse social, ethical, medical and psychosocial agendas, the Indian Council of Medical Research has laid down rigorous guidelines and treatment protocols for infertility and Assisted Reproductive Technology clinics.^[14] These mandate the provision of psychological assessment, counselling and therapy by a trained mental health practitioner at infertility clinics in India.^[14] Accordingly, universally known gold standard measure i.e., FPI serves as disease-specific measure for the evaluation of ISS in Indian infertile couples. Research assessing the soundness of the original 46 items FPI and its clinical usefulness in the Indian population is thus very much needed. It may not only increase its value but also help modify the tool as per the socio-cultural experiences of distressed men and women in the country.

In addition, recent literature also highlights the overlapping relationship between ISS, anxiety and depression experienced by infertile couples during medically assisted reproductive therapy (MART). Moreover, high levels of ISS, anxiety and depression are known to determine the fate of conception/clinical pregnancy following MART.^[15] In this context, it is hypothesised that the translated version of FPI may be better in detecting as well as supporting couples with a pre-existing emotional vulnerability which precludes worsening of health outcomes.^[16,17] Detecting and treating high ISS in early stages is thus a vital component of comprehensive mind and body intervention in infertility.^[17,18] Hence, the primary objective of this study is to explore the psychometric properties of the original 46-item FPI in an Indian sample. Furthermore, the study aims to modify the original FPI to develop a clinically

valid measure (FPI-Kannada version [FPI-K]) which may be more relevant to the Indian population.

METHODS

Design and study setting

This research is carried out as part of an RCT conducted to find the effectiveness of psychotherapy in infertile couples who were attending the department of reproductive medicine and surgery, in a tertiary hospital setup of a medical college. For the present study, convenience sampling was used and 205 participants, i.e., 113 women and 92 men. The study included those individuals in the age of 20–45 years who were seeking consultation or treatments at the infertility clinic. These were known cases of primary or secondary infertility, with or without other medical, or urological conditions, and who did not have any psychiatric morbidity (as assessed on the screening measure used in this study viz., the Mini-International Neuropsychiatric Interview, English version 5.0 (MINI 5.0)). Ethical approval was obtained from the Institutional Ethics Committee and informed consent was obtained from all eligible, consenting participants (project no IEC 64/2015). The study was registered in CTRI (CTRI/2016/02/006648). The study duration was 19 months from March 2015 to December 2016. The sample size was time bound. Sample size estimation was not performed. All ethical guidelines (as per the World Medical Association’s Declaration of Helsinki) were followed during the conduct of this research.

Procedure followed for data collection

Participants who fulfilled the study criteria were informed and invited to participate in the study by explaining them the purpose of the study and its details, using the subject information sheet. Thereon, the socio-demographic PROFORMA and psychological tests (scales for ISS, anxiety, depression and perceived stress) were administered on the participants by the Principal Investigator. The subjects were instructed to complete all the patient-rated scales to the best of their knowledge, without leaving any item unanswered. Any doubts faced by the participants during the administration, were clarified. The clinician-rated measures were administered by the principal investigator (a licensed clinical psychologist and psychotherapist trained in reproductive psychology and psychological aspects of infertility). The participants were offered a free session of supportive psychotherapy for coping with infertility distress, for their participation. If any participant experienced significant psychiatric morbidity, they were excluded from the study and referred to a psychiatrist for further management. The

collected data were entered into SPSS 20 software and subjected to statistical analysis.

Description of the original fertility problem inventory and development of the Kannada version translation of it

The original FPI consisting of 46 items questionnaire developed in English, by Newton, 1999,^[4] in which each question is answered by the respondent on a 6-point Likert scale, assessing ISS among couples. It has 5 sub-domains as described earlier and percentile norms are available for raw scores which are separate for each gender. High scores are indicated by percentile of 85 and above, a raw score of 167 or above as assessed in females and of 147 or above as assessed in males.

