Research article

Psychometric properties of persian version of the cardiff fertility knowledge scale (CFKS–P)

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A B S T R A C T

Background: The level of fertility knowledge of reproductive-age people is low to moderate, and the inadequate knowledge of infertility-related factors may cause some people to unconsciously engage in activities that reduce their fertility. Given the significance of fertility knowledge, and the lack of standard instruments to evaluate it in Iran, the present study aimed at determining psychometric properties of the Persian version of the Cardiff Fertility Knowledge Scale (CFKS–P) in Iranian population.

Materials and methods: In this cross-sectional study, a total of 280 participants (comprising 140 couples) attending mandatory pre-marriage educational sessions at two public health centers in Tehran were consecutively sampled from July to September 2021. The study examined the face, content, and structural validity (through confirmatory factor analysis) of the questionnaire. The reliability of the questionnaire was assessed using measures of internal consistency.

Results: The structural validity of CFKS-P was approved with 13 items and two factors (basic knowledge of fertility and misconception about fertility) based on confirmatory factor analysis (RMSEA = 0.023, 90 % CI = 0.053–0.082, TLI = 0.916 and CFI = 0.972, χ^2 = 148.345). Kuder–Richardson coefficient of the scale was calculated to be 0.85. The overall percentage of correct answers for fertility knowledge was 50.76 %.

Conclusion: The CFKS-P is a valid and reliable instrument for measuring the fertility knowledge in Iranian men and women. This scale can help the health care providers to assess the fertility knowledge of their clients or the quality of health education provided.

1. Introduction

Recent evidence showed that reproductive-age people have inadequate knowledge about fertility, infertility risk factors, and consequences of childbearing delay. Result of a systematic review showed that fertility knowledge of reproductive-age people is low to moderate particularly in men and people with lower educational level [1]. The overall percentage of correct answers for fertility

knowledge in the original scale (an international study from 18 countries, 12 languages) was 56.9 %, and women, people with academic education, paid employment and a history of prior medical consultation for infertility had more knowledge [2]. In a study from Iran, the fertility knowledge among the reproductive-age people was also at a modest level (51.55 %). Women and individuals with higher economic status had more excellent knowledge [3].

The insufficient knowledge regarding ovulation, fertility, and conception in people of reproductive-age and their tendency to postpone childbearing to later ages can increase the infertility rate and involuntary childlessness [4,5]. There is a lack of understanding of both male and female reproductive aging and an overestimation of success of assisted conception [6,7]. Women and men globally are delaying the birth of their first child [8] and most of the men do not modify their lifestyle to promote their fertility [9]. Although, there is a positive attitude towards parenthood, most of people wish to have children at an age, which the biological fertility is declined in women [10]. In addition, inadequate knowledge of infertility-related factors causes some people to unconsciously engage in activities that reduce their fertility and ultimately lead to reduced quality of life in many areas, including general health, psychological and social and even individual performance. Fertility knowledge can reduce infertility through preventing sexually transmitted diseases (STDs) especially in developing countries. Fertility knowledge can ensure that people have a realistic view of fertility treatments [11], and is a key factor related to self-care (knowing about the fertility potential) and starting infertility treatment if needed [12]. Women with perceived risk of being infertile will consider infertility a strong barrier to achieving their reproductive life plan and will report higher inclination to fertility treatments [13].

Some validated tools are available to assess fertility knowledge and increase awareness about risk factors for reduced fertility including Cardiff Fertility Knowledge Scale (CFKS) [2], Fertility and Infertility Treatment Knowledge Score (FIT-KS) [14], Fertility Awareness Survey (FAS) [15], Fertility Awareness Scale [16], and Childbearing Intention Questionnaire [17]. The original CFKS is a standardized and validated tool that is widely utilized in research on fertility knowledge and is one of the few fertility knowledge scales that has been tested in many non-Western contexts. It offers comprehensive and quantifiable results that facilitate easy comparison among different groups. This scale has been developed by Boivin et al. (2013) and shown to have satisfactory validity and reliability. The CFKS is quick to complete and easy to score and includes 13 true/false/don't know items related to 1) indicators for reduced fertility, 2) misconceptions about fertility and 3) fertility facts [2]. The reliability and validity of the Turkish [18], Japanese [19], Chinese [20] and French [21] versions of the CFKS questionnaire have also been evaluated in separate studies.

