ISSN 2522-9400 **European Modern Studies Journal** *Vol 8 No 2*
available at www.journal-ems.com
DOI: 10.59573/emsj.8(2).2024.36

Validity and Reliability of the Sri Lankan Version of the Patient-Centered Questionnaire-Infertility (PCQ-Infertility)

W L C Anuradha Liyanage[1], Sanjeeva Godakandage[2], Manuj C Weerasinghe[3],
[1]Postgraduate Institute of Medicine, University of Colombo, Sri Lanka
[2]Family Health Bureau, Ministry of Health, Sri Lanka
[3]Faculty of Medicine, University of Colombo, Sri Lanka

Abstract

Background: Reproductive healthcare of the highest calibre should encompass not only safety and effectiveness but also a patient-centered approach. Patients demand patient-centered subfertility treatment in addition to efficient medical management. Offering patient-centered care is crucial for both patients and healthcare professionals. The absence of a suitable instrument for measuring patient-centeredness poses a significant challenge in evaluating this essential aspect of care in Sri Lanka. The present study resulted in a culturally adapted and validated tool in Sinhala language to measure patient-centredness of care received by female partners of subfertile couples.

Methods: The Patient Centredness Questionnaire-Infertility (PCQ-Infertility) was culturally adopted using a modified Delphi process, translated into Sinhala and assessed for its judgmental validity. The study was conducted September to December 2019. A cross-sectional study among 251 females attending the Subfertility Clinic at Teaching Hospital Mahamodara assessed the factor structure through exploratory factor analysis. The factor structure was confirmed with another cross-sectional study at the same setting among 250 females through confirmatory factor analysis. Test re-test reliability, internal consistency and inter-rater reliability were also assessed.

Results: The validated PCQ-Infertility had 44 items with a seven-factor structure identified after exploratory factor analysis and confirmatory factor analysis with a combination of acceptable fit indices (SRMR of 0.079, CFI 0.862 and RMSEA 0.069). A Cronbach's alpha value 0.761 assured high internal consistency. Test- retest and inter-rater reliability assessment gave satisfactory results with values exceeding 0.7 for all domains.

Conclusion: Modified PCQ-Infertility is a valid and reliable instrument which can be used to assess patient centredness care received of subfertile females in Sri Lanka.

Key words: Patient centredness of care, Subfertility, Validation

Introduction

The primary yet demanding aim of healthcare is providing high-quality care (Van Empel et al., 2011a). 'Care which is responsive to individual patient preferences, needs, and values and is respectful of patients' is defined as patient-centered care (Corrigan et al., 2001). The necessity for patient-centeredness has turned out to be an important global concern. It has been identified by the Institute of Medicine of the United States National Academy of Sciences as one of six attributes of health care quality, the others being safety, timeliness, effectiveness, efficiency, and equity (Corrigan et al., 2001). The quality of care provided to subfertile couples is directly linked to compliance with subfertility treatments. High-quality fertility care should be effective, safe, and patient-centered (Van Empel et al., 2010a, b). Recent surveys confirm that, in addition to effective medical management, patients also want patient-centered subfertility care (Schmidt et al., 2003; Dancet et al., 2010; Van Empel et al., 2010a, b). Providing patient-centered care (PCC) is enormously important to patients and healthcare providers equally, as greater levels of PCC in family medicine are directly linked to fewer

misconduct complaints, greater physicians' satisfaction, greater patients' satisfaction, better patient health, and a general increase in the efficacy of care (Dancet et al., 2010; Van Empel et al., 2010a, b). Patient-centered care may especially benefit such areas of healthcare that are associated with high emotions and prolonged treatment times. Subfertility care is one such condition. Subfertility and its medical management encompass a physical and psychological burden for both females and males (Pook and Krause, 2005; Cousineau and Domar, 2007; Peterson et al., 2007; Verhaak et al., 2007), which may be contributing to high discontinuation rates from allopathic treatment (Brandes et al., 2009; Van den Broeck et al., 2009). In subfertility care, as an example, for a woman/couple undergoing Intrauterine Insemination (IUI) treatment, the period of treatment may be prolonged and involves several interventions starting from ingesting hormonal tablets for several days or injecting herself for several weeks to stimulate the production of oocytes, visiting the clinic multiple times for trans-vaginal ultrasound check-ups, placing the sperms inside the woman's uterus to subsequently waiting for two weeks to determine whether a pregnancy has occurred which may become very tedious emotionally. If in the case of failure to achieve pregnancy, such IUI cycles may be repeated and as a result, the duration of this treatment can be prolonged to several months or even years, thus making the impact of subfertility and its treatment have a considerable negative impact on a patient's quality of life. This impact could be seen in terms of impairments in psychosocial well-being, sexual satisfaction, and marital relationships (Verhaak et al., 2007). According to Brandes et al. (2009), due to the high physical and emotional pressure of being in treatment, approximately 23 per cent of couples end treatment prematurely. It has been stressed that, due to the high percentage of patients who decide to leave treatment early, mostly due to high medical costs and adverse psychological effects, every clinic should focus on delivering more patient-centered care (Brandes et al., 2009). Patients who voluntarily discontinued treatment have reported that the psychological burden (72%) and the lack of staff empathy (32%) had influenced their decision (Van den Broeck et al., 2009). This infers that a lack of patient-centeredness of care can cause discontinuation of treatment for non-medical reasons. Therefore, it is imperative that every clinic should focus on delivering more patient-centered care to their patients (Brandes et al., 2009). Despite the success of current medical management, including assisted Reproduction (Zegers-Hochschild et al., 2009), a considerable proportion (one-third) of the subfertile patients ultimately do not get a child (Pinborg et al., 2009; Brandes et al., 2010). Therefore, process indicators such as patient-centeredness are extremely important in addition to outcome indicators like pregnancy rates.

The patient-centeredness of care should preferably be assessed by surveys that measure the patient's experience. Although patient satisfaction with subfertility care has been studied in a clinical setting (Lansakara, 2006), patient-centered care received by subfertile couples, which is broader than patient satisfaction, has not been studied in Sri Lanka according to the available literature. In a 2023 study by Dharmadasa et al., an attempt to measure satisfaction among subfertile women regarding patient-centered care in fertility clinics was made. While the study acknowledged the clinic's emphasis on personalized attention and care, it highlighted the need for further enhancement of PCC to maximize its potential, suggesting improvements to enhance client satisfaction through more efficient PCC services. However, no tool to study PCC has been validated for use in Sri Lanka.

The PCQ-Infertility is a tool designed especially to assess PCC in subfertility treatment (van Empel et al., 2010a, b). Its design was based on a PCC model that considered the unique aspects of subfertility treatment. Dancet et al. (2010) constructed this model based on a thorough evaluation of the literature on subfertility, multiple focus groups, and the theoretical model of PCC from the Picker Institute (Corrigan et al., 2001). The Patient-Centredness Questionnaire-Infertility was developed in the Netherlands through focus group discussions and literature surveys. It was subsequently validated using a sample of 888 subfertile patients

from 30 fertility clinics (van Empel et al., 2010b). The questionnaire consists of 46 questions divided into seven dimensions: accessibility, information provision, communication, patient involvement, respect for patients' values, continuity and transition and staff competence. The questionnaire was further validated by a group from Portugal by affirmative factor analysis, proving its construct validity (Pedro et al., 2013). The PCQ-Infertility has since been successfully tested and used in the Netherlands, Slovakia, Slovenia, Portugal, and Iran (Pedro et al., 2013; Aarts et al., 2012; Gameiro, Canavarro & Boivin, 2013, Karajičić, 2014; Huppelschoten, 2015. Dizaj et al., 2016; Vlaisavljevic et al., 2016).

