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Socio-demographic Determinants of Infertility: A Study in Four Selected Provinces of Iran

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Abstract

Objectives: Infertility is one of the reproductive health issues that not only affects infertile couple's life, but it is a matter of demographic concerns on a vast scale. This study aims to examine the impact of socio-demographic factors on the incidence of infertility.

Materials and Methods: We used data from our cross-sectional fertility survey conducted in 2017 in four selected provinces of Iran including Gilan, West Azarbaijan, Sistan and Baluchistan, and Yazd. Using a structured questionnaire, 4088 women of reproductive age were interviewed in the survey for their reproductive life history as well as their socio-demographic and economic condition. Bivariate (chi-square test), and multivariate (Multiple Logistic Regression) analyses are applied to the data to meet the aim of the study. *P* values less than 0.05 are considered statistically significant where differentials are tested.

Results: The prevalence of current infertility according to clinical definition varied from 7.4% in Yazd, 8.6% in West Azerbaijan, 12.4% in Gilan, and 22.3% in Sistan and Baluchistan. Logistic regression analysis revealed a significant association between infertility and the age and age at marriage of women. Controlling for other socio-demographic variables probability of being infertile increases as women get married at an older age. In addition, women who lived in a household with the lowest socio-economic conditions were 80 percent more likely to experience infertility compared to those living in households with the highest socio-economic conditions. Living in Sistan and Baluchistan was also a strong predictor of infertility in the study resulting in a high odds ratio (3.050) compared with women living in Yazd province.

Conclusions: Women's age and age at marriage are the most important demographic characteristics in explaining infertility and having a lower socio-economic condition trigger it. Since the age of marriage is increasing in Iran, it may affect primary infertility where childbearing is postponed to the late 30s and early 40s.

Keywords: Infertility, Reproductive behavior, Fertility determinants, Women, Iran

Introduction

Infertility represents a significant concern that exerts multifaceted impacts on the lives of affected couples (1). The pursuit of infertility treatments, irrespective of the ultimate success in achieving pregnancy, generates substantial financial, psychological, and health implications. Furthermore, the degree of infertility is imaginatively linked to fertility dynamics, rendering it a decisive subject of interest for policymakers where fertility is discussed.

In the realm of infertility research, estimations have been delineated through the utilization of three distinct definitions: clinical in medical sciences, as defined by the World Health Organization (WHO), and as defined in demography. The standard clinical definition of infertility is "failure of a couple to conceive after 12 months or more of regular sexual unprotected intercourse" (2,3). The WHO has modified the medical definition of infertility as "absence of pregnancy after 24 months of unprotected sexual intercourse" (2). In the demography field, infertility is defined as "the inability to have a live birth after five years of unprotected sexual intercourse" (2). Indeed, demographers have changed the end point from pregnancy to live birth while the clinical definition of infertility includes the inability to conceive. In other words, the demographic perspective emphasizes the occurrence of live births, encompassing both individuals who face challenges in conceiving and those who confront difficulties in carrying a pregnancy to term. (4).

The distinction between primary and secondary infertility has also been important in the literature. According to the WHO, the terminology "primary infertility" is used when a woman has never conceived, and secondary infertility is defined as the inability to conceive in a couple that has previously experienced at least one successful pregnancy (4,5).

Infertility is estimated to affect as many as 186 million people worldwide (6). According to a new report published

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Key Messages

- The prevalence of infertility according to clinical definition varied by province ranging from 7.4% in Yazd, 8.6% in West Azerbaijan, 12.4% in Gilan, and 22.3% in Sistan and Baluchistan reflecting the role of provincial development status.
- Women's age at marriage the most important demographic characteristics in explaining infertility and having a lower socio-economic condition may trigger it.
- Age of marriage is increasing in Iran, it may affect primary infertility where childbearing is postponed to the late 30s and early 40s.

by the WHO, and based on data from 1990 to 2021 (2), the period prevalence of clinical infertility is estimated to be 12.6% There is some variation in infertility prevalence across the region. Available data indicate that the estimated period prevalence of infertility is highest in the African Region (16.4%) and lowest in the Eastern Mediterranean Region (10%). The measures of infertility in the Middle East and North Africa (MENA) based on a systematic review study indicate that clinical primary infertility is as low as 3.8 percent and demographic infertility in the MENA region is about 22.6% (7).