Reliability and validity of fertility problem inventory

Each of the 5 scales consisted of relatively homogeneous items as indicated by the moderate-to-high reliability (internal consistency) of each scale (social concern = 0.87, sexual concern = 0.77, relationship concern = 0.82, rejection of childfree lifestyle = 0.80, NFP = 0.84 and global stress = 0.93).^[4] Test-retest correlations performed after a 30-day interval also showed moderate-to-high reliability (global stress was 0.83 for women and 0.84 for men). Subscales present good reliability, with Cronbach's coefficients ranging from 0.77 to 0.87. Criterion validity was calculated showing strong correlations (ranging from 0.31 to 0.78) among various FPI subscales and FPI revealed satisfactory concurrent validity with the Brief Symptom Inventory and ENRICH marital distress scale.^[4]

Translation procedure for the development of fertility problem inventory-Kannada version

After obtaining authorisation by its developers, the 'forward-backward' translation (English to Kannada) and backward-forward translation (Kannada to English) were applied to FPI. The translations were carried out by two independent health professionals who were bilingual experts in Kannada and English. The translation coordinator (first author) compared the two translations and checked them for any discrepancies with the help of these experts. Furthermore, two native English speakers confirmed the contents between the original English version and the back-translated version. Any discrepancies that emerged from the comparison were discussed and as a result some of the items were actually reworded. Thus, the final version of FPI-K was emerged.

Pilot testing of fertility problem inventory-Kannada version

The FPI-K is pilot tested on 40 consenting individuals (20 women and 20 men) diagnosed with

infertility and undergoing treatment at MARC. This allows a check of the translated version for its ease of understanding.

Description of other collateral measures

i. Socio-demographic and clinical pro forma: This was a semi-structured datasheet for recording details pertaining to the socio-demographic and clinical variables of the participants.

Screening measures

ii. The Mini-International Neuropsychiatric Interview, English version 5.0 (MINI 5.0)

The MINI is a structured clinical diagnostic interview schedule designed for use in epidemiological studies and enables in diagnosing psychiatric disorders as per the Diagnostic and Statistical Manual of Mental Disorders (DSM) IV or International Classification of Diseases-10. It is a short measure that can be administered by the researcher in 15–20 min and identifies 19 psychiatric conditions (with 17 Axes I disorders and one Axes II disorder). It is known to be a reliable measure with high concordant validity with Composite International Diagnostic Interview and Structured Clinical Interview for DSM. It is administered by clinicians after a brief training and has been translated for use in several languages.^[19]

Psychological tools

Hamilton Anxiety Scale

The scale consists of 14 clinician-rated items, compiled by Hamilton (1959) that assess anxiety symptoms.^[20] Each item is scored on a scale of 0 (not present) to 4 (severe), where <17 indicates mild severity, 18–24 mild-to-moderate severity and above 25 indicate moderate to severe. The internal consistency reliability of HAM A ranges from 0.77 to 0.81 and test-retest reliability is 0.96. Literature supports its reliability, concurrent and internal validity and sensitivity of the scale, in a population with anxiety and depressive disorders.

Hamilton depression scale

The scale consists of 21 clinician-rated items, compiled by Hamilton (1960) and measures the severity of depressive symptoms.^[21] The Internal consistency reliability of different versions of HAM-D ranges from 0.48 to 0.92 and inter-rater reliability is 0.60 for 21-item scale. The concurrent validity of HAM-D is reported to be ranging from 0.65 to 0.90 with MADRS. The construct validity and factor structure show statistically significant relationships with measures of generalised anxiety and other anxiety variables. Studies have shown satisfactory internal reliability and convergent and discriminant validity of the scale.

Perceived stress scale

The scale is a 14 items self-report questionnaire invented by Cohen and Williamson (1983, 1988), and each item is scored on a 5-point Likert scale.^[22] The questions are general in nature and relatively free of content specific to any sub-population group. The scale can be used to determine whether ‘appraised’ stress is an aetiological factor in behavioural disorders or diseases. Items of the PSS were designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. PSS has 2 versions namely, 14 items and 10 items versions. The present study uses 14 items version. PSS has been found to provide better predictions for psychological symptoms, physical symptoms and utilisation of health services than other similar instruments. It has adequate test-retest reliability and is also known to have a good construct, concurrent and predictive validity.

