

Access this article online
Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_594_22

Childbearing decisions and related factors in the COVID-19 pandemic: A narrative review study

Faranak Safdari – Dehcheshmeh^{1,2}, Mahnaz Noroozi³, Soraya Memar⁴, Fariba Taleghani⁵

¹Student Research Committee, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran, ²Department of Midwifery and Reproductive Health, School of Nursing and Midwifery, Shahrekord University of Medical Sciences, Shahrekord, Iran, ³Department of Midwifery and Reproductive Health, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran, ⁴Department of Social Sciences, Isfahan University, Isfahan, Iran, ⁵Department of Adult Health Nursing, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran

Address for correspondence:

Dr. Mahnaz Noroozi,
Department of Midwifery and Reproductive Health,
School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran.
E-mail: noroozi@nm.mui.ac.ir

Received: 24-04-2022
Accepted: 06-06-2022
Published: 28-02-2023

Abstract:

The COVID-19 pandemic has had considerable consequences in many areas of life, including the social area and childbearing plans. The present narrative review aimed to examine the childbearing decisions and its related factors during the COVID-19 pandemic. This review was conducted by searching in scientific databases, including Web of Science, Science Direct, Google Scholar, Scopus, Cochrane, PubMed, ProQuest, Scientific Information Database (SID), Iranian Research Institute for Information Science and Technology (IranDoc) and Iranian Journal Database (Magiran) in June 2022. The search resulted in 111 sources, of which 16 were in line with the research objective. Couples have mainly cancelled or delayed their previous plans related to childbearing decisions. There are two groups of direct and indirect factors related to childbearing decisions during the COVID-19 pandemic: The former includes (1) well-being-related factors such as economic conditions, interpersonal relationships and gender roles in terms of task division; and (2) health-related factors, including health emergencies and physical and psychological health. The latter includes factors such as social distancing and social media. Based on the results, governments should facilitate childbearing by adjusting existing policies, addressing economic insecurity and protecting the livelihoods of those affected by the crisis. Health policymakers and planners must also prioritize women's access to reproductive health services in a safe environment while promoting equity in access. It is also necessary to promote the quality and quantity of indirect care and virtual counseling based on the needs of women in crisis.

Keywords:

COVID -19, decision making, fertility, reproductive behavior

Introduction

The highly infectious coronavirus disease 2019 (COVID-19), known as the modern plague, first appeared in China in late 2019 and challenged people worldwide with completely new conditions due to its rapid spread throughout the globe.^[1] Accordingly, countries adopted extensive local, national and international policies such as closing borders, travel bans, quarantine, social distancing and closure of unnecessary occupations and educational centers to prevent the outspread of the virus.^[2] The

COVID-19 pandemic has had a significant impact on the social, political, economic and psychological aspects of human life,^[3] including fertility and childbearing as an important social aspect.^[4]

Fertility is one of the most important life events that, in addition to biological and physiological aspects, can also be considered from a behavioral perspective. Depending on the resources and opportunities available in the community, individuals may behave in a way that increases or decreases their fertility. It is, therefore, logical for fertility intentions to be affected in case of crises and

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Safdari – Dehcheshmeh F, Noroozi M, Memar S, Taleghani F. Childbearing decisions and related factors in the COVID-19 pandemic: A narrative review study. J Edu Health Promot 2023;12:48.

transfer of resources.^[5] From a historical perspective, events and crises with high mortality, such as famine and war, have had predictable effects on human fertility. Epidemics also have a similar pattern to natural disasters in terms of their impact on the population.^[6] After all of these crises, individuals have made short- and long-term changes in their childbearing plans and behaviors in the form of delayed marriage or childbearing to adapt to the complexities and uncertainties of the external environment.^[7,8]

The history of health crises in the Zika and Ebola epidemics has shown that most people have revised and postponed their childbearing plans.^[9] In the COVID-19 pandemic, many studies have shown similar results. However, some studies have shown conflicting results; for example, a study by Zhu and Siemicka found that a higher percentage of people did not change their previous fertility plans.^[3,10] Among the studies, only Flynn showed that 27% of individuals decided to set forward their childbearing plans, while one-third of women preferred to have fewer children during the pandemic.^[11]