In Iran, the range of infertility has been reported from 3 to 20% (8-13), and according to the available reports in Iran, infertility is increasing, and this rise is especially reported in the case of secondary infertility (10-12). On the other hand, Iran's fertility has sharply declined in recent decades. The period total fertility rate (TFR) fell from 7.7 births per woman in the 1960s to nearly 6.0 by the mid-1970s but increased slightly during the late 1970s and early 1980s. In 1985, fertility started to decline after which it fell sharply during the 1990s and reached below the replacement level in the early 2000s (14). The fertility rate has remained at around 1.8–1.9 births per woman since the mid-2000s before rising to around 2.1 by 2016 and subsequently declining to 1.7 by 2022 (15). This decline was led to the introduction of a bill in 2012 to increase fertility. The bill was ratified by the Parliament in November 2021 and the country adopted pronatalist population policies to facilitate family formation and fertility increase. The new population policy law is called Population Rejuvenation and Family Support " (PRFS) law (16). Meanwhile, supporting infertile couples and their access to assisted reproduction technologies has been one of the main concerns of experts and policymakers. The PRFS Law has clearly emphasized the treatment of infertile couples by considering policies to strengthen the relevant supportive institutions. In principle, it is supposed that widely accessible infertility treatment through Iran's public healthcare system could contribute positively to the fertility rate. Given the importance of the issue, estimating infertility using accurate methods and understanding the factors associated with infertility requires rigorous research. According to Tellier and Obel (17), both the medical/clinical and demographic concerns are important measures of infertility, but should not confuse with each other in reviewing the trends and policies. It is suggested that an accurate provincial and national estimate of infertility based on clinical and epidemiological measure defined by WHO, as well as based on demographic definition is needed to demonstrate the situation of infertility among Iranian women to prepare guidelines and action plans accordingly. Early screening of infertile couples and referring them to infertility treatment clinics is also suggested to reduce infertility prevalence (13,18). This study aims to estimate the prevalence rate of primary and secondary infertility based on the three definitions mentioned above (clinical, epidemiological by WHO, and demographic) and to explain women's infertility by their socio-demographic characteristics.

Ghahremanei and Ghaem (19) in their study of infertility refer to the importance of context and external environment, and individual characteristics. They argue that not only physiological and hereditary characteristics, but also individual characteristics and social environment are effective in the experience of infertility. Poston and Trent (20) consider the increase in childlessness in less developed areas as a result of couples' inability to have children. They refer to infectious and sexually transmitted diseases, genetic disorders, malnutrition, etc as factors that reduce fecundity resulting in unwanted childlessness. In addition to anatomical and genetic disorders, the impact of structural factors should not be ignored in explaining infertility. Place of residence, age at first marriage, employment status, age at childbearing, and education level, especially for women, are likely associated with unwanted childlessness and infertility experiences.

In this study, the theoretical framework developed by Poston and Trent (20) are utilized to investigate the impact of the contextual and external environment as well as the individual characteristics of women on the likelihood of experiencing infertility. The following hypotheses are tested: (a) Education level has a significant relationship with infertility; (b) women's age and age at marriage have a positive relationship with infertility; (c) women's social and economic status has an inverse relationship with infertility; (d) infertility differs based on place of residence and; (e) consanguineous marriages may increase the chance of infertility. However, it is noteworthy to emphasize that this study does not claim to fully explain the causes of infertility in Iran, but it will try to explore infertility prevalence and the socio-economic and demographic characteristics of infertile women in four selected provinces of the country.