Statistical analysis

The original 5-factor structure of FPI proposed by Newton in 1999, was tested using confirmatory factor analysis (CFA) with diagonally weighted least square estimation technique. It was observed that the original factor structure of FPI is not confirmed and hence we tried to explore the factor structure using EFA with minimum residual method of extraction followed by oblimin rotation. Kaiser–Meyer–Olkin (KMO) test and Bartlett’s test of sphericity were done to check whether the data were suited for factor analysis. KMO measure of sampling adequacy showed 0.60, and Bartlett’s test of sphericity resulted with $P < 0.001$. The number of factors to be retained was determined by parallel analysis method using the ‘EFA MRFA’ package available in R software.^[23,24] Polychoric correlation was used for performing EFA and items with factor loadings of 0.3 and above were retained. Items with cross-loadings (factor loadings ≥ 0.3 under multiple factors) were considered as the most appropriate factor after consulting with the subject experts. The resultant factor structure thus obtained from EFA was confirmed using CFA. The internal consistency of items under each factor was estimated using Cronbach’s alpha. PSS was used to establish the convergent validity of the newly developed FPI-K and Pearson correlation coefficient was computed between the PSS score and the total score of FPI-K. In this study, the convergent validity of the FPI-K is evaluated by Pearson’s correlation coefficients between the scores obtained on sub-domain and total scores on FPI-K, HAM-A, HAM-D and PSS for all subjects. A cut-off score for the FPI-X was obtained separately for males and females using ROC analysis. For ROC analysis, HAM-A was used as the gold

standard in which the participants were divided into two groups based on a HAM-A, cut-off value of 17. All analyses were done using IBM SPSS Statistics 22 and R version 4.0.4.

RESULTS

The basic characteristics of the study participants ($n = 205$) are given in Table 1. The average age of the female participants was 29.3 years ± 4.0 years, while that for males was 38.4 years ± 5.4 years. Around 55.12% were male and majority (40.49%) of them qualified senior secondary level of education. About 10% of the participants were found to have taken fertility treatment for more than 5 years. More than half of the participants (50.48%) earn $< 20,000$ rupees per month. Men were found to be more infertile than women (29.76% vs. 23.9%).

To study whether the original factor structure proposed by Newton (1999) was applicable to the Indian population, CFA with diagonally weighted least square estimation was used for the 46 items FPI scale. However, the model estimation could not converge as the data were not fitting with the proposed model structure. Hence, attempt was made for an exploratory factor analysis (EFA) to explore the factor structure for the study population. Parallel analysis was performed to decide on the number of factors to be retained in EFA.

Figure 1a depicts the result of parallel analysis. The red, green and blue lines respectively give the percentage variance explained by each factor from the study data, mean of the percentage variance obtained from

Table 1: The summary of the basic characteristics of the study participants

Variables	Categories	n (%)
Gender	Male	92 (44.88)
	Female	113 (55.12)
Education	Primary	11 (5.37)
	Secondary	52 (25.37)
	Senior secondary	83 (40.49)
	Graduate	51 (24.88)
	Post-graduate	8 (3.9)
Family income per month in Indian national rupees	<10,000	26 (12.68)
	10,000–19,999	98 (47.8)
	20,000–29,999	50 (24.39)
	30,000–39,999	19 (9.27)
	>40,000	12 (5.85)
Type of infertility defect in participants	Male factor	61 (29.76)
	Female factor	49 (23.9)
	Combined	71 (34.63)
	Idiopathic	24 (11.71)
Years since taking fertility treatments	<5	184 (89.76)
	>5	21 (10.24)

500 random permutations of data each with sample size of 205, and mean of percentage variance of the middle 95% distribution obtained from each of these random permutations. The factors whose Eigenvalues are more than that obtained from random permutation were retained and according to this, the first six factors were retained.

Table 2 presents the factor structure of the 46 items of original FPI (translated in Kannada) tool obtained from EFA. As shown in Table 2, the original FPI was refined and reduced into a 32-item measure renamed FPI-K. Just as the original FPI, the new 32-item FPI-K was also explained by 6 factors.