Despite the enduring cultural significance of fertility and childbearing in Iranian society [22], along with the prevailing desire among the majority of men and women in Iran to have biological children [23], there has been a noticeable lack of research attention on exploring fertility knowledge and the tools used to assess it. The fertility-specific tool can aid healthcare providers in evaluating fertility knowledge, including facts, risks, and myths, and in delivering more effective counseling. The fertility rate in Iran has decreased in recent decades, partly due to delayed marriage, childbearing, and age-related infertility leading to unfulfilled parenthood [24]. Despite this decline, most individuals in Iran still express a preference for having their biological children. The decrease in fertility rates in Iran has primarily affected the number of large families, with more individuals choosing to have children at a later age rather than leading to an increase in childlessness [25]. Given that the CFKS assesses factors related to reduced fertility and misconceptions about fertility, the aim of this study was to evaluate the psychometric properties of the CFKS in the Iranian population, as it has not been culturally adapted for use in Iran.

2. Materials and Methods

The present cross-sectional study aimed to adapt CFKS to the Iranian culture and determine its psychometric properties. This study was conducted in comprehensive health centers affiliated to Iran University of Medical Sciences (IUMS) from July to September 2021. We recruited marrying couples referred for acquiring a marriage license in two public health centers affiliated to IUMS in Tehran, Iran through consecutive sampling. The exclusion criteria encompassed individuals who had a prior history of marriage and those who did not own a smartphone. It is compulsory for Iranian couples to attend pre-marriage education sessions in order to increase their sexual and reproductive knowledge [26]. This marriage preparation program was held virtually (5 h) during the COVID-19 pandemic. The CFKS-P was provided to the participants before the sessions.

2.1. Data collection

The minimum required sample size to perform factor analysis is 10 samples per scale item [27], which, according to the number of 13 items, and considering 10 people per item, at least 130 participants are needed. We included 280 participants (140 couples) in the study.

The inclusion criteria were having an Iranian nationality with minimum basic literacy, women aging from 18 to 35, and men aging 18–45 years, with no previous marriage. Medical students or staff were excluded.

The researcher explained the reasons for conducting the research to couples referring to premarital education centers, and participation in the research was suggested. Then, the participants were examined in terms of eligibility criteria, and if they met the inclusion criteria, they received information about the research purpose and confidentiality. Informed consent was also obtained to ensure that participants make an "informed" decision about participating in this research. Participants were given the right to leave the study at any time. The sampling process was continued until the required number of samples was obtained.

2.2. Instrument

The questionnaire included socio-demographic characteristics (the participant's age, education, occupation), reproductive history, and the CFKS scale. We applied the Cardiff Fertility Knowledge Scale (CFKS) to assess fertility knowledge. This questionnaire consisted of 13 items measuring knowledge in three aspects: (a) fertility decline indicators; (b) misconceptions about fertility and (c) basic facts about infertility.

All items are scored on a three-point scale (right, wrong, or don't know). The score would be one if the answer was correct, and zero if the answer was wrong or 'I do not know'. Points were added, divided by the total number of items, and then multiplied by 100. The internal reliability (Cronbach's alpha) was 0.79 for the original version of the scale [2].

2.3. Translation process

In this study, after obtaining permission from the tool developer (Prof. Jacky Boivin), the translation of the original version from English into Persian was done using the Forward-backward method [28]. The original version was translated from English into Persian by the research team (reproductive health expert) fluent in both languages. This translated version was reviewed and then translated from Persian into English by two translators fluent in both languages who were not involved in the previous stage to check for differences between the translated items and the original items. The revised version was delivered after incorporating enhancements for better clarity. Specifically, definitions of important terms such as "healthy lifestyle," "erection," and "sexually transmitted disease" were clarified by adding explanations in parentheses to enhance comprehension. The Persian version of the tool is available as appendix 1.