Reproductive changes following epidemic diseases are due to biological and behavioral mechanisms. In the biological mechanism, the physical conditions either prevent pregnancy or lead to stillbirth or maternal death. On the other hand, behavioral mechanisms are based on individual decisions and adjustment of their reproductive behaviors, according to health emergencies and economic costs of the crisis,^[4] leading to reconsideration of their priorities and the cancellation or change of childbearing plans.^[11] Biologically, the direct effects of COVID-19 infection on fertility may be mild compared to previous epidemics,^[12] and thus, less reduction in biological fertility occurs. The COVID-19 pandemic has increased the mortality rate of the elderly to a greater extent to date. Hence, the health dimension of the COVID-19 crisis may not be directly responsible for the reconsideration of individuals' previous fertility intentions, and parental mortality may not be an appropriate mechanism for fertility changes.^[13,14] Unlike many previous health crises, COVID-19 has had major economic outcomes.^[15] Trade disruptions, declined gross domestic product (GDP), constant market changes, closure of occupations, more unemployment and job insecurity, lower incomes, financial fluctuations and negative perceptions of the future are interconnected influential factors on making fertility decisions during the pandemic.^[15,16]

The COVID-19 pandemic occurred in the context of demographic changes in which fertility rates in many countries had declined over the years.^[17] Simultaneously, with the demographic crisis, the social, political,

economic and psychological aspects of the pandemic have led to declining marriages, delayed childbearing and avoidance of pregnancy, and in some cases, even the loss of fertility opportunities.^[18] The demographic consequences of the epidemic are particularly significant in countries where the birth rate is lower than the replacement rate.

Therefore, it is very helpful to examine childbearing decisions to understand the impact of the COVID-19 crisis on short-term fertility^[12] because fertility intentions and objectives are strong predictors of reproductive behaviors.^[17] Identifying the changes in childbearing plans as a short-term consequence of the epidemic and its related factors can provide the insights required for women's evidence-based guidance and counseling and is a step toward reducing the negative impacts of COVID-19 on individuals' psychological and physical health.^[9] Policymakers can also facilitate the realization of fertility plans if they understand the nature of the reproductive decisions during the crisis and identify the main dimensions of the pandemic that may affect fertility processes, patterns, and choices. Accordingly, the present narrative review aimed to examine childbearing decisions and its related factors during the COVID-19 pandemic.

Materials and Methods

This narrative review was conducted in June 2022 by searching in Iranian databases, including Scientific Information Database (SID), Iranian Research Institute for Information Science and Technology (IranDoc), and Iranian Journal Database (Magiran) using the following keywords in Persian: COVID-19, pandemic, corona disease, reproductive behavior, fertility, childbearing, fertility plans, fertility intentions, and fertility preferences. Simultaneously, the search in Google Scholar and English databases of PubMed, Scopus, ISI Web of Science, Science Direct, ProQuest and Cochrane Library was conducted using the following English keywords: COVID-19, pandemic, SARS-CoV-2, coronavirus disease, reproductive behavior, fertility, childbearing, fertility plans, fertility intentions, and fertility preferences. Publications related to childbearing decisions and their related factors during the COVID-19 pandemic were reviewed considering the period of December 2019 to June 2021.

Selection, extraction, and synthesis of data

The studies were evaluated based on the inclusion and exclusion criteria. Persian and English full-text articles that directly addressed the effect of COVID-19 on childbearing decision-making and related factors were included in the study. Articles that could not be accessed in full text or were in languages other than Persian and English, as well as gray articles, were excluded.

The initial extensive search led to the extraction of 111 articles in the first stage. The second stage included the evaluation of the extracted articles in two steps according to the inclusion criteria. First, 67 duplicated articles were removed from the study, and then 28 articles were excluded due to irrelevant titles, objectives, or content and also inaccessibility of the full text of the article. Ultimately, a total of 16 articles were selected in the third stage for the final evaluation [Figure 1]. Data were extracted from articles based on the authors, country, samples, date, and results [Table 1]. The studies with the best contributions were synthesized. After reading full texts and synthesizing relevant evidence, literature was organized. It is noteworthy that the two reviewers performed the search process independently, and a third party was consulted in case of disagreement.

Ethical considerations

Ethics code of IR.MUI.RESEARCH.REC.1399.610 was received from the ethics committee of Isfahan University of Medical Sciences. The present review article used the collected information for scientific purposes, and the authors adhered to intellectual property in reporting and disseminating results.