The Factor 1 had 8 items of the original FPI namely items 3, 4, 12, 13, 14, 22, 23, 35 (Cronbach's alpha = 0.668). The Factor 2 had 5 items of the original FPI namely items 15, 25, 28, 31, 38 (Cronbach's alpha = 0.605). The Factor 3 had 7 items of the original FPI namely items 10, 27, 30, 37, 39, 40, 46 (Cronbach's alpha = 0.601). The Factor 4 had 3 items of the original FPI namely

items 2, 5 and 6 (Cronbach's alpha = 0.702). The Factor 5 had 5 items of the original FPI namely items 11, 16, 18, 21, 24 (Cronbach's alpha = 0.622). The Factor 6 had 4 items of the original FPI namely items 29, 34, 36, 42 (Cronbach's alpha = 0.525). Overall Cronbach's alpha for FPI-K is 0.671. On the basis of the new groupings of items obtained on the 32-item FPI-K the factors were renamed as Factor 1 as 'Stressors related to intimacy and procreation,' Factor 2 as 'Stressors related to acceptance of involuntary childlessness,' Factor 3 as 'Stressors of interpersonal comparison,' Factor 4 as 'Stressors related to blocked life goals,' Factor 5 as 'Stressors of marital relations' and Factor 6 as 'Stressors due to unmet desires for parenthood.'

As shown in Table 2, the remaining 14 items of the original FPI namely 1, 7, 8, 9, 17, 19, 20, 26, 32, 33, 41, 43, 44 and 45 were not considered for the FPI-K as the factor loadings of these items were less than 0.3 in all the six domains. It was also decided to include items 39 and 46 despite these having cross factor loading