2.4. Content validity

We measured the Content Validity Ratio (CVR) and Content Validity Index (CVI). To determine the CVI, the relevance, clarity, and simplicity of the items were assessed using a 4-point Likert scale. If the score was less than 0.7, the item was revised. If it was between 0.7 and 0.79, a review was performed, and if it was greater than 0.79, it was acceptable [29]. CVR was determined by experts who were asked to evaluate the importance of each item using a 4-point Likert scale. Given that the number of specialists was 21, the minimum CVR was 0.42 based on Lawshe's table [30].

2.5. Face validity

To determine the face validity of the scale, 15 couples (including 15 men and 15 women) were asked to assess all the items in terms of difficulty, relevance, and ambiguity.

2.6. Structural validity

We used confirmatory factor analysis (CFA) in Mplus, a specialized software for modeling categorical data. This approach allowed us to preserve the questionnaire's original structure and provided a robust analysis method for evaluating the psychometric properties of the instrument [31]. In CFA, we considered the fit indices and their acceptable threshold values, including the Comparative Fit Index (CFI) and Tucker and Lewis index (TLI) with a threshold of ≥ 0.90, and the Root Mean Square Error of Approximation (RMSEA) with a threshold of <0.08 [32].

In addition, loading values equal to or exceeding 0.2 were deemed to signify a significant contribution of the item to the construction of its respective scale.

2.7. Reliability

Internal consistency was determined using the Kuder-Richardson Formula for a sample of 15 couples (15 men and 15 women) to assess the reliability of the questionnaire. Higher values indicate a higher level of internal consistency (0 indicates no reliability, and 1 represents perfect test reliability). A Kuder Richardson coefficients higher than 0.7 were considered to indicate a reasonable level of internal consistency.

2.8. Data analysis

The SPSS software version 22 (IBM Inc., Armonk, NY, USA) was used to calculate descriptive statistics (including frequency, mean, and standard deviation), and inferential statistics (Pearson correlation and independent T-test), were used to analyze the data. To assess the structural validity of the scale, a generalized confirmatory factor analysis was performed in MPlus version 7.1. First, the model was assessed for adequacy by model fit indices, and then the item-scale relationships were tested. In all analyses, $P < 0.05$ was considered as a significant level. This study was reported using the cross-sectional STROBE checklist.

3. Results

3.1. Participants' characteristics

Participants entered the study from July to September 2021. The average age of the participants was 29.78 ± 6.73 years. Most participants had an educational level of bachelor (56.8 %) and a full-time job (51.8 %). Sixty-five percent felt the need for fertility knowledge, and 72.5 % intended to obtain this information through social media. The correct answer percentages for fertility knowledge were 52.19 % for men, 49.34 % for women, and 50.76 % overall.The CFKS score was only related to the feeling of the need for fertility knowledge (p = 0.044, Table 1).

3.2. Face validity

To assess the face validity, all items in the scale were described as simple, clear, unambiguous, and the respondents did not find any difficulty completing the questionnaire.

3.3. Content validity

The content validity ratio (CVR) and Content Validity Index (CVI) for the whole questionnaire were 0.67 and 0.95, respectively, which indicated the high content validity of the questionnaire (Table 2).

3.4. Structural validity

To investigate which model is the best fit for our data, we assessed a few competing models. Models with one factor, two factors and so on. Finally, we chose the best model according to the goodness of fit indices. The model with the best fit was a 2-factor model, which was subsequently used in the aim of validity of the instrument. According to the indices presented in Fig. 1, the following values were obtained: RMSEA = 0.023, 90 % CI = 0.053–0.082, CFI = 0.972, TLI = 0.916, $\chi 2$ = 148.345, which confirmed the model adequacy.

The factor loading for all questionnaire items was significant and this model had an appropriate fit and its factor structure can therefore be confirmed. In addition, all loading values surpassing 0.2 were retained in the model. The sole exception was observed for CFKS5, which exhibited a loading of 0.18, marginally below the threshold of 0.2. Despite this, the research team opted to retain this item in consideration of its proximity to the established criterion.Considering a good relative fit of the confirmatory factor model, the structural validity of the tool was confirmed. Finally, CFKS-P was approved with 13 items and two factors: Basic knowkedge of fertility (items 1, 2, 3, 4, 5, 9, 11 and 13) and misconception about fertility (items 6, 7, 8, 10, 12). Item 5 was transferred from factor 2 to factor 1 because its content was more similar to factor 1 (Fig. 1).