Materials and Methods

This study is based on the analysis of data derived from the cross-sectional fertility survey conducted in 2017(21). Data were collected by the trained interviewers using a

structured questionnaire designed by the authors. The validity of the questionnaire was confirmed by more than 10 demographers and health professionals. The Cronbach's alpha reliability of questionnaire's factors was at least 0.873. In this survey, due to practical purposes, the sample size was determined equal for each province. The sampling frame was developed using Iran's 2016 Population and Housing Census. To research women of reproductive age, 1500 households were selected in each province using a multi-stage stratified cluster random sampling method. Then sampling was conducted proportional to population size in each district within each province. The cluster size was set at 10 households. There were no interventions or treatments in this study, and the aim of the study was explained to the respondents before the interview process, and women who provided oral consent to participate in the study were interviewed. To meet the aim of the present paper, a sub-sample was drawn from this survey consisting of currently married women aged 15-49 years. Accordingly, a sample of 4088 married women aged 15-49 in four provinces of Gilan, West Azarbaijan, Sistan and Baluchistan, and Yazd were taken into analysis. It is noticeable that these four provinces have different levels of fertility and socio-economic and development condition. Using a comprehensive information on timing of marriage, birth history, contraceptive use practice, fertility intention, and sexual relation, we estimate the prevalence rate of infertility. First, the prevalence rate of primary and secondary infertility are estimated based on the three definitions mentioned above, clinical and epidemiological by WHO, and based on demographic definition. The period of concern is one year for clinical and two years epidemiological infertility. But, in the demographic definition of infertility, the period of concern is not having a live birth for at least five years. In all three estimations, the intention and desire to have a child, not using contraception and having a regular sexual relation during the period of concern is taken into account.

Second, the relationship between socio-demographic characteristics variables and infertility are investigated. These variables include education level (illiterate, primary, lower secondary, upper secondary, university), women's age (15-24, 25-34, 35+), age at first marriage (<20, 20-24, 25-29, 30+), socio-economic condition (low, medium, high), type of marriage (first cousin, second cousin, non-kin marriage), and place of residence (urban, rural). The socio-economic status variable is measured using the variables of job type, education level, monthly household income, housing ownership, car ownership, land, and other assets (22,23). The dependent variable is the function of fertility status, which is classified into fertile and infertile. It should be noted that the function variable is based on the clinical definition of infertility. Counting the dichotomous variable of infertility status as fertile versus infertile. Statistical analysis was performed using SPSS version 24. Socio-demographic determinants of infertility are tested using either chi-square or gamma test where appropriate. Logistic regression analysis is applied to determine the predictors of infertility and a *P* value less than 0.05 is considered statistically significant, and the results of the odds ratio with a 95% confidence interval are presented. Various statistical tests including Hosmer and Lemeshow (H-L), as well as Cox-Snell R-squared and Nagelkerke R-squared tests are controlled to evaluate the fitness and accuracy of the regression models.

Results

The sample size for the current study comprised 4088 married women aged 15-49 including 857in Gilan province, 1052 in West Azerbaijan province, 1216 in Sistan and Baluchistan province, and 945 in Yazd province. The mean age of the women participating in this study was 33 years and the mean age at marriage was 20 years. Around 63% of women were living in urban areas, and 44% of them had a consanguine marriage. The mean of women's children ever born was equal to 2.28 children per woman. In term of education level, 10.4% of women were illiterate, 23% had completed their high school, and 17.8% had a university education. About 44% of women were living in a household with low socio-economic conditions.

Given the importance of primary and secondary infertility for population and health policies, the measure of infertility prevalence has been combined as an estimate for infertile couples. The prevalence of infertility shown in the following figure includes the total infertility (primary and secondary). As expected, the prevalence of infertility in four provinces according to the clinical definition is higher than the estimated value based on the WHO and demographic definition. The level of infertility in Sistan & Baluchistan province is noticeably higher than other provinces comprising 22%, 16%, and 11% of women according to clinical, WHO epidemiological, and demography definitions respectively (Figure 1).

Table 1 shows the prevalence of primary and secondary infertility in the four provinces based on the three definitions. The results show that a significant part of the infertility observed in these provinces is caused by secondary infertility.