Although PCQ- I has proven to be a reliable and valid instrument to assess patient-centredness of care in several European countries it has not been validated in a country with a similar socio-cultural background to Sri Lanka. Therefore, the aim of this study was to adapt and validate a patient-centered questionnaire infertility in order to evaluate the patient-centered care received by subfertile patients attending subfertility clinics.

Methods

Operational Definitions

Since there are several definitions of subfertility used around the world, operational definitions were developed specifically for this study. An operational definition of subfertility was developed by taking into account the World Health Organization's (WHO) definition of infertility (WHO 2014), as well as input from consultant obstetricians and gynaecologists and consultant community physicians working in subfertility services. "A disease of the male or female reproductive system defined by the failure to achieve pregnancy after twelve months or more of regular unprotected intercourse" is the operational definition of subfertility used in this study. Primary Subfertility is when a woman has never conceived in spite of regular unprotected sexual intercourse for twelve months and the secondary subfertility is delay for a woman to conceive again, who have conceived previously, even if the pregnancy may not have been successful due to miscarriage, ectopic pregnancy.

The steps carried out during the cultural adaptation and validation of the Patient-Centeredness Questionnaire - Infertility (PCQ-I), as outlined by Gjersing, Caplehorn & Clausen (2010), are depicted in Figure 1.

Cultural Adaptation and Modification of the PCQ-Infertility

The cultural adaptation process of the PCQ-Infertility involved the use of the modified Delphi process (Henson & Roberts, 2006) with a group of nine experts from the fields of subfertility, gynaecology, and community medicine. The process comprised two rounds of consultation conducted via individually addressed electronic mails. During each round, panellists rated their level of agreement on a scale of 1 (total disagreement) to 9 (total agreement) and provided opinions on item acceptability and cultural appropriateness in the local context. They were also invited to suggest modifications to enhance cultural appropriateness and propose new questions related to patient-centered care (PCC) of subfertility in Sri Lanka.

In the second round, the modified tool, and the initial version with mean scores from the first round were shared with the expert panel for ratings. Written instructions were given to the experts along with the questionnaires. During the process, panel members were asked to express their opinions freely regarding each item separately, in relation to two aspects, namely: ‘Acceptability of the concept in the local context’ and ‘Cultural appropriateness of the words used’.

Ratings between 1 and 3 were considered as ‘Agree that the item is inappropriate for the local context’. Ratings between 4 and 6 were taken as ‘Agree that it is equivocal, which means

it requires changing some of the words', and ratings between 7 and 9 were considered as 'Agree that the item is appropriate for the local context'.

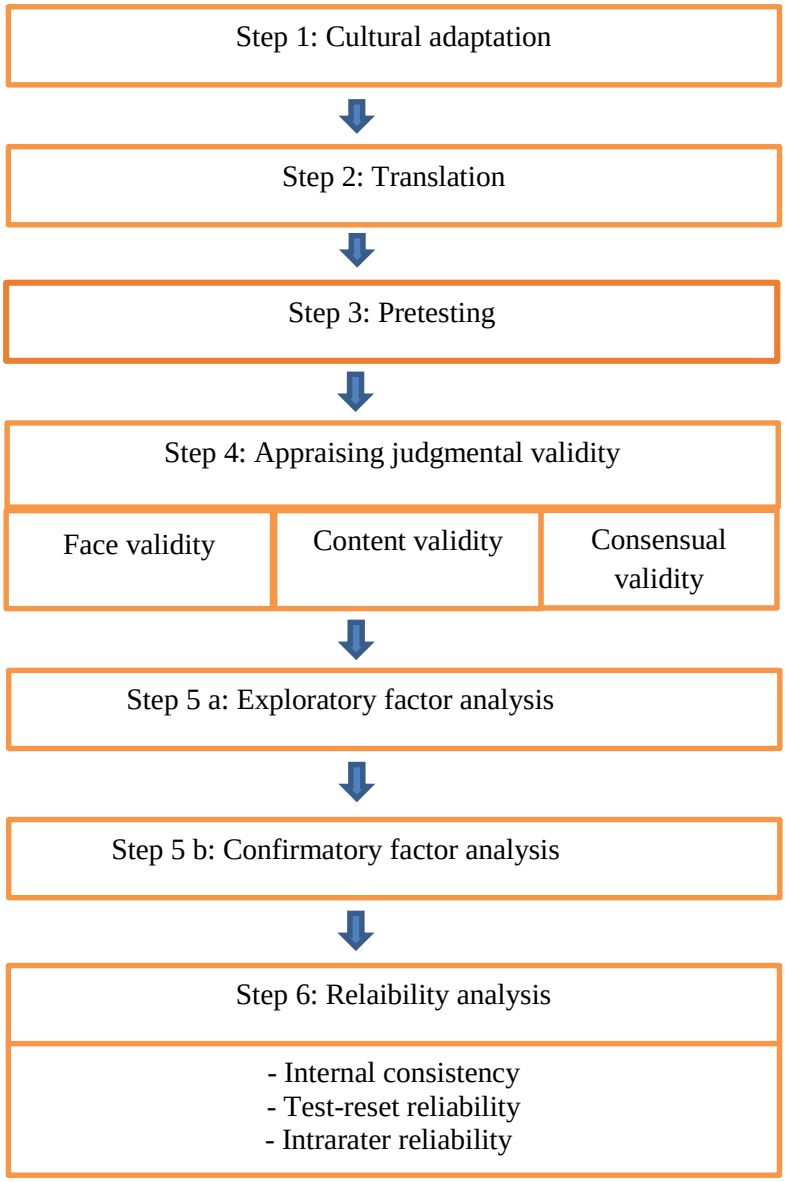

Figure 1. Schematic diagram of the cultural adaptation translation and validation of patient centredness questionnaire infertility

The questions that yielded more than 70% agreement among the reviewers were included in the final questionnaire. Agreement among more than 70% of the expert panel to remove an item was taken as the cut-off to remove an item from the questionnaire (Gordon, Murphy, Cande & Hiltunen, 1994). If a score of less than seven was assigned to any item, suggestions were requested on ways of modifying it. The rating for each item and all additional remarks were summarized.

Translation of PCQ-Infertility

The translation process of the PCQ-Infertility involved the forward-backward translation method (Gjersing, Caplehorn & Clausen, 2010). Two translators proficient in both Sinhala and

English independently translated the questionnaire into Sinhala, the local language. The provisional forward translation was then translated back into English by two bilingual translators without referring to the original English version. After reaching a final consensus, the provisional forward translation was deemed acceptable.