Table 1

Participants' characteristics and its relationship with CFKS[d] (N = 280).

Variables		Male	Female	Total	P-value
		Mean (SD)			
CFKS-P score[d]		52.19 (17.47)	49.34 (17.55)	50.76 (17.54)	0.173[a]
Age (Year)		31.16 (6.08)	28.40 (7.08)	29.78 (6.73)	0.722[b] r = −0.021
N (%)					
Education level	Secondary school or lower	30 (21.4)	22 (15.7)	52 (18.6)	0.807[c]
	Undergraduate	76 (54.3)	83 (59.3)	159 (56.8)	
	Postgraduate	34 (24.3)	35 (25.0)	69 (24.6)	
Occupation	Un-employed	9 (6.4)	24 (17.1)	32 (11.4)	0.931[c]
	Housewife	0 (0)	35 (25.0)	36 (12.9)	
	Employed (full-time)	101 (72.1)	44 (31.4)	145 (51.8)	
	Employed (part- time)	22 (15.7)	25 (17.9)	47 (16.8)	
	Working at home	8 (5.7)	12 (8.6)	20 (7.1)	
Feeling of need for fertility knowledge	No	60 (42.9)	36 (25.7)	96 (34.3)	**0.044**[c]
	Yes	80 (57.1)	104 (74.3)	184 (65.7)	
Method of acquiring fertility knowledge	Social media	104 (74.3)	99 (70.7)	203 (72.5)	0.341[c]
	TV	11 (7.9)	4 (2.9)	15 (5.4)	
	Health care professional	11 (7.9)	26 (18.6)	37 (13.2)	
	book, magazine, newspaper	14 (10.0)	11 (7.9)	25 (8.9)	

[a] Independent sample *t*-test.

[b] Pearson Correlation.

[c] ANOVA.

[d] CFKS-P: Cardiff Fertility Knowledge Scale (Persian version).

Table 2
The CVI, and CVR for CFKS-P

CFKS-P[a]	CVI[b]	CVR[c]
CFKS-P1	1.0	0.8
CFKS-P2	0.95	0.8
CFKS-P3	1.0	0.8
CFKS-P4	1.0	0.8
CFKS-P5	0.95	0.8
CFKS-P6	0.95	0.61
CFKS-P7	0.95	0.52
CFKS-P8	0.95	0.61
CFKS-P9	1.0	0.61
CFKS-P10	0.90	0.61
CFKS-P11	0.95	0.61
CFKS-P12	0.90	0.71
CFKS-P13	0.85	0.52