Table 2 shows the distribution of studied married women in the four selected provinces by their age and fertility status. As expected, the results suggest that infertility increases with age. The increase in infertility pattern with age is mainly due to secondary infertility. However, primary infertility is usually diagnosed in the first years of marriage, and the infertile women may continue in this status to the end of their reproductive age or may be assisted to conceive. Thus, the pattern of primary infertility by age is ambiguous due to the lack of relevant information about the onset of primary infertility. The fertility status of women by their current age indicates primary infertility is more common in younger women, decreases in middle age, and increases again from the

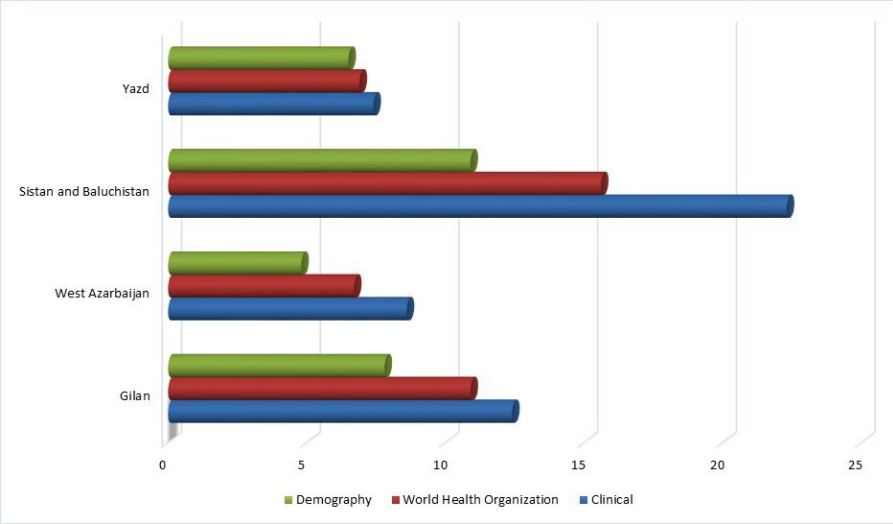

Figure 1. Prevalence (%) of Infertility for Married Women Aged 15-49 According to the clinical, WHO Epidemiological and Demographic Definitions by Province

age of 35 onwards. In West Azerbaijan and Sistan and Baluchistan provinces, primary infertility is high in the age group of 15-19 years compared to older age groups. The ambiguity arises from findings is whether women's fecundity is lower in the early years of reproductive life and increases from the age of 20 onwards or whether it is higher in Sistatn and Balushistan because of less usage of contraception before the first pregnancy than in the other provinces. Nevertheless, primary infertility reaches its highest level at the age groups of 25-29 and 30-34.

In Table 2, fertile women are separated according to childlessness, childbearing, and infertility. In Gilan province, a significant percentage of women in the age group under 35 are fertile without children. This group of women use a contraceptive method to avoid childbearing or remain childless. They might be infertile,

Table 1. Prevalence (%) of Primary and Secondary Infertility According to Three Clinical, WHO Epidemiological, and Demographic Definitions by Province

Infertility		Gilan	West Azarbaijan	Sistan and Baluchistan	Yazd
Clinical	Primary	2.1	2.3	3.5	1.6
	Secondary	10.3	6.3	18.8	5.8
WHO epidemiological	Primary	1.9	1.8	2.7	1.4
	Secondary	9.0	4.9	12.9	5.5
Demographic	Primary	3.1	2.4	2.4	2.3
	Secondary	4.7	2.4	8.5	4.2

Table 2. Percentage Distribution of Married Women Aged 15-49 by fertility Status, Province, and Age