Pre-testing of the PCQ-I

The next step was pre-testing the PCQ- Infertility among randomly selected 25 subfertile females attending the subfertility clinic at Family Health Bureau. The administration of each questionnaire was followed by a structured interview conducted by the PI. The interview focused on each question separately to determine the difficulty in understanding, acceptability, and comprehension of each item and the feasibility of using the questionnaire. Participants were given a chance to express their views and questions. The practical difficulties that arose during the completion of the questionnaire were also assessed. The average time taken to fill the questionnaire was 15 minutes. Based on the interviews, a few modifications were made to the wordings of several items.

Apprising Judgmental Validity of the PCQ-Infertility

A multidisciplinary panel of experts who were involved in the process. The face validity of the study tool was evaluated with regard to the subjective qualities that make it suitable for assessing patient-centered care received by subfertile couples (Hulley et al., 2013). The face validity of the tool was further assessed by a multidisciplinary panel of experts who were not involved in the cultural adaptation of the questionnaire. Nine experts from the fields of Community Medicine (n=5), and Gynaecology and Obstetrics (n=4) were involved in the process.

The same panel of experts ensured that the questionnaire was comprehensive enough to measure patient-centeredness care and that the questionnaire components covered all the attributes that needed to be assessed in the patient-centeredness of care concept ensuring content validity.

Consensual validity was assessed through agreement among the expert panel on the validity of the tool, following the approach described by Abramson & Abramson in 1999. The same panel of experts involved in the face and content validity assessed the consensual validity of the Sinhala version of PCQ-Infertility using the Modified Delphi technique. It was planned to be done in three rounds. The experts were requested to rate each item regarding three aspects namely: 'Relevance in assessing patient centredness of care received by subfertile patients', 'Appropriateness of the words used' and 'Acceptability in the local context' in assessing patient centredness of care received by subfertile patients.

Experts were asked to rate their agreement on a scale of 0 (Not suitable at all) to 5 (highly suitable). Ratings given by experts were assessed at the end of the process. Items with mean scores of more than 3.5 were considered as to be retained in the instrument. All experts were in agreement that all the items of the PCQ-Infertility are relevant in assessing patient-centredness of care received by subfertile patients. Only a few changes were made in wordings to make it suitable for the local context. Two Modified Delphi rounds were conducted. In the second round all items had scored more than 3.5 for all aspects which were assessed. At the end of the process, the instrument with a set of 46 items was forwarded for appraisal of construct validity.

Apprising Construct Validity of the PCQ-Infertility

To appraise the construct validity of the PCQ-Infertility, both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted.

Study Design and Setting

A cross sectional study was carried out for EFA at Teaching Hospital Mahamodara, Galle. Data collection was carried out from September to October 2019.

Then, a separate cross sectional study for confirmatory factor analysis was conducted on another sample in the same setting followed by EFA and it was carried out from November 2019 to December 2019.

Study Participants

The study population comprised female partners of subfertile couples who were currently married (legally or customarily) and had primary or secondary subfertility, as per the operational definition of subfertility, in the reproductive age group (15-49 years), who were attending subfertility clinics at Teaching Hospital Mahamodara Galle. Females who were unable to provide rational information due to any reason (e.g., mental retardation), those who were not proficient in Sinhala, those who were referred from the private sector only for investigation or treatment, and women who came to the clinic for the first time were excluded from the study. To obtain a reliable estimate, the number of observations required needed to be five to ten times the number of variables in the tool (Tabachnick, Fidell, 2010). Based on this criterion, the required sample size for this study was estimated at 230. To account for potential non-response, the required sample size was increased to 250. Thus, a sample of 250 study participants was recruited for the cross-sectional study of EFA. All consecutive clinic attendees who fulfilled the inclusion and exclusion criteria were recruited until the required sample size was achieved.

For the CFA, a separate sample of study participants (n=250) with the same inclusion and exclusion criteria was selected. The modified PCQ-Infertility, which contained seven domains was used to collect data.

Data Collection

Two pre-intern Medical Officers were trained as data collectors. The interviewer-administered, pre-tested, final Sinhala version of the PCQ-I was used along with the section included to obtain details of socio-demographic factors and subfertility related information to collect data for EFA.

Modified PCQ-Infertility using EFA with additional questions to assess socio-demographic factors was used to collect data for CFA. In the clinic, study participants were assessed for eligibility. The eligible study participants were then informed of the purpose of the study and provided with other relevant information using the information sheet. The study participants who consented to participate were administered the questionnaire. Only ten study participants were interviewed per day by a data collector to improve the quality of data. Data collection was supervised by the principal investigator throughout the data collection period. To avoid data duplication, a list of clinic registration numbers was taken and checked before collecting data from the new study unit.

Data Analysis

An EFA using Principal Component Analysis was conducted using SPSS version 23. Bartlett’s test of sphericity and the Kaiser-Meyer–Olkin (KMO) measure were performed to assess the factorability of the data. The hypothesis that correlation matrix is an identity matrix is tested using Bartlett's test of sphericity and significance results ($p<0.05$) indicate good factorability of data. KMO is a measure of sampling adequacy and a value closer to one is point towards sizeable sampling adequacy (0.9 or higher as highly acceptable; 0.8 – 0.9 Meritorious; 0.7 as acceptable; 0.6 as average; and less than 0.5 as unacceptable) (Kaiser & Rice, 1974).

Factor structure and factor loadings after ProMax rotation were assessed. The selection of factors was done according to their Eigen values. The factors were considered relevant if the Eigen values were more than one. The items were observed for their factor coefficients and loadings of more than 0.4 were considered as adequate. The items which were grouped together were identified by the factor coefficient of each item. The items with maximum loading onto the same factor were grouped together and identified as a domain (latent factor) (Henson and Roberts, 2006, Fabrigar et al., 1999, Osborne and Costello, 2009). Thirteen latent factors were identified by the EFA. Several factors were amalgamated and seven domains were identified.

CFA was performed using the graphic version 23 of AMOS (Analysis of Moment Structures). CFA was performed on the 44 items to determine the extent to which the underlying seven-factor model could be replicated in the data. Additionally, a five-factor model and a six-factor model were also tested in the CFA. The normality assessment revealed that several of the responses to the PCQ-Infertility questions were not normally distributed. The Maximum Likelihood method (ML) with bootstrapping was used as the data were non-normally distributed. Bollen-Stine bootstrap P values for Chi-square were calculated. (Finney & DiStefano 2006). Several fit indices were used to evaluate the appropriateness of models.

Assessment of Reliability

The tool was re-administered to 20 participants, two weeks after initial data collection for CFA by the same data collector to assess test-retest reliability. The inter-rater reliability was assessed by the Intra-class Correlation Coefficient (ICC). The questionnaire was administered to 20 selected for CFA participants by a Research Assistant (RA). Second RA administered the questionnaire to the same 20 participants, one hour after administration by the first Research Assistant (RA).

Results

Cultural Adaptation

At the first round of the Delphi process for cultural adaptation, the mean scores for each item ranged from 2.18 to 9.0. More than 70% of the experts suggested the removal of two items (Q1 and Q2). Those items were dealing with accessibility of the clinic via telephones and emails. Thirty items of the original tool had scored an average of more than seven. Furthermore, three raters suggested adding new questions regarding privacy and protection of the clients during the service delivery as those are important aspects of patient centredness of care in the Sri Lankan context. Items 03, 04, 08, 09, 10, 11, 12, 16, 17, 19, 31, 32, 37 and 46 had a mean score between 3-7, indicating that the wording of these items should be modified to make it more culturally appropriate. These items were modified based on the suggestion provided by the experts. At the end of second round, following the modification mean scores of all the items were above 7. The modifications are shown in Table 1.