[a] CFKS-P: Cardiff Fertility Knowledge Scale (Persian version).
[b] CVI Content Validity Index.
[c] CVR Content Validity Ratio.
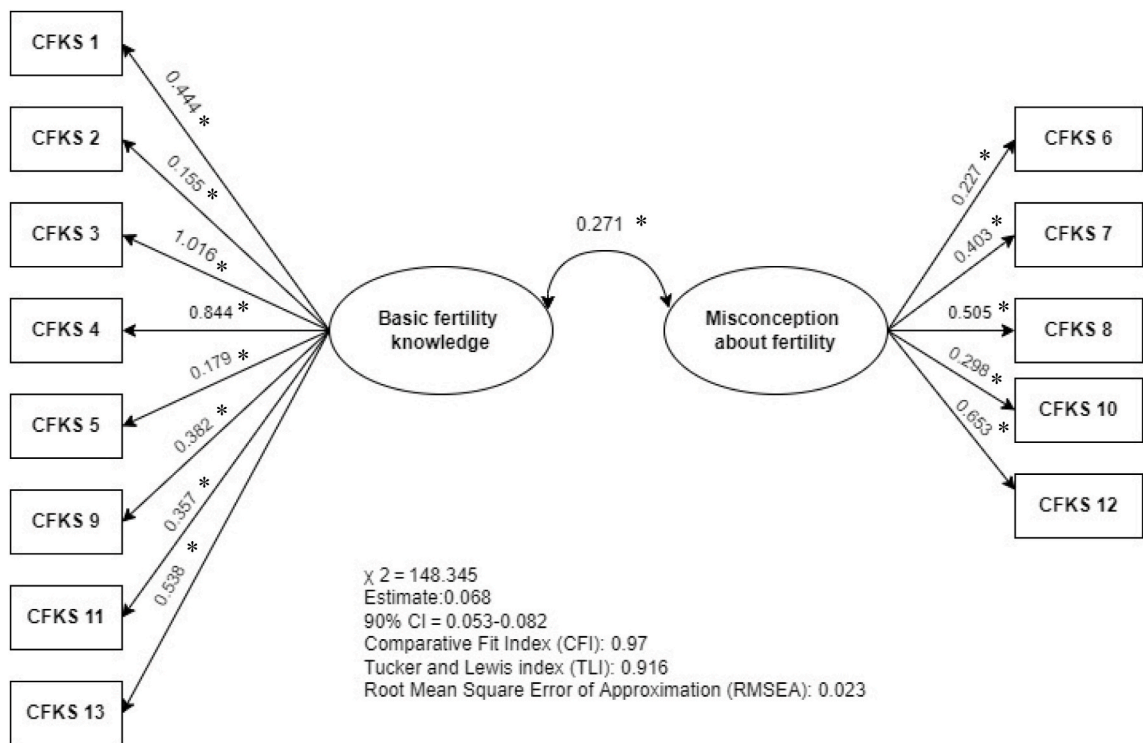
Fig. 1. CFA factor loading for CFKS-P
*: P < 0.05 All item-scale relationships and the correlation between sub scales are significant.

3.5. Reliability

Kuder–Richardson coefficient (KR21) of the scale was calculated to be 0.83 for factor 1 (basic knowkedge of fertility), 0.83 for factor 2 (misconception about fertility), and 0.85 for the overall 13-item questionnaire. Therefore, no items were deleted and there was no need for revision.

4. Discussion

The results showed that the Persian version of CFKS is a valid and reliable tool for assessing fertility knowledge in Iranian men and women. The content, face, and structural validity, and internal consistency of the instrument were all confirmed.

To assess the structural validity of the instrument, we performed the CFA. The psychometric assessment of the Persian version led to

the extraction of two factors (1: basic knowledge of fertility, 2: misconception about fertility). There were some items [1,6,8,9,11,13] which were explained in both factors but these items were related more strongly to one factor than another. In case of overlapping factor loadings for the two identified factors, the items were placed in the factor that conceptually fit better [33]. Moreover, item 5 was inappropriately labeled under factor 2, which was then moved to factor 1. The factor loading for all questionnaire items was significant. Furthermore, CVI and CVR values were in a good range. Therefore, none of the items were removed. In the Turkish version, the scale showed a content validity index of 0.97, and it was determined that the factor loading was 28.26 %. The analyses indicated that the ultimate version of the scale consisted of 11 items and displayed a one-factor structure, explaining 44.45 % of the scale's variance [18]. Bunting et al. (2016), extracted one factor in their assessment of the psychometric properties of the original CFKS. In original study, an exploratory factor analysis showed that all items were loaded at 0.30 on one general factor that was accounted for 30 % of the between-item variance, and descriptive statistics showed the composite scale to be normally distributed.The data on psychometric properties is not fully reported in this study [2].

In current study, the CFKS-P showed a CVR of 0.67 and a CVI of 0.95, signifying a high degree of content validity. In the Turkish version, the CFKS had a CVR value of 0.78 and a CVI value of 0.97, demonstrating that both item-level and scale-level content validity were achieved. In Chinese version, the Scale-Content Validity Index (S-CVI) was 0.950, with the Item-Content Validity Index (I-CVI) ranging from 0.875 to 1.000 [20].