Provinces	Fertility Status	Age Group				*P* Value
		15-24	25-34	35+	Total	
Gilan	Fertile no children	59.6	17.0	0.6	11.6	<0.001
	Fertile with children	33.7	77.7	82.5	76.1	
	Primary infertility	3.4	1.5	2.1	2.1	
	Secondary infertility	3.4	3.8	14.8	10.3	
West Azerbaijan	Fertile no children	32.4	7.4	0.6	7.7	<0.001
	Fertile with children	58.5	88.2	87.2	83.7	
	Primary infertility	6.3	2.1	1.3	2.3	
	Secondary infertility	2.8	2.3	10.9	6.3	
Sistan and Baluchistan	Fertile no children	19.9	4.7	0.4	6.3	<0.001
	Fertile with children	66.4	76.2	68.7	71.4	
	Primary infertility	6.6	2.6	2.9	3.5	
	Secondary infertility	7.0	16.5	27.9	18.8	
Yazd	Fertile no children	40.8	7.8	0.9	7.9	<0.001
	Fertile with children	57.3	86.4	89.3	84.7	
	Primary infertility	1.9	2.1	1.1	1.6	
	Secondary infertility	0.0	3.7	8.8	5.8	

but their fecundity status remains hidden due to the use of contraceptives. In any case, the continuation of the delay in childbearing has led to an increase in primary infertility. In the two provinces of Gilan and Sistan & Baluchistan, a high percentage of women aged 25 and above are secondary infertile.

Table 3 shows the fertility status of married women aged 15-49 by educational attainment and their age at marriage in selected provinces. The results indicate that there is a significant relationship between infertility and marriage age in the present sample. As the women's age at marriage increases, the percentage of infertility increases. Particularly, when women delay their marriage to their 30s, the percentage of primary infertility increases significantly, and even secondary infertility increases for this group of women due to the decrease in fecundity.

According to the results, there is a correlation between infertility and the level of education, and the percentage of infertility is higher among women with a lower level of education in all provinces. For instance, illiterate women in Gilan, Yazd, and Sistan and Baluchistan provinces have the highest rate of either primary or secondary infertility which might be partially due to their age which will be examined in the multivariate analysis.

The findings show that there is no significant relationship between infertility and labor force participation. In Sistan and Baluchistan and Yazd provinces, the percentage of infertile women among employed women is higher than their counterparts who were not participating in the labor force. In other provinces, the percentage of infertility seemed higher for those women who were not participating in the labor force. However, the differences are not significant in any provinces (the table is not shown).

The results for fertility status by the socioeconomic condition of the households that women were living with are shown in Table 4. The finding suggests socioeconomic condition of the household significantly explains the fertility status of women. The percentage of infertility in women who were living in a household with a lower socio-economic condition is higher than women in a household with a better socio-economic condition. Around 11% of women in West Azarbaijan with low socio-economic conditions are infertile, while about 3.4% in the medium socio-economic condition were infertile, and no infertility was reported by women with high socio-economic conditions. In Sistan and Baluchistan province, around 24% of women belonging to low socio-economic households are infertile and the rate decreases to 15% among women in high socioeconomic households. It is noteworthy that in Yazd province, the percentage of infertility of women in low socio-economic households is twice the percentage for women with high socio-economic conditions.

The results from three logistic regression models are shown in Table 5**.** In logistic regression, data were entered into the model in three steps, and all three models were tested for goodness of fit using Hosmer–Lemeshow tests. The estimates of the parameters resulting from the models and the maximum likelihood of the models indicated that the inclusion of the predictors in the models is well fitted. And variance by Cox-Snell R-squared and Nagelkerke R-squared measures were 5.5 and 10.5% respectively.

Women's age and age at marriage were the first variables included in the model to measure the likelihood of their effect on infertility experiences. The result from the logistic regression indicated that age and age at marriage as an indication of postponing childbearing have a significant effect on the odds of infertility. Controlling for age, the estimated odds of infertility indicates that women who got married in their 20s were around 65% less likely to claim infertility than women who got married at age 30

Table 3. Percentage Distribution of Married Women Aged 15-49 by Fertility Status Age of Marriage and Educational Attainment in Selected Provinces