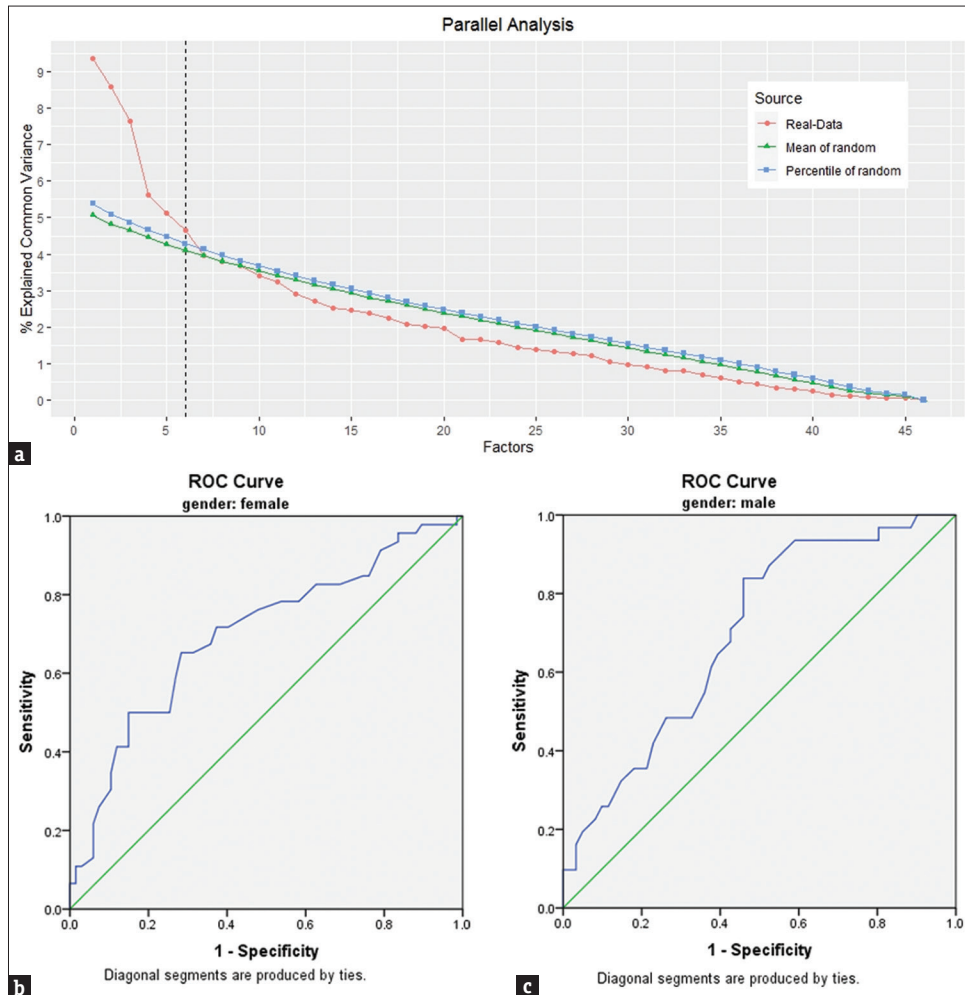


Figure 1: (a): Result of parallel analysis. (b) ROC curve for detecting anxiety in infertile women. (c) ROC curve for detecting anxiety in infertile men. ROC = Receiver operating characteristic

Table 2: Factor structure of the 46 items of original fertility problem inventory (translated in Kannada) used in Indian Sample

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Communality
1. Couples without a child are just as happy as those with children	0.09	0.12	0.14	0.11	0.18	-0.09	0.093
2. Pregnancy and childbirth are the two most important events in a couple's relationship	0.08	-0.16	0.05	0.64	-0.01	0.02	0.408
3. I find I've lost my enjoyment of sex because of the fertility problem	0.35	0.07	0.08	0.13	0.1	-0.22	0.191
4. I feel just as attractive to my partner as before	0.34	0.14	0.06	-0.12	0.06	-0.14	0.194
5. For me, being a parent is a more important goal than having a satisfying career	0	0.02	0.06	0.57	0.02	0.11	0.367
6. My marriage needs a child (or another child)	-0.15	0.06	0.05	0.63	0.03	-0.01	0.473
7. I don't feel any different from other members of my sex	0.16	-0.15	0.09	-0.22	0.19	-0.22	0.21
8. It's hard to feel like a true adult until you have a child	0.21	-0.03	-0.04	0.22	-0.11	0.09	0.092
9. It doesn't bother me when I'm asked questions about children	0.26	-0.01	0.05	0.06	-0.11	-0.17	0.106
10. A future without a child (or another child) would frighten me	0.02	0.08	0.42	0.18	-0.03	0.06	0.236
11. I can't show my partner how I feel because it will make him/her feel upset	-0.13	-0.04	0.08	0.25	0.49	0.07	0.354
12. Family don't seem to treat us any differently	0.40	-0.03	0.02	0.07	0.12	-0.16	0.195
13. I feel like I've failed at sex	0.49	-0.22	-0.08	-0.18	0.08	0.16	0.399
14. The holidays are especially difficult for me	0.55	-0.12	0.05	-0.14	-0.03	0.13	0.401
15. I could see a number of advantages if we didn't have a child (or another child)	-0.14	0.5	0.19	-0.02	-0.04	-0.05	0.309
16. My partner doesn't understand the way the fertility problem affects me	-0.09	-0.14	0.08	-0.04	0.48	0.3	0.408
17. During sex, all I can think about is wanting a child (or another child)	0.04	-0.24	0.17	0.07	0.12	0.16	0.157
18. My partner and I work well together handling questions about our infertility	0.1	0.07	-0.03	-0.14	0.43	-0.05	0.219
19. I feel empty because of our fertility problem	0.17	0.09	0.22	-0.08	-0.06	0.2	0.144
20. I could visualise a happy life together, without a child (or another child)	0.16	0.24	0.02	-0.13	0.16	0.11	0.138
21. It bothers me that my partner reacts differently to the problem	0.07	0.02	-0.23	0.07	0.63	-0.14	0.427
22. Having sex is difficult because I don't want another disappointment	0.41	-0.15	0.11	-0.23	0.16	0.26	0.434
23. Having a child (or another child) is not the major focus of my life	0.42	0.4	0.08	0.04	-0.04	0.15	0.367
24. My partner is quite disappointed with me	-0.02	0.03	0.2	-0.15	0.49	0.11	0.338
25. At times, I seriously wonder if I want a child (or another child)	0.09	0.41	-0.11	0.12	-0.1	-0.19	0.267
26. My partner and I could talk more openly with each other about our fertility problem	-0.02	-0.15	-0.14	-0.03	0.08	0.24	0.113
27. Family get-togethers are especially difficult for me	0.09	0.07	0.56	0.08	-0.2	0.01	0.371
28. Not having a child (or another child) would allow me time to do other satisfying things	0.08	0.59	-0.16	0.08	0	-0.03	0.388
29. I have often felt that I was born to be a parent	0.12	0.02	0.11	0.13	-0.04	0.47	0.288
30. I can't help comparing myself with friends who have children	0.09	-0.22	0.43	0.1	0.22	0.06	0.349
31. Having a child (or another child) is not necessary for my happiness	-0.15	0.57	0.03	-0.12	-0.04	0.15	0.359
32. If we miss a critical day to have sex, I can feel quite angry	0.2	-0.18	0.29	0.07	-0.05	-0.09	0.165
33. I can't imagine us ever separating because of this	0.07	0.04	-0.02	-0.1	0.04	-0.15	0.043