Table 1. Modifications to Items Based on the Suggestions Made by the Expert Panel

Item No.	Original item	Modified/new item
1	How often have you been able to speak to someone immediately when you called the fertility care center?	Removed (contacting the fertility centre through telephones is not a usual practice in Sri Lanka)
2	Was it a problem for you to contact staff by telephone or email if you had any questions?	Removed (contacting the fertility centre through telephones or email is not a usual practice in Sri Lanka)
3	Did you receive a contact number for urgent questions or problems at night or on weekends?	Did you receive information of a contact place or steps to follow for urgent questions or problems at nights or weekends?

4	Did you receive written information apart from verbal information?	Did you receive written information apart from verbal information at the clinic?
8	Did you receive an overview of your treatment plan with a time frame?	Did you receive an overview about your treatment plan and time frame for each of them?
9	Were you informed of any possible side-effects of the medication/s prescribed to you?	Were you informed of any possible side-effects of the medication/s or hormone injections prescribed to you?
10	Were the instructions on how to inject your hormones comprehensive?	Were the instructions on how to take your hormones or medication/s comprehensive?
11.	Did the staff inform you how to get support from a social worker or a psychologist?	Did the staff inform you how to get support from a psychologist?
12.	Did you miss any instructions from a nurse? If so, when?	How often did you miss any instructions from a nurse?
16.	How often did physicians listen to you carefully?	How often did doctors listen to you carefully and patiently?
17.	How often did the physician take you seriously?	How often did the physician pay thorough attention to you?
19.	How often did you have the impression that the staff was talking about you instead of talking to you?	How often did you have the impression that the staff was instructing you about what you should do instead of talking to you by considering all the information about you?
31.	Was one staff member assigned to you to contact any time you had any questions or problems?	Was any staff member assigned to you to contact any time you had any questions or problems?
32.	How many different physicians are or were involved in your treatment at your present hospital?	How many doctors are or were involved in your treatment at your present hospital clinic?
37.	Did care givers contradict each other in policy	Did service providers at the clinic have contradictory opinions on your treatment?
46.	How long, on average, did you have to wait unnecessarily before being able to start with the next treatment?	As you think, how long, on average, did you have to wait unnecessarily before being able to get a treatment done or investigation prescribed for you?
new		How often did you feel that your privacy was maintained during treatment?
new		How often did you feel that you were protected during your treatment?

Results of the Cross Sectional Study for Exploratory Factor Analysis

Two hundred and fifty one subfertile females who attended the subfertility clinic participated in the study. The mean age of the sample was 31.4 years (SD=5.0). Some of the socio-demographic characteristics of the sample are given in Table 2.

Table 2. Distribution of the Socio Demographic Characteristics of the female partners of the subfertile couples of the Cross Sectional Study for Exploratory Factor Analysis

Socio-demographic Characteristics		**Number**	**%**
Age in years (N=251)	≤24	21	8.4
	25-29	75	29.9
	30-34	78	31.1
	35-39	57	22.7
	40-44	18	7.2
	45-49	2	0.7
Ethnicity (N=251)	Sinhala	240	95.6
	Tamil	4	1.6
	Muslim	6	2.4

	Other	1	0.4
Religion (N=251)	Buddhism	235	93.6
	Catholicism	7	2.8
	Islam	6	2.4
	Hinduism	3	1.2
Highest level of education (N=251)	No education	1	0.4
	Grade 1-5	29	11.6
	Grade 6- 11	39	15.5
	Passed G. C.E. (O/L) *	54	21.5
	Grade 12-13	46	18.3
	Passed G.C.E. (A/L) **	72	28.7
	Graduate/ diploma	10	4.0
Current employment status (N=251)	Currently Unemployed	182	72.5
	Currently employed	69	27.5
Monthly family income (N=251)	< Rs.15,000	3	1.2
	≥Rs. 15,000 - < Rs. 30,000	30	12.0
	≥Rs. 30,000- < Rs.50,000	162	64.5
	≥Rs.50, 000	56	22.3
Type of subfertility	Primary	198	78.9
	Secondary	53	21.1

*Note: *General Certificate of Education (Ordinary Level) examination*
***General Certificate of Education (Advanced Level) examination*

Bartlett`s test of sphericity showed that the population correlation matrix is significantly different from the identity matrix (5180.9; $p<0.001$). The Kaiser-Meyer-Olkin (KMO) (0.768) was at an acceptable level for factor analysis. Also, the overall reliability was assessed using Cronbach‘s alpha (0.761), and it was greater than the value recommended for factor analysis (0.7).

Principal Component Analysis method with ProMax rotation was used for factor extraction. The factors were considered relevant if the Eigen values were more than one. The items were observed for their factor coefficients and loadings of more than 0.4 were considered as adequate. n the present study the problem of cross loading was removed when the rotational power was set at 0.04 under ProMax rotation. All the factors loaded clearly with a factor loading > 0.4 except for one variable. That was (Q18) “physician took enough time”. However, that aspect was required for the tool according to the expert opinion. The factor loading of that item was not that low. Furthermore, the difference between in magnitude of the loading is large (> 0.2). Therefore the variable can be allowed to remain and assumed to load on the factor for which it has the highest loading (Ferguson & Cox, 1993). Consequently, the item was well accepted within the factor 9.

The items with maximum loading onto the same factor were grouped together and identified as a domain (latent factor). Item numbers 20 and 31 were dropped because they loaded as a single factor and did not load on to any of the above factors. The analysis resulted in 13 factors with Eigen values ranging from 1.093 to 4.763. This 13 factor model explained 65.63% of the total variance of the model. Communalities indicate the amount of variance in each item that is accounted for all extracted factors. The communalities for domains ranged from 0.355 to 0.713. Table 3 shows the factor coefficient of items after ProMax rotation in the Principal Component Analysis procedure.

Table 3. Factor Coefficients of Item after ProMax Rotation in Principal Component Analysis Procedure

Item	Component												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Q3													.589
Q4													.759
Q5	.461												
Q6	.933												
Q7	.782												
Q8	.670												
Q9						.500							
Q10						.853							
Q11													.698
Q12	.935												
Q13										.610			
Q14										.644			
Q15						.862							
Q16									.697				
Q17									.754				
Q18									.669	.			
Q19										.739			
Q21							.765						
Q22							.806						
Q23												.756	
Q24													
Q25				.665								0.590	
Q26				.797									
Q27				.696									
Q28			.707										
Q29												.618	
Q30				.585									
Q32								.880					
Q33								.822					
Q34								.456					
Q35		.853											
Q36		.942											
Q37		.966											
Q38							.727						
Q39				.411									
Q40					.933								
Q41					.455								
Q42											.670		
Q43											.659		
Q44					.607								
Q45					.938								
Q46											.763		
Q47			.900										
Q48			.923										

Each factor had three or more items loaded onto it. Table 4 demonstrate the factors, the number of items loaded on to factors and number of items under each factor identified after exploratory factor analysis.