Province	Fertility status	Age at Marriage				*P* Value	Educational Attainment					*P* Value
		>20	20-24	25-29	30+		Illiterate	Primary	Lower Secondary	Upper Secondary	University	
Gilan	Fertile	89.6	86.5	89.5	72.0	< 0.001	85.8*		87.6	85.1	94.9	0.003
	Primary infertility	1.2	1.5	3.0	10.0		2.8*		0.9	2.1	2.0	
	Secondary infertility	9.2	12.0	7.5	18.0		11.7*		11.6	12.8	3.0	
West Azerbaijan	Fertile	92.1	92.8	89.5	74.2	< 0.001	89.4	88.1	91.6	94.1	98.4	0.000
	Primary infertility	1.8	1.8	2.4	16.1		3.5	2.7	1.9	2.7		
	Secondary infertility	6.1	5.4	8.1	9.7		7.1	9.2	6.5	3.2	1.6	
Sistan and Baluchistan	Fertile	77.3	80.2	79.8	62.1	0.01	70.5	76.3	79.3	84.9	85.1	< 0.001
	Primary infertility	3.2	79.8	3.8	13.8		1.9	2.9	4.2	5.7	5.0	
	Secondary infertility	19.5	62.1	16.3	24.1		27.5	20.9	16.5	9.4	9.9	
Yazd	Fertile	91.7	93.8	95.4	81.8	< 0.001	85.7*		91.9	95.0	94.3	0.006
	Primary infertility	0.9	2.2	1.9	18.2		1.8*		1.6	2.0	1.1	
	Secondary infertility	7.4	4.0	2.8	0.0		12.5*		6.5	3.0	4.6	

*Due to the small number of illiterate women in Yazd and Gilan provinces, illiterate women and women with primary education were combined in one category.

or older. However, the odds for women married before age 20 is slightly higher and they were 54% less likely to be in an infertile state.

In the second step, other variables including socio-economic condition, place of residence, and consanguinity were added to the model. It is noticeable that controlling for all variables in the model, the effect of age and age at marriage are slightly reduced, while the increase of age and age marriage still significantly explains infertility experiences. Moreover, women who lived in a household with low socio-economic conditions compared to those living in households with high socio-economic conditions were two times more likely to develop infertility (OR = 1.992). The results revealed that consanguineous marriage has a positive effect on infertility, and the probability of infertility among women who had married their first (OR=1.540) or second cousin (OR=1.730) is higher than those who had married a non-relative.

Table 4. Percentage Distribution of Married Women Aged 15-49 by Fertility Status, Province, and Socio-economic Condition of the Household

Province		Low	Medium	High	*P* Value
Gilan	Infertile	13.3	12.5	5.6	0.045
	Fertile	86.7	87.5	94.4	
	N	308	473	94	
West Azerbaijan	Infertile	11.3	4.3	0.0	< 0.001
	Fertile	88.7	95.7	100	
	N	646	342	64	
Sistan and Baluchistan	Infertile	24.2	17.9	15.8	0.046
	Fertile	75.8	82.1	84.2	
	N	855	311	49	
Yazd	Infertile	11.7	5.7	6.7	0.008
	Fertile	88.3	94.3	93.3	
	N	256	644	45	

Table 5. The Results of Estimating the Parameters of the Logistic Regression Model in Determining the Economic, Demographic, ad Social Factors Affecting Infertility