Contd...

Table 2: Contd...

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Communality
34. As long as I can remember, I've wanted to be a parent	0	0.07	0.16	-0.01	-0.05	0.4	0.2
35. I still have lots in common with friends who have children	0.58	0.13	-0.03	0.05	-0.1	-0.17	0.382
36. When we try to talk about our fertility problems, it seems to lead to an argument	0.15	-0.03	0.19	-0.04	0.16	-0.37	0.206
37. Sometimes I feel so much pressure, that having sex becomes difficult	-0.03	-0.14	0.33	-0.17	-0.19	0.07	0.177
38. We could have a long, happy relationship without a child (or another child)	0.08	0.44	0.15	-0.13	0.1	0.06	0.238
39. I find it hard to spent time with friends who have young children	0.04	0.34	0.41	-0.04	0.28	-0.09	0.381
40. When I see families with children I feel left out	-0.13	-0.05	0.49	0.21	0.09	0.11	0.357
41. There is a certain freedom without children that appeals to me	-0.15	0.27	-0.26	0.2	0.08	0.29	0.3
42. I will do just about anything to have a child (or another child)	0.13	0.17	0.01	0.22	0.1	0.45	0.33
43. I feel like friends or family are leaving us behind	0.21	0	-0.08	0.18	-0.21	0.14	0.118
44. It doesn't bother me when others talk about their children	0.34	0.06	0.13	0.08	0.03	0.12	0.165
45. Because of infertility, I worry that my partner and I are drifting apart	-0.05	0	0.17	-0.14	-0.01	-0.13	0.058
46. When we talk about our fertility problem, my partner seems comforted by my comments	0.02	0.1	0.36	-0.1	-0.08	-0.31	0.229

based on adequate clinical validity observed in our sample. The parallel analysis of the remaining 32 items resulted in 6 factors solution and using a minimum residual method the cumulative percentage variance explained by these six factors was 32%.

Table 3 presents the Spearman correlations (ρ) and P values between subdomains of brief FPI-K and HAM-A, HAM-D, PSS.

Table 4 presents the ROC analysis of brief FPI-X. It shows that a cut-off score of above 137 on brief FPI-X would tap clinically significant ISS and anxiety in infertile women while the cut-off score or males were found to be above 131.

DISCUSSION

In this study, the original 5-factor structure of FPI proposed by Newton 1999 was tested using CFA in a sample from India. In our sample, the original factor structure of FPI could not be replicated and hence we tried to explore the factor structure using EFA. Based on the results from EFA, the original FPI was refined and thus introduced brief FPI-K with 32 items of the original 46 items, the remaining 14 items were not fitting under any of the six factors identified using EFA.