As indicated in Table 4, six items (13, 15, 23, 28, 38, 39) did not load onto the original domain structure of the PCQ-Infertility. Additionally, two new items (44 and 45) were added to the questionnaire and were assigned to the staff competence domain.

The 13 factor structure identified by the PCA and items loaded onto each were examined by the PI and supervisors. Several factors were seemed to measure conceptually similar constructs. Therefore, such factors were amalgamated as a single factor to obtain a meaningful factor structure. Finally, seven factors were identified and they could be given the same names in the original PCQ-I questionnaire. However, some items did not fit into the factors to which they belonged in the original PCQ- Infertility.

Table 5 describes the factor coefficients of 44 items and how they were mapped in the seven factor structure.

Given that several factors measured conceptually similar constructs, some of the factors were merged to achieve a more meaningful factor structure. Ultimately, seven factors were identified and given the same names as in the original PCQ-I questionnaire.

Table 4. Factors (Domains) and the Number of Item under Each Domain After Principal Component Analysis

Factor (Domain)	Items loaded on to factor	Number of items
Factor 13	Q3,Q4,Q11	3
Factor 1	Q5,Q6,Q7,Q8,Q12	5
Factor 6	Q9, Q10, Q15	3
Factor 10	Q13, Q14, Q19	3
Factor 9	Q16, Q17, Q18	3
Factor 7	Q21, Q22, Q38	3
Factor 12	Q23, Q24, Q29	3
Factor 4	Q25, Q26, Q27, Q30, Q39	5
Factor 8	Q32, Q33, Q34	3
Factor 2	Q35, Q36, Q37	3
Factor 11	Q42, Q43, Q46	3
Factor 5	Q40, Q41, Q44, Q45	4
Factor 3	Q28, Q47, Q48	3

Confirmatory Factor Analysis (CFA)

Two possible models (five factor model and six factor model) were assessed against the hypothesized seven factor model that was developed after EFA. Fairly acceptable levels of model fit indices were obtained by the seven factor model. Several modifications were suggested by the AMOS software to improve the model fit indices. According to that four within factor error covariance were considered to the analysis.

1. Five Factor model- items, measuring ‘communication skills’ and items measuring ‘involvement in your treatment’ were loaded into one latent factor and items measuring care organization and items measuring ‘staff competency’ loaded into one latent factor.

2. Six Factor model – items, measuring ‘communication skills’ and items measuring ‘involvement in your treatment’ were loaded in to one latent factor.

3. Seven Factor model - seven latent factors materialized according to the literature and experts’ opinion after EFA.

4. Seven Factor model with modifications suggested by software - seven latent factors materialized according to the literature and exerts opinion after EFA with modification suggested by AMOS software.

Model fit was determined by examining eight fit indices. These indices categorized under three groups i.e.: measures of absolute fit, parsimonious fit and incremental (relative) fit. It has been recommended that a combination of indices, representing all three groups, be used to assess the model fit (Brown, 2006). Therefore, eight fit indices were used and the relevant statistics are presented in Table 6.

Table 5. Factor Coefficients of Individual Items of PCQ-I Mapped within the seven Factor Structure

Domains in the original tool	Item	Component												
		1	2	3	4	5	6	7	8	9	10	11	12	13
Information & explanation	Q3													.589
	Q4													.759
	Q5	.461												
	Q6	.933												
	Q7	.782												
	Q8	.670												
	Q9						.500							
	Q10						.853							
	Q11													.698
	Q12	.935												
	Q13										.610*			
Staff communication skills	Q14										.644			
	Q15						.862*							
	Q16									.697				
	Q17									.754				
	Q18									.669	.			
	Q19										.739			
Involvement in your treatment	Q21							.765						
	Q22							.806						
	Q23												.756*	
Respect your Values & Needs	Q24												-.590	
	Q25				.665									
	Q26				.797									
	Q27				.696									
	Q28			.707*										
	Q29												.618	
	Q30				.585									
Continuity & transition during your treatment	Q32								.880					
	Q33								.822					
	Q34								.456					
	Q35		.853											
	Q36		.942											
	Q37		.966											
Staff competence	Q38							.727*						
	Q39				.411*									
	Q40					.933								
	Q41					.455								
	Q42											.670		
	Q43											.659		
	Q44					.607								
	Q45					.938								
Care organization	Q46											.763*		
	Q47			.900										
	Q48			.923										

The chi square value assesses overall fit and the discrepancy between the sample and the fitted covariance matrices. A non-significant chi-square valve indicates a good fit. The chi-square value is sensitive to sample size and it could be infiltrated with large sample sizes. Therefore, it is suggested to examine the relative chi-square which is the ratio between the chi-square value and the degrees of freedom of the model. A relative chi-square value less than three is satisfactory (Brown, 2006).

Model one (five-factor model) did not show an acceptable model fit to the data and its chi-square value was 2702.202 (df=892). This was followed by model two (six -factor model), where the model displayed a slight improvement of the fit indices with a chi- square value of 2537.888 (df =887), but its overall fit was not acceptable. Seven-factor model (model three)

which was materialized after the EFA showed an improved fairly acceptable fit indices with a chi-square value of 2258.668 (df=881).

After incorporating the modification suggested for the seven-factor model, fit indices were much improved (chi square =1925.648, df=877, RMSEA= 0.069, SRMA=0.0793). This model displayed the best model fit statistics out of all the models tested.

Table 6. Model Fit Statistics of Models

Model	Fit indices									
	X^2	Df (P value)	GIF	RMSEA	CFI	NFI	TLI	X^2/df	IFI	SRMR
Five factor model	2702.202	892 (0.002)	0.690	0.090	0.472	0.393	0.440	3.0	0.481	.943
Six Factor model	2537.888	887 (0.006)	0.700	0.081	0.606	0.489	0.530	2.8	0.613	0.910
Seven factor model	2258.668	881 (0.005)	0.712	0.079	0.820	0.737	0.806	2.5	0.821	0.819
Seven factor model with modification suggested by AMOS	1925.648	877 (0.005)	0.739	0.069	0.862	0.775	0.851	2.1	0.863	0.079

X2 =Chi square value, df- degree of freedom, Bollen-Stine bootstrap p value- significant level
GIF =Goodness of fit index (>0.9 is desired)
RMSE =Root mean square error of approximation (<0.05 is desired, <0.08 is acceptable)
CFI =Comparative fit index (>0.9 is desired)
NFI = Normed Fit Index (>0.9 is desired)
TLI = Tucker-Lewis Index (>0.9 is desired)
X2/df = Chi square value/degree of freedom (< 2 is desired)
IFI = Incremental fit index (>0.9 is desired)
SRMR = Standardized root mean square residual (<0.08 is desired)

Reliability

The Cronbach's alpha value for the total questionnaire met Nunnaly's criterion of 0.7, indicating adequate internal consistency. However, two domains, namely "Involvement in Your Treatment" and "Care Organization," each with three items, did not meet the criteria for adequate internal consistency. It has been suggested that low Cronbach's alpha values may result from having fewer items in a domain (Avella 2016). The intra-class correlation coefficients (ICC) for all domains and the total score were greater than 0.7 (Donohoe, Stellefson & Tennant 2012) indicating good test-retest reliability. Additionally, The Inter-observer reliability was assessed by calculating intra-class correlation coefficient value for the total scale and its domains and all domains and the total score were greater than 0.7, indicating good inter-observer reliability.