Step	Variable		B	SE	*P* Value	Exp(B)	95% CI EXP(B)	
							Lower	Upper
Step 1	Age group (REF: 35+)	15-24	-0.863	0.178	< 0.001	0.422	0.298	0.598
		25-34	-0.611	0.110	< 0.001	0.543	0.438	0.673
	Age of marriage (REF: 30+)	<20	-0.774	0.216	< 0.001	0.461	0.302	0.704
		20-24	-0.970	0.220	< 0.001	0.379	0.246	0.584
		25-29	-1.038	0.250	< 0.001	0.354	0.217	0.578
	Constant		-0.780	0.202	< 0.001	0.458		
Step 2	Age group (REF: 35+)	15-24	-0.941	0.180	< 0.001	0.390	0.274	0.555
		25-34	-0.622	0.111	< 0.001	0.537	0.432	0.667
	Age of marriage (REF: 30+)	<20	-1.005	0.223	< 0.001	0.366	0.236	0.567
		20-24	-1.056	0.226	< 0.001	0.348	0.224	0.541
		25-29	-1.046	0.254	< 0.001	0.351	0.213	0.578
	Socio-economic condition (Ref: high)	Low	0.689	0.173	< 0.001	1.992	1.420	2.795
		Medium	0.237	0.173	0.170	1.268	0.903	1.778
	Urban (Ref: rural)	Urban	-0.193	0.108	0.072	0.824	0.667	1.018
	Consanguinity marriage (Ref: non-kin marriage)	First cousin	0.432	0.127	0.001	1.540	1.201	1.975
		Second cousin	0.548	0.123	< 0.001	1.730	1.358	2.203
	Constant		-1.158	0.261	< 0.001	0.314		
Step 3	Age group (REF: 35+)	15-24	-1.097	0.183	< 0.001	0.334	0.233	.478
		25-34	-0.709	0.114	< 0.001	0.492	0.393	0.615
	Age of marriage (REF: 30+)	<20	-0.898	0.226	< 0.001	0.408	0.262	0.635
		20-24	-0.923	0.229	< 0.001	0.397	0.254	0.622
		25-29	-0.984	0.257	< 0.001	0.374	0.226	0.619
	Socio-economic condition (Ref: high)	Low	0.604	0.179	.001	1.829	1.288	2.597
		Medium	0.273	0.175	.118	1.315	0.933	1.852
	Place of Residence	Urban	-0.056	0.111	.614	0.945	0.760	1.176
	Consanguinity marriage (Ref: non-kin marriage)	First cousin	0.066	0.143	.643	1.069	0.808	1.414
		Second cousin	0.224	0.136	.100	1.251	0.958	1.632
	Province (Ref: Yazd)	Gilan	0.465	0.174	.008	1.591	1.131	2.239
		West Azarbaijan	0.058	0.181	.750	1.059	0.743	1.510
		Sistan & Baluchistan	1.115	0.168	< 0.001	3.050	2.193	4.242
	Constant		-1.629	0.301	< 0.001	0.196		

Due to the significant provincial differences that we observed in the prevalence of infertility, the province of residence was added to the model in the last step. Given that Yazd is one of the provinces of Iran with a higher rate of consanguinity marriage and reasonably above replacement level fertility, it was selected as the reference province in the model. The odds ratios resulting from this stage predict that women in Sistan and Baluchistan were found in an infertile state three times more compared with women living in Yazd. While this figure for women Gilan is 1.6 times of women in Yazd. By adding the province as one of the predictors in the model, consanguinity lost its significance as a predictor of infertility. Although the β coefficient for the women's age and age at marriage has decreased slightly, the effect of these two variables remained statistically significant throughout the analysis with a *P* value of less than 0.05.

Discussion

Four provinces selected in this study are in different geographical locations with different socio-economic and ethnic backgrounds. The findings of this study showed that in these provinces, on average, 12.6% of women are infertile. However, the provincial differences in infertility varies from 7.4% in Yazd province to 22% in Sistan and Baluchistan province. Razeghi Nasrabad et al (18) using 2010 Iran Demographic and Health Survey (IDHS), found that in Sistan and Baluchistan which is considered to have a low level of socio-economic development, women displayed the highest level of childlessness at age 40-44 (lifetime childlessness) as compared to all other provinces.

The estimation of infertility in this study is fundamentally different from studies that consider lifetime infertility (9,24,25). For example, Vahidi and colleagues (24) estimated the prevalence of primary infertility in West Azerbaijan 25.3, Sistan and Baluchistan province 46.1, Yazd 18.2%, and Gilan 22.2%. In another study, Akhundi and colleagues (25), estimated the prevalence of infertility in West Azerbaijan 26.24%, Sistan and Baluchestan 11.56%, Yazd 21.39%, and Gilan 23.81%. In population and health policies, it is important to pay attention to the difference between current (period) and lifetime infertilities. Lifetime infertility shows how many percent of couple experience infertility at any stage of their lives. However, the current estimate refers to the infertility at the time of the research and does not consider the individual's past experiences. Lifetime infertility is calculated regardless of whether a person has or does not have children at the time of research. Naturally the lifetime infertility shows higher figures than the current infertility rate.