The factor structure of the 32-items of FPI-K obtained in this study can be subsumed under 6 new sub-domains. The six sub-domains of ISS obtained on the FPI-K were named as (i) stressors related to intimacy and

Table 3: Spearman's Correlation coefficient (P values) between subdomains of brief fertility problem inventory-X and Hamilton Anxiety Scale, Hamilton Depression Scale, Perceived Stress Scale

Factors	ρ (P)		
	HAMA	HAMD	PSS
Factor 1	0.171 (0.014)	0.214 (0.002)	0.184 (0.008)
Factor 2	0.078 (0.269)	0.085 (0.227)	0.200 (0.004)
Factor 3	0.145 (0.038)	0.137 (0.050)	0.136 (0.051)
Factor 4	0.304 (<0.001)	0.427 (<0.001)	0.408 (<0.001)
Factor 5	0.285 (<0.001)	0.228 (0.001)	0.272 (<0.001)
Factor 6	0.256 (<0.001)	0.380 (<0.001)	0.255 (<0.001)
Total score (32 items)	0.460 (<0.001)	0.539 (<0.001)	0.573 (<0.001)

HAMA=Hamilton Anxiety Scale, HAMD=Hamilton Depression Scale, PSS=Perceived Stress Scale

Table 4: The receiver operating characteristic analysis of fertility problem inventory-X

Gender	Cut-offs of total score on FPI-K	Area under the ROC curve	95% CI (LL-UL)	Significance
Female	137	69.80	0.59-0.79	<0.001
Male	131	69.60	0.58-0.80	0.002

FPI-K=Fertility problem inventory-Kannada version, ROC=Receiver operating characteristic, LL=Lower limits, UL=Upper limits

procreation, (ii) stressors related to acceptance of involuntary childlessness, (iii) stressors of interpersonal

comparison, (iv) stressors related to blocked life goals, (v) stressors of marital relations and (vi) stressors due to unmet desires for parenthood. The findings of this study are in conjunction with another recent investigation.^[25] The latter also proposed that 46-item FPI could be reduced to a 27 items measure with four factors. These 27 items FPI explained 44% of total variance by four factors. The subscales which were retained comprised of items from factor 1: Social stress, factor 2: NFP, factor 3: Rejection of childfree life and finally factor 4: Having items from relational and sexual stressors of infertility.^[25]

The findings of this study are partially supported by some of the previous studies.^[5,7,26] Gourounti *et al.* (2011) in their study retained all items of original FPI but has put forward a four-factor solution which explained 33.1% of total variance by subscales such as spousal concern, social concern, NFP and rejection of childfree lifestyle.^[7] Similarly, Peng *et al.* (2011) supported a 46-item FPI with a 5-factor solution (SOC, REL, NFP, ROCFL and SEX, respectively) explaining 34.26% of the total variance. Our results compared to the latter group of investigations revealed that only 32 of FPI-K subsumed under 6 sub-domains could explain only 32% of variance, which is comparable to what most others have reported.^[26] The maximum possible score on FPI-K was 192 and minimum was 32.

The data obtained from this study highlight that in the FPI-K, most of the infertility distress have been explained by sexual and social stressors of infertility (*viz.*, SEX and SOC in original 46-item FPI). Factor 1 in brief FPI-K contains items concerning the same (SOC and SEX). Second, items assessing NFP were clubbed in factor 2, ROCFL represented factor 3 and REL in factor 4. Factor 5 and 6 consisted of a mixed of items from SOC, NFP, SEX and REL. The latter findings are also partially confirmed by existing research in which social stressors account for maximum variance in experienced of infertility distress.^[5,7,25,26] The finding which appeared as a novel in our data was the importance of sexual stressors related to intimacy and procreative stress in infertile couples. Our results reveal that procreation-focused sexual experiences were significantly stressful impacting ones sense of worthiness (most of which were covered by factor 1). One of the previous investigations conducted by Gourounti *et al.* (2011) also emphasised on the importance of SEX and REL domains of FPI and clubbed them into one single potent factor for ISS namely 'spousal concerns'.^[7]