Discussion

The Patient-Centered Questionnaire – Infertility is a specific study instrument used to assess patient-centeredness of care. Patient-specific experiences can readily be transformed into recommendations to improve the quality of care for the disease and are essential to uplift the quality of fertility care (Cleary, 1999).

When borrowing tools from other settings, the process of cultural adaptation is a prerequisite (Avella, 2016). Cultural adaptation of the tool using the modified Delphi method allowed consensus generation of experts from multiple specialties (Avella, 2016). The anonymity of this process prevents the reputation, authority, or personality of some participants

from influencing others (Donohoe et al., 2012). It provided an opportunity to allow panel members considerable freedom in voicing their opinions, suggestions, and diverse perspectives without fear of criticism (De Villiers, de Villiers, & Kent, 2005).

Several modifications were made to the tool during the cultural adaptation process. The experts added two new questions which were not included in the original tool. These two questions were about perceptions of privacy and protection during treatment. Even though there were no items in the original tool regarding perceived ensured privacy and perceived protection during treatment, they were identified as important aspects in the PCC model developed by Dancet et al. (2011). Privacy and protection go hand in hand with the patient-centeredness of care of services (Royal College of Nursing, 2016). Thus, the addition of two items by local experts added value, which was an advantage to the questionnaire without changing the focus of the questionnaire.

Access to care is one of the domains that were in the original study tool and consisted of two items related to the accessibility of the healthcare center via telephone or email. However, the final decision in the modified Delphi was to remove those two items due to the non-availability of such facilities in the Sri Lankan setting. Literature pointed out that 'distance to the health care facility' and 'availability of transport' are important aspects of access. However, those aspects were not included in the questionnaire since the tool focuses mainly on steps adapted by a healthcare facility to improve its service provision. Despite being important, aspects of accessibility like the distance to the clinic cannot be improved by a hospital.

The thorough validation process of the Sinhala version of the PCQ-Infertility is a significant strength, as it ensures the reliability and validity of the tool for use in the local context. The use of triangulation in the absence of a gold standard for criterion validity is commendable, as it is considered the best method to ensure validity. The involvement of experts in the modified Delphi technique to assess face, content, and consensual validity adds to the robustness of the validation process. The separate cross-sectional studies for EFA and CFA provide further evidence of the tool's validity.

Furthermore, the decision to carry out EFA was appropriate, given the cross-cultural influences affecting perceptions and health practices. The modifications made to the original PCQ-Infertility during the cultural adaptation process also necessitated a fresh evaluation of the tool's construct validity. The fact that the original instrument was not directly applicable in the study setting highlights the importance of adapting and validating tools for use in specific cultural contexts. Overall, the comprehensive validation process ensures that the Sinhala version of the PCQ-Infertility is a reliable and valid instrument for assessing infertility-related stress in the local population.

Exploratory Factor Analysis was carried out using Principal Component Analysis (PCA), which is the most acceptable method to appraise the factor structure in EFA (Shlens, 2014). The number of factors to be retrieved is determined by the Eigenvalue (if it is greater than one) (Thompson, 2004). The Eigenvalues of the components in this investigation varied from 4.763 to 0.015. Promax rotation was used, as this tool measures a psychological index that can be expected to have correlations between factors (De Vellis, 2012). After Exploratory Factor Analysis, 44 items were assigned into seven factors.

Seven-factor structure, five-factor structure, and six-factor structure were tested using Confirmatory Factor Analysis (CFA) using Amos 23 software. The chi-square value assesses the overall fit and the discrepancy between the sample and the fitted covariance matrices. A non-significant chi-square value indicates a good fit. None of the models fit well with the data. The chi-square value is sensitive to sample size and it could be inflated with large sample sizes. Therefore, it is suggested to examine the relative chi-square, which is the ratio between the chi-square value and the degrees of freedom of the model. A relative chi-square value less than 2 is satisfactory (Brown, 2006). All three models resulted in a relative chi-square value of more

than two, but relative chi-square values for the three models were also close to 2. A parsimony fit index, the Root Mean Square Error of Approximation (RMSEA) value, showed an acceptable level of <0.8 for only the seven-factor models. The Goodness of Fit Index (GFI) should exceed 0.90 (Byrne, 1994) for good model fit. The GFI values were not satisfactory for all the models. Similarly, Normed Fit Index (NFI), comparative fit index (CFI), Incremental Fit Index (IFI), and SRMR values were also not satisfactory for all the models because these indexes did not exceed 0.9, which is the desired value (Byrne, 1994). When these indices were considered, most of them had shown better values in the seven-factor model. Therefore, Confirmatory Factor Analysis confirmed (RMSEA 0.069, SRMR 0.079, GFI 0.739, CFI 0.862) that the PCQ-Infertility tool assesses the experiences of patients in seven distinct domains of PCC.

The eight-factor structure is the most accepted factor structure and the most used in other countries. Van Empel et al. (2010b) conducted a study to develop and validate the PCQ-Infertility among a sample of 888 subfertile couples in 30 fertility clinics and identified eight PCC factors. They confirmed the construct validity of the PCQ-I by testing several hypotheses. It showed that patients who had better quality treatment (e.g., access to their medical record, had a regular doctor, received written information, and planning for their treatment) reported more positive experiences of PCC than patients without these services. However, factor analysis was not done to confirm the validity of the theoretical model of PCC. Pedro et al. (2016) further confirmed the same construct in a sample of women and men undergoing infertility diagnosis or treatment in Portugal. The CFA confirmed that the PCQ-Infertility tool assesses patients' experiences of eight distinct aspects of PCC: accessibility, information, communication, respect, patient involvement, competence, continuity, and service organization. Fit indices were CFI = 0.929 and RMSEA = 0.058 (90% CI 0.051–0.065). A study in New Zealand aiming to validate this PCQ-I has confirmed the eight-factor structure. Construct validity of the tool was assessed by testing three hypotheses (Mourad et al., 2019).

The present study obtained a seven-factor structure that best matches the Sri Lankan context. The main difference is that the factor 'access' was not included in the Sinhala version of the PCQ-Infertility since one factor had to be dropped after cultural adaptation. A thorough assessment of the Patient Centredness Questionnaire–Infertility instrument revealed that the concept of access to the clinic via telephones and emails was not as relevant in the Sri Lankan setting, as there were no established systems for this type of access. Even though the other factors were the same as in the above studies, some items were not in the original factors: item 13 in the 'information and explanation' domain, item 15 in the 'communication' domain, item 23 in the 'involvement in your treatment' domain, item 28 in the 'respect your values and needs' domain, items 38 and 39 in the 'staff competence' domain, and item 46 in the 'care organization' domain did not load onto the original domain structure of the PCQ-Infertility. The alteration of the items in the original factor structure emphasized the value of cultural adaptation and validation of the tool to the present research setting. It also highlighted the importance of ensuring the validity of items and concepts in the current language, time, and context. Another distinct difference from the PCQ-I tools of other countries is that two new items were added. The two added items enabled PI to assess two new perceived attitudes of subfertile females toward service providers that were valid in the Sri Lankan setting. Therefore, the seven-factor structure obtained after cultural adaptation and careful validation in the present study is satisfactory to measure patient-centered care in the Sri Lankan context. Test-retest reliability was assessed using the Intra-class Correlation Coefficient (ICC). All ICC values were more than 0.7, indicating good test-retest reliability (Terwee et al., 2007). However, the absence of a random sample for test-retest reliability was a limitation, and therefore, several other reliability measurements were also used for data triangulation.