In the Persian version, Kuder–Richardson coefficient of the scale was calculated to be 0.85, which suggests favorable internal consistency. Similar to the Persian version of the scale, the internal reliability of the English version was moderate (a = 0.79). In the original scale, CFKS was not confirmed in Italy (a = 0.59) and Turkey (a = 0.41) due to the low reliability of the scale in these countries [2]. In the Chinese version, the Cronbach's alpha coefficient was 0.827 and the test-retest reliability was 0.826 (20). In the Turkish version, the analysis revealed a highly reliable Intra-Class Correlation (ICC) value of 0.902 for the total score of the scale. Moreover, the Turkish version exhibited a Cronbach's alpha coefficient of 0.68 [18].

We checked the face validity of the tool using quantitative methods. Some items were revised based on participants' point of view, but none were removed because all items were scored important and needed to be measured. Similarly, the process of translation and cultural adaptation of French version (CFKS–F) showed few linguistic differences in the translation phase, which were resolved by agreement of the expert committee. The pre-final version of this questionnaire was generally well understood by both men and women, although CFKS-F was less well understood by men. However, the expert committee made minor changes based on participants' opinions to clarify the three-question formula in the CFKS-F [21]. Whilst a Japanese translation of the questionnaire has been produced, the available data on its psychometric properties are limited to a brief report utilizing EFA [19]. Furthermore, there currently exists no reported data on the psychometric properties of the Chinese version of the questionnaire [20].

In the current study, the overall percentage of correct answers was 50.76 % and it was not significantly different between male and female. In a similar study in Zanjan, Iran, the overall percentage of correct fertility knowledge score was 51.55 %. However, men demonstrated higher fertility knowledge than women, possibly influenced by differences in participants, settings, and sampling from both rural and urban areas in this study [3]. Likewise, the correct score percentages for fertility knowledge in an international study spanning 79 countries, as well as studies in Turkey, Japan, and China, were 56.9 %, 46.62 %, 44.4 %, and 49.9 %, respectively [2, 18–20]. The lack of sufficient data provided by the developer for the interpretation of scores may pose challenges for researchers in fully understanding the results.

Findings of a systematic review showed that the level of fertility knowledge is low to moderate among people of reproductive age [1]. Considering the limited fertility knowledge among individuals preparing for marriage in Iran, coupled with the implementation of new pronotalis policies in the country, we strongly advocate for the introduction of comprehensive education on fertility and reproductive health prior to marriage, particularly as part of university curricula. This proactive approach aims to equip young adults with the necessary information and skills to make informed decisions about their reproductive health and fertility goals, ultimately contributing to improved fertility outcomes and overall well-being in society.

This was the first study conducted to evaluate the psychometric properties of CFKS-P in Iran. The inclusion of both childbearing-age men and women is considered a strength of the study since the psychometric assessment of the scale allows for its use with all these groups. Participants were marrying couples referred for compulsory premarital counseling in public health centers in Tehran, so the findings may not be generalizable to the general population, which is a limitation of the study. Although the Persian version of the Cardiff instrument was found to be valid and reliable in this study, it is recommended to conduct thorough qualitative research to uncover common misconceptions about fertility in Iranian society. This can inform the creation of a more culturally sensitive tool that better reflects the nuances of Iranian culture, thereby improving the accuracy and relevance of fertility knowledge assessment.

5. Conclusion

The findings of the current study showed that the CFKS-P is a valid and reliable instrument for assessing fertility knowledge in Iranian men and women. This scale is very short and takes a little time to complete and can be used in clinics (e.g. premarital counseling) and research. This scale can help the healthcare providers, specially the midwives, to assess the fertility knowledge of their clients or the quality of health education provided. This tool can also be used in descriptive cross-sectional studies or in interventional studies to measure the effect of provided education.

Disclosure statement

Ethics statement

The project received approval from the Ethics Committee of Iran University of Medical Sciences (code: IR.IUMS.REC.1400.593, Date: 2021/9/28). The aim of the study was explained to the participants and informed consent was obtained from them. The participants were assured that their personally identifying information would not be collected. After providing electronic informed consent by selecting "agree to participate," via a link distributed to them through social media (WhatsApp), participants completed the questionnaires online.

Consent for publication

In the current study, no individual data was used and hence no consent was needed for publication.

Availability of data and materials

Data and the CFKS-P are available from the corresponding author upon reasonable request and with the permission of research deputy of Iran University of Medical Sciences.