Our data gather strong support for the clinical importance of sub-domains such as ROCFL and NFP of FPI since these are known to significantly contribute to emotional

well-being of sub-fertile couples. The latter sub-domains tap the personal meanings or representations of infertility for the participants. The ROCFL and NFP were hypothesised to influence the other life domains of infertile men and women namely SOC, SEX and REL aspects.^[5,8] In a similar vein, Moura-Ramos *et al.*, 2012 in their study also supported a 46-item FPI with two intermediate latent factors, *i.e.*, first being representations about the importance of parenthood (in which ROCFL and NFP were combined) and second being impact on life domains (in which SOCIAL SEX and REL was combined).^[8] Helping them cope better with these personal domains (ROCFL, NFP) could avert their non-compliance or abrupt discontinuation from ongoing ovulation induction (OI), Intra uterine insemination (IUI), In vitro fertilization (IVF), OI/IUI/IVF cycles.^[17,27]

Overall the Cronbach's alpha for FPI-K calculated against PSS was 0.67. These were lower than that found in the existing literature. In most of the other studies, the Cronbach's alpha for FPI came out to be higher, *i.e.*, around 0.81,^[25,26] 0.89^[7] and 0.85.^[25] However, Taber mentioned that traditional cut-off (alpha value = 0.60 or 0.70) values may not be applicable for all scales.^[28]

In this study, the convergent validity of the FPI-K is evaluated by Spearman's correlation coefficients between the scores obtained on the various sub-domains and total scores on FPI-K, HAM-A, HAM-D and PSS for all subjects. The data from this study suggests that FPI-K has a fairly good convergent validity with PSS, HAM-A, HAM-D. These findings are in concordance with the existing literature in which FPI has shown to have good convergent validity with other measures of anxiety and depression.^[4] In recent studies, FPI is specifically known to have high convergent validity with measures such as the Hospital Anxiety and Depression Scale,^[26] State Trait Anxiety Inventory, Center for Epidemiologic Studies-Depression Scale, Profile of Mood States.^[5,7] Furthermore, Zurlo *et al.* reported that shorter forms of FPI resulted in inter-correlations ranging from 0.04 to 0.46 against measures of state anxiety, depression and dyadic marital adjustment.^[25] Compared to latter, our data merit the use of shorter forms as FPI-K retained fairly good convergent validity.

The present study is not without its limitations. First, the sample size of the study is limited and is only collected from one single clinic. In addition, the sample was heterogonous with participants belonging to different stages of treatments as well as in different types of treatments (ICSI) Intra Cytoplasmic Sperm Injection, (GIFT) Gamete Intra Fallopian Transfer, (ZIFT) Zygote intrafallopian transfer, (FET) Frozen

embryo transfer (OI, IUI, IVF, IVF-ICSI, GIFT, ZIFT, FET, Donor programmes) and this could have impacted their ISS profile. Second, it is a self-report measure and recall or reporting biases can contribute to errors in the obtained scores. Furthermore, some items of the original FPI failed to load satisfactorily on intended factors thus contributing to lower reliability. Cross-cultural differences could have caused the same, despite the rigorous procedures adopted for translation and adaptation. It was not possible to perform a CFA to the reduced version of FPI as it was not recommended to perform CFA on the same sample which was used to explore the factor structure. Furthermore, the total variance explained by the 6 factors on FPI -K was comparable to most of the existing modified versions of FPI. Moreover, the sample size of this study was not enough to split the data into two parts and use one data set for performing EFA and the other one for CFA. The factor structure of the newly developed reduced FPI-K has to be confirmed using a different sample from Indian and this may also bring forth the need for further revisions.

CONCLUSION

The FPI-K (translated and adapted version of original FPI) was found to have satisfactory psychometric properties in a clinic-based sample from India, with meaningful factor structure, fair internal reliability and good convergent validity. It also had good sensitivity as well specificity against HAM-A for both men and women. The FPI-K emerges as a fairly good single measure which can be used to tap ISS concerns in men and women. Being a self-report measure, it appears as a culturally sensitive tool that can be easily administered and scored by staff nurse before treatments and during critical times of MARTs. It is proposed that those scoring above the identified cut-off on FPI-K are at risk of emotional maladjustment. These are in dire need for professional psychological help for adaptive coping with high ISS.

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Conflicts of interest

There are no conflicts of interest.

Data availability and sharing statement

The data supporting the results reported in a published article can be provided on request to the author.

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