There were some limitations to this study. First, the patients were recruited from only one hospital, which may limit the generalizability of the findings to Sri Lanka. Second, when assessing the test-retest reliability of the PCQ-Infertility, only patients scheduled to attend the clinic in two weeks were selected due to feasibility issues. Therefore, the selection was not random. Inter-rater reliability, which was assessed by the Intra-class Correlation Coefficient (ICC), was in an acceptable range (more than 0.7) for all domains. Thus, it confirms adequate training of the raters and standardization of the instrument for application (Souza, Alexandre & Guirardello, 2017). Cronbach's alpha coefficient is the most commonly used measure of reliability in terms of internal consistency. Cronbach's alpha coefficient demonstrates the level of covariance between the items of a scale. Although values higher than 0.7 are ideal (Nunnally & Bernstein, 1994), values under 0.70 but close to 0.60 are still satisfactory (Streiner, 2003). Therefore, the Cronbach's alpha values were in an acceptable range, with values ranging from 0.63 to 0.90 for all domains.

Conclusion

The Sinhala translated version of the 44-item Patient Centered Questionnaire- Infertility is a valid and reliable instrument to measure the patient-centredness of care received by female partners of subfertile couples in Sri Lanka.

References

Aarts, J. W. M., Huppelschoten, A. G., Van Empel, I. W. H., Boivin, J., Verhaak, C. M., Kremer, J. A. M., & Nelen, W. L. (2012). How patient-centred care relates to patients' quality of life and distress: a study in 427 women experiencing infertility. *Human Reproduction, 27*(2), 488-495.

Abramson, J., & Abramson, Z. (1999). *Research methods in community medicine: surveys, epidemiological research, programme evaluation, clinical trials* (5th ed.). Churchill Livingstone, London: John Wiley & Sons.

Avella, J. R. (2016). Delphi panels: Research design, procedures, advantages, and challenges. *International Journal of Doctoral Studies*, *11*(1) 305–321. https://doi.org/10.28945/3561

Brandes, M., Hamilton, C. J, de Bruin, J.P, Nelen, W.L., Kremer, J.A. (2010). The relative contribution of IVF to the total ongoing pregnancy rate in a subfertile cohort. *Human Reproduction, 25*(1), 118-126.

Brandes, M., Van Der Steen, J. O. M., Bokdam, S. B., Hamilton, C. J. C. M., De Bruin, J. P., Nelen, W. L. D. M., & Kremer, J. A. M. (2009). When and why do subfertile couples discontinue their fertility care: A longitudinal cohort study in a secondary care subfertility population. *Human Reproduction*, *24*(12), 3127–3135. https://doi.org/10.1093/humrep/dep340

Brown, T. A., & Moore, M. T. (2006). *Confirmatory factor analysis. Handbook of structural equation modelling* (1st ed.). The Guilford Press, New York, London.

Byrne, B. M. (1994). *Structural equation modeling with EQS and EQS/Windows: Basic concepts, applications, and programming*. Sage.

Cleary, P.D. (1999). The increase importance of patient surveys: Now that sound methods exist, patient surveys can facilitate improvement, *BMJ, 319*(7212), 720– 721.

Corrigan, J. M. (2001). *Crossing the quality chasm. Building a better delivery system, a new health system for the 21st century*. Institute of Medicine, Committee on the National Quality Report on Health Care Delivery.

Cousineau, T. M., & Domar, A. D. (2007). Psychological impact of infertility. *Best Practice & Research Clinical Obstetrics & Gynaecology*, *21*(2), 293-308.

Dancet, E. A. F., Van Empel, I. W. H., Rober, P., Nelen, W. L. D. M., Kremer, J. A. M., & D'Hooghe, T. M. (2011). Patient-centred infertility care: a qualitative study to listen to the patient's voice. *Human Reproduction*, *26*(4), 827-833. https://doi.org/10.1093/humrep/der022

Dancet, E.A.F., Nelen, W.L.D.M., Sermeus, W., De Leeuw, L., Kremer, J.A.M, & Hooghe, T.M. D. (2010). The patients' perspective on fertility care: a systematic review, *Human Reproduction Update*, *16*(5), 467–487. https://doi.org/10.1093/humupd/dmq004

De Villiers, M., De Villiers, P., & Kent, A. (2005). The Delphi technique in health sciences education research. *Medical Teacher*, *27*(7), 639-643. https://doi.org/10.1080/13611260500069947

DeVellis, R. F. (2012). Scale development: *Theory and applications* (3rd ed.). London: Sage Publications.

Dizaj, A. V. T., Ezabadi, Z., Takbiri, A., & Baniasadi, A. (2016). Infertility care in Royan Institute: a patient centeredness analysis. *Payesh (Health Monitor)*, *15*(3), 325-332.

Donohoe, H., Stellefson, M., & Tennant, B. (2012). Advantages and limitations of the e- Delphi technique: Implications for health education researchers. *American Journal of Health Education*, *43*(1), 38–46. https://doi.org/10.1080/19325037.2012.10599216

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological methods*, *4*(3), 272.

Finney, S. J., & DiStefano, C. (2006). Non-normal and categorical data in structural equation modeling. *Structural equation modeling: A second course*, *10*(6), 269-314.

Gameiro, S., Canavarro, M. C., & Boivin, J. (2013). Patient centred care in infertility health care: direct and indirect associations with wellbeing during treatment. *Patient education and counseling*, *93*(3), 646-654.

Gjersing, L., Caplehorn, J. R., & Clausen, T. (2010). Cross-cultural adaptation of research instruments: Language, setting, time and statistical considerations. *BMC Medical Research Methodology*, *10*(1), 1-10. https://doi.org/10.1186/1471-2288-10-13

Gordon, M., Murphy, C. P., Candee, D., & Hiltunen, E. (1994). Clinical judgment: an integrated model. *Advances in Nursing Science*, *16*(4), 55-70.

Henson, R. K., & Roberts, J. K. (2006). Use of exploratory factor analysis in published research: Common errors and some comment on improved practice. *Educational and Psychological measurement*, *66*(3), 393-416. https://doi.org/10.1177/0013164405282485

Hulley, S. B., Cummings, S. R., Browner, W. S., Grady, D. G., & Newman, T. B. (2013). *Designing Clinical Research: An epidemiological approach* (2nd ed.). Philadelphia, Lippincott Williams & Wilkins.

Huppelschoten, A. G., Nelen, W. L., Westert, G. P., van Golde, R. J., Adang, E. M., & Kremer, J. A. (2015). Improving patient-centredness in partnership with female patients: a cluster RCT in fertility care. *Human Reproduction*, *30*(5), 1137-1145.