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CRediT authorship contribution statement

Mojgan Mirghafourvand: Writing – review & editing, Methodology, Conceptualization. **Mohammad Asghari Jafarabadi:** Writing – review & editing, Validation, Methodology, Formal analysis, Conceptualization. **Maryam Gharacheh:** Writing – review & editing, Data curation, Conceptualization. **Eri Maeda:** Writing – review & editing, Validation, Supervision, Conceptualization. **Shima Haghani:** Writing – review & editing, Methodology, Formal analysis, Conceptualization. **Fahimeh Ranjbar:** Writing – original draft, Supervision, Project administration, Data curation, Conceptualization.

Declaration of generative AI and AI-assisted technologies in the writing process

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Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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References

[1] J. Pedro, T. Brandão, L. Schmidt, M.E. Costa, M.V. Martins, What do people know about fertility? A systematic review on fertility awareness and its associated factors, Ups. J. Med. Sci. 123 (2) (2018) 71–81.

[2] L. Bunting, I. Tsibulsky, J. Boivin, Fertility knowledge and beliefs about fertility treatment: findings from the International Fertility Decision-making Study, Hum. Reprod. 28 (2) (2013) 385–397.

[3] H. Mohammadi, K. Kamali, S. Jahanfar, F. Ranjbar, Fertility knowledge and its related factors among married men and women in Zanjan, Iran, Hum. Fertil. (2021) 1–8.

[4] A. Sarría-Santamera, G. Bapayeva, G. Utepova, J. Krstic, S. Terzic, G. Aimagambetova, et al., Women's knowledge and awareness of the effect of age on fertility in Kazakhstan, Sexes 1 (1) (2020) 60–71.

[5] L.S. Lundsberg, L. Pal, A.M. Gariepy, X. Xu, M.C. Chu, J.L. Illuzzi, Knowledge, attitudes, and practices regarding conception and fertility: a population-based survey among reproductive-age United States women, Fertil. Steril. 101 (3) (2014) 767–774. e2.

[6] L.A. Bernardi, M. Luck, M.A. Kyweluk, E.C. Feinberg, Knowledge gaps in the understanding of fertility among non-medical graduate students, F&S Reports 1 (3) (2020) 177–185.

[7] I. Szalma, T. Bitó, Knowledge and attitudes about assisted reproductive technology: findings from a Hungarian online survey, Reproductive biomedicine & society online 13 (2021) 75–84.

[8] J. Harper, J. Boivin, H.C. O'Neill, K. Brian, J. Dhingra, G. Dugdale, et al., The need to improve fertility awareness, Reproductive Biomedicine & Society Online 4 (2017) 18–20.

[9] M. Bodin, L. Käll, T. Tydén, J. Stern, J. Drevin, M. Larsson, Exploring men's pregnancy-planning behaviour and fertility knowledge: a survey among fathers in Sweden, Ups. J. Med. Sci. 122 (2) (2017) 127–135.

[10] N.O. Sørensen, S. Marcussen, M.G. Backhausen, M. Juhl, L. Schmidt, T. Tydén, et al., Fertility awareness and attitudes towards parenthood among Danish university college students, Reprod. Health 13 (1) (2016) 1–10.

[11] D. Daumler, P. Chan, K. Lo, J. Takefman, P. Zelkowitz, Men's knowledge of their own fertility: a population-based survey examining the awareness of factors that are associated with male infertility, Hum. Reprod. (2016) 1–10.

[12] J. Boivin, L. Bunting, J.A. Collins, K.G. Nygren, International estimates of infertility prevalence and treatment-seeking: potential need and demand for infertility medical care, Hum. Reprod. 22 (6) (2007) 1506–1512.

[13] J. Pedro, T. Brandão, J. Fernandes, A. Barros, P. Xavier, L. Schmidt, et al., Perceived threat of infertility and women's intention to anticipate childbearing: the mediating role of personally perceived barriers and facilitators, J. Clin. Psychol. Med. Settings 28 (3) (2021) 457–467.