The high rate of secondary infertility compared to primary infertility indicates that some couples became infertile after having a child. Therefore, in line with the results of other studies (10-12) the increase in the total infertility rate is affected by secondary infertility. Less access to medical care during the first pregnancy and during childbirth, insufficient midwifery care (12), abortion (12,26,27), curettage, old age of mothers at the time of the decision to have children (26,28-30), and uterine adhesions caused by surgery, especially cesarean section (12,27) are important causes of secondary infertility (31-33).

The results indicate that there is a significant negative relationship between infertility and age of marriage. In particular, when women delay their marriage until their 30s, the rate of primary infertility increases significantly. These results are consistent with the results of previous studies (11,12,28-30). Even secondary infertility increases for this group of people because they lose the opportunity to have more children due to the reduced fecundity.

This finding is an important information for population policy where infertility is matter of concerns. As discussed earlier, in the PRFS law there is a lot of focus on supporting infertile couples and treatment of infertility to increasing fertility rate in the country. However, secondary infertile couples may not seek treatment because they have at least one child. The age of women is a determining variable in infertility, and with increasing age at marriage, the probability of being infertile may increase. The results of this study are consistent with the study of Liang and colleagues (30), Kazemijaliseh and colleagues (33), Benksim and colleagues (5), and Kundu and Dhillon (26). These studies showed that the length of marriage, women's age, and socioeconomic status are predictors of secondary infertility. Kazemijaliseh and colleagues (33) also showed that primary infertility is related to women's age, smoking, and education level.

The socio-economic condition variable creates significant differences in the fertility status and according to the result, the probability of infertility decreases with the rise of socio-economic status of women. Therefore, paying attention to welfare indicators in low-privileged regions and provinces is a fundamental priority. Our findings are consistent with the results of the previous studies (26-33). According to the results of these researchers, in situations where people live in less developed areas or have characteristics corresponding to lower development levels, the probability of unwanted childlessness and infertility would increase. In fact, factors that may directly lead to infertility, such as various types of uterine infections, improper nutrition, or being in less suitable work and health environments, are more common in less developed regions (20,26). The place of residence had a significant effect on the chance of experiencing infertility, as women who lived in Sistan & Baluchistan and Gilan provinces have more chance of being infertile as compared to those living in Yazd province.

Limitations of the Study

The results of this study suggest that socio-economic and demographic characteristics of women explain infertility partially, and genetic and anatomical factors, which are

also emphasized in clinical studies, may have a greater impact on experiencing infertility. As the data used for this study with limited information on other aspects of infertility, a national survey should be carried out to estimate the current infertility rate and its associations at the national level.

Conclusions

The current infertility rates that were calculated in this study are very different from the rates of lifetime infertility that were calculated in other studies (9,13,24). . However, the findings are highly important from a policy perspective. This shows that lifetime infertility estimates tend to be higher figures than the current infertility rate. Although, lifetime infertility is a useful measure, in line with Boivin's argument, focusing on current infertility is a better indicator to show the current need for health services and assisted reproductive technology in different regions (34).

The results of this study showed age of marriage has a negative effect on infertility. Given the increasing trend of the age of marriage in Iran, it is necessary to facilitate marriage and family formation. In addition, women should be given the necessary information about the consequences of postponing childbearing when they and to avoid delaying marriage and having children. The high level of infertility in Sistan and Baluchistan province confirms the relationship between the level of development and infertility. It also indicates the high need for services and health care in this province.

It is important for policymakers that bear in mind that the age of marriage is increasing in Iran and it will likely affect infertility and childlessness where childbearing is postponed to the late 30s and 40s. This calls for more evidence-based programs targeting newly married as well as infertile couples to be aware of and have access to assisted fertility technology.

Conflict of Interests

Authors declare that they have no conflict of interests.

Ethical Issues

This study was approved by the ethics committee of the National Institute for Population Research, Iran (Code: 2182912).

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