Kaiser, H. F., & Rice, J. (1974). Little Jiffy Mark IV. *Educational and Psychological Measurement*, *34*(1), 111–117. https://doi.org/doi:10.1177/001316447403400115

Karajičić, S. (2014). Towards patient-centered infertility health care: case study Slovak Republic. *Health Policy Institute*, *9*(3), 1-57.

Lansakara, L. (2006). *Psychological aspects of infertility, among currently married females in reproductive age and the service needs of fertility impaired couples in district of Colombo.* (Thesis in MD-Community Medicine), Post Graduate Institute of Medicine, University of Colombo.

Mayura Madhava Dharmadasa, S. Sridharan, N. Prasanthi, W.S Kalansooriya, Chamodya Herath, Tharuka Herath, Hansini Pramudika, M. M. Tajan Fernando, & Dinithi Lakshani

Thilakasiri. (2023). Satisfaction level among infertile women regarding patient-centered care in the fertility clinic at CSHW. *International Journal of Science and Technology Research Archive, 5*(1), 086–097. https://doi.org/10.53771/ijstra.2023.5.1.0078

Mourad, S. M., Curtis, C., Gudex, G., Merrilees, M., Peek, J., & Sadler, L. (2019). Measuring patient-centredness in publicly funded fertility care: A New Zealand validation and international comparison of the Patient-Centred Questionnaire-Infertility. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, *59*(2), 265–271. https://doi.org/10.1111/ajo.12869

Nunnally, J.C., & Bernstein, I.H. (1994). *Psychometric theory* (3rd ed.). New York, McGraw; Hill.

Osborne, J. W., & Costello, A. B. (2009). Getting the most from your analysis. *Pan*, *12*(2), 131-146.

Pedro, J., Canavarro, M. C., Boivin, J., & Gameiro, S. (2013). Positive experiences of patient-centred care are associated with intentions to comply with fertility treatment: findings from the validation of the Portuguese version of the PCQ-Infertility tool. *Human Reproduction, 28*(9), 2462-2472.

Peterson, B. D., Newton, C. R., & Feingold, T. (2007). Anxiety and sexual stress in men and women undergoing infertility treatment. *Fertility and sterility*, *88*(4), 911-914.

Pinborg, A. Hougaard, C.O. Nyboe, A. D. Molbo, D., & Schmidt, L. (2009). Prospective longitudinal cohort study on cumulative 5-year delivery and adoption rates among 1338 couples initiating infertility treatment. *Human Reproduction*, *24*(4), 991–999. https://doi.org/10.1093/humrep/den463

Pook, M., & Krause, W. (2005). Stress reduction in male infertility patients: a randomized, controlled trial. *Fertility and sterility*, *83*(1), 68-73.

Royal College of Nursing. (2016). Royal College of Nursing response to Health Education England's consultation: Building capacity to care and capability to treat – a new team member for health and social care. Retrieved from https://cdn.ps.emap.com/wp-content/uploads/sites/3/2016/03/Royal-College-of-Nursing-response-to-Health-Education-Englands-consultation.pdf

Schmidt, L., Holstein B.E., Boivin, J,, Tjornhoj-Thomsen, T., Blaabjerg, J., Hald, F., Rasmussen, P.E.R., Nyboe Andersen A. (2003). High ratings of satisfaction with fertility treatment are common: findings from the Copenhagen Multi-centre Psychosocial Infertility (COMPI) Research Programme. *Hum Reproduction, 18*, 2638–2646.

Schmitt, T. A. (2011). Current methodological considerations in exploratory and confirmatory factor analysis. *Journal of Psychoeducational Assessment, 29*(4), 304–321. https://doi.org/10.1177/0734282911406653

Shlens, J. (2014). *A tutorial on principal component analysis*. Mountain View, CA. https://doi.org/10.48550/arXiv.2402.02838

Souza, A. C. de, Alexandre, N. M. C., & Guirardello, E. de B. (2017). Psychometric properties in instruments evaluation of reliability and validity. *Epidemiologia e Serviços de Saúde, 26*, 649–659. https://doi.org/10.5123/S1679-49742017000300022

Streiner, D.L. (2003) Starting at the beginning: An introduction to coefficient alpha and internal consistency. *J Pers Assess*, *80*(1), 99-103.

Tabachnick, B., & Fidell, L. (2010). *Using multivariate statistics* (6th ed.). Boston: Pearson Education.

Terwee, C. B., Bot, S. D. M., de Boer, M. R., van der Windt, D. A. W. M., Knol, D. L., Dekker, J., Bouter, L. M., & de Vet, H. C. W. (2007). Quality criteria were proposed for measurement properties of health status questionnaires. *Journal of Clinical Epidemiology*, *60*(1), 34–42.

Thompson, B. (2004). Exploratory and confirmatory factor analysis: Understanding concepts and applications. *Washington, DC, 10694*. Retrieved from https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.920.8902&rep=rep1&type=pdf

Van den Broeck, U., Holvoet, L., Enzlin, P., Bakelants, E., Demyttenaere, K., & D'Hooghe, T. (2009). Reasons for dropout in infertility treatment. *Gynecologic and obstetric investigation*, *68*(1), 58-64.

Van Empel, I.W.H., Aarts, J.W.M., Cohlen, B.J., Huppelschoten, D.A, Laven, J.S.E., Nelen, W. L.D.M., & Kremer, J.A.M. (2010b). Measuring patient-centredness, the neglected outcome in fertility care: a random multicentre validation study. *Human Reproduction*, *25*(10), 2516-2526. https://doi.org/10.1093/humrep/deq219

Van Empel, I.W.H., Nelen, W.L.D.M., Tepe, E. T., Van Laarhoven, E. A.P., Verhaak, C.M., & Kremer, J. A.M. (2010a). Weaknesses, strengths and needs in fertility care according to patients. *Human Reproduction*, *25*(1), 142-149. https://doi.org/10.1093/humrep/dep362

Verhaak, C.M., Smeenk, J.M.J., Evers, A.W.M., Kremer, J.A.M., Kraaimaat, F.W., & Braat, D.D.M. (2007). Women's emotional adjustment to IVF: a systematic review of 25 years of research. *Human Reproduction Update*, *13*(1), 27–36. https://doi.org/10.1093/humupd/dml040

Vlaisavljevic, V., Mursi, J., & Slavica, K. (2016, July). Comparison of patients-centeredness experience in infertility care in patients fully reimbursed by national insurance and in cross-border self-paying patients. *Human Reproduction*, *31*, 63-63.

World Health Organization. (2014). *Sexual and reproductive health; infertility definitions and terminology*. Retrieved from http://www.who.int/reproductivehealth/topics /infertility /definitions/en/

Zegers-Hochschild, F., Adamson, G. D., de Mouzon, J., Ishihara, O., Mansour, R., Nygren, K.,.....Vanderpoel, S. (2009). International Committee for Monitoring Assisted Reproductive Technology (ICMART) and the World Health Organization (WHO) revised glossary of ART terminology, 2009*. *Fertility and Sterility*, *92*(5), 1520– 1524. https://doi.org/10.1016/j.fertnstert.2009.09.009