[14] R. Kudesia, E. Chernyak, B. McAvey, Low fertility awareness in United States reproductive-aged women and medical trainees: creation and validation of the Fertility & Infertility Treatment Knowledge Score (FIT-KS), Fertil. Steril. 108 (4) (2017) 711–717.

[15] J.C. Daniluk, E. Koert, A. Cheung, Childless women's knowledge of fertility and assisted human reproduction: identifying the gaps, Fertil. Steril. 97 (2) (2012) 420–426.

[16] Z. Özşahin, Y. Aksoy Derya, Fertility awareness scale development study in Turkish women, European Journal of Integrative Medicine 49 (2022) 102101.

[17] C. Lampic, A.S. Svanberg, P. Karlström, T. Tydén, Fertility awareness, intentions concerning childbearing, and attitudes towards parenthood among female and male academics, Hum. Reprod. 21 (2) (2006) 558–564.

[18] RK Odabaş, A Ergin, FB Birinci, Validity and reliability study of the cardiff fertility knowledge scale in Turkish, J. Obstet. Gynaecol. 50 (4) (2024) 719–727.

[19] E. Maeda, H. Sugimori, F. Nakamura, Y. Kobayashi, J. Green, M. Suka, et al., A cross sectional study on fertility knowledge in Japan, measured with the Japanese version of Cardiff Fertility Knowledge Scale (CFKS-J), Reprod. Health 12 (1) (2015) 10.

[20] Y. Zhou, Y. Luo, T. Wang, Y. Cui, M. Chen, J. Fu, College students responding to the Chinese version of Cardiff fertility knowledge scale show deficiencies in their awareness: a cross-sectional survey in Hunan, China, BMC Publ. Health 20 (2020) 1–8.

[21] C. Blanchet, V. Babineau, J. Boivin, S.-M. Ruchat, Cross-cultural adaptation of the cardiff fertility knowledge scale and the fertility status awareness tool for the French-canadian population, J. Obstet. Gynaecol. Can. 41 (2) (2019) 204–209.

[22] S. Tremayne, M.M. Akhondi, Conceiving IVF in Iran, Reproductive biomedicine & society online 2 (2016) 62–70.

[23] Z. Behjati Ardakani, M. Navabakhsh, F. Ranjbar, M.M. Akhondi, A. Mohseni Tabrizi, Step-by-step decision-making process in third party assisted reproduction: a qualitative study, Hum. Fertil. (2020) 1–12.

[24] F. Ranjbar, M. Shirzad, K. Kamali, M. Akhondi, A. Ghoodjani, A.Z. Behjati, et al., Fertility behaviour of Iranian women: a community-based, cross-sectional study, Arch. Iran. Med. 18 (1) (2015) 2.

[25] H.B. Razeghi-Nasrabad, M.J. Abbasi-Shavazi, M. Moeinifar, Are we facing a dramatic increase in voluntary and involuntary childlessness in Iran that leads to lower fertility? Crescent Journal of Medical and Biological Sciences 7 (2) (2020) 212–219.

[26] F. Farnam, M. Pakgohar, M. Mir-mohammadali, Effect of pre-marriage counseling on marital satisfaction of Iranian newlywed couples: a randomized controlled trial, Sex. Cult. 15 (2) (2011) 141–152.

[27] Jc Nunnally, Ih Bernstein, Psychometric Theory, 1994. New York.

[28] M. Kalfoss, Translation and adaption of questionnaires: a nursing challenge, SAGE Open Nursing 5 (2019) 2377960818816810.

[29] S.B. Plichta, E.A. Kelvin, Munro's Statistical Methods for Health Care Research, 2013.

[30] C.H. Lawshe, A quantitative approach to content validity, Person. Psychol. 28 (4) (1975) 563–575.

[31] L.J. Cronbach, Coefficient alpha and the internal structure of tests, Psychometrika 16 (3) (1951) 297–334.

[32] J.F. Hair, W.C. Black, B.J. Babin, RE Anderson Multivariate Data Analysis: A Global Perspective, Pearson Prentice Hall, New Jersey, 2010.

[33] J. Neter, M.H. Kutner, C.J. Nachtsheim, W. Wasserman, Applied Linear Statistical Models, 1996.