Results

The findings of this study are presented in two parts: reproductive decision-making and factors related to reproductive decision-making in the COVID-19 pandemic.

Reproductive decision-making

The results of most studies indicated a change in the fertility plans of couples during the COVID-19 pandemic.^[3,10,11,23,24] The reconsideration of the couples' fertility plans in the pandemic was in the form of confirmation or cancellation of previous plans, less childbearing preference and delaying or setting forward the childbearing plan. The results of studies confirm the greater tendency to delay childbearing^[11,24,28–30,32] and the cancellation of previously set fertility plans^[3,10,11,26] [Table 1]. A study by Kahn *et al.*^[23] showed that about half of women who were trying to

conceive and more than one-third of women who were thinking of pregnancy before the epidemic cancelled their previous plans. However, two studies by Zhu and Sienicka found that a higher percentage of people did not change their previous fertility plans.^[3,10] Among the studies, only Flynn showed that 27% of individuals decided to go forward with their childbearing plan, while one-third of women preferred to have fewer children during the pandemic.^[11]

Factors related to reproductive decision-making in the COVID-19 pandemic

Based on studies, factors related to fertility decisions in the COVID-19 pandemic include factors with direct and indirect relationships.

Factors with a direct relationship with fertility decisions in the COVID-19 pandemic

These factors are either related to well-being or health.

Factors related to well-being

COVID-19 has affected many areas of human well-being negatively.^[22] According to the results of studies, factors related to well-being include economic conditions, interpersonal relationships and gender roles in terms of task division.

Economic conditions

Pandemics have different adverse effects on economic conditions and fertility intentions,^[19] affecting material well-being directly and indirectly. In the direct impacts, the death or infection of a family member with COVID-19 affects the financial conditions of the family significantly. On the other hand, the pandemic affects material well-being indirectly through quarantine policies and various restrictions to control the virus. Hence, consequences such as economic insecurity, unemployment, decreased income, or fear of income decline would reduce the fertility intention and delay fertility goals for a longer period.^[3] In a survey of American women, Kuo Lin *et al.*^[19] found that nearly half of the respondents (46%) lost their income during the epidemic and a quarter of them showed less willingness to get pregnant. Based on this study, the inability to provide food, transportation or housing was associated with a decreased preference to conceive. In a study by Sienicka *et al.*^[3] the pandemic changed fertility intentions in 22% of respondents, most of whom preferred to have children later than planned. More than half of the people who changed their fertility plans were afraid of losing their income, and 40.3% had experienced a decrease in income. In their study, Arpino *et al.*^[14] found that those suffering from an income shock due to the COVID-19 pandemic or who had more negative expectations about their income or future job were more likely to ignore their childbearing intention and plans. Lindberg *et al.*^[24] also showed that women whose financial

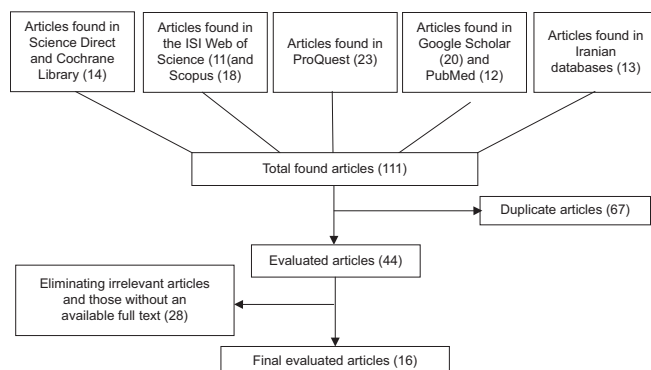


Figure 1: The flowchart for the selection process of the articles

Table 1: Studies of childbearing decisions and related factors in COVID-19 pandemic from 2019 to 2021

Author and publication year	Type of study	Sample size	Place of study	Data gathering tools	Result
Lin <i>et al.</i> (2021) ^[19]	Cross-sectional	554 women aged 18-49 years	America	Questionnaire	A quarter of the participants reported a decrease in the desire to become pregnant, and 37% reported that the pandemic made them afraid of getting pregnant. Also, 17% had difficulty accessing contraceptives, especially those who experienced a decrease in income. Inability to provide food, transportation and/or housing was associated with a reduced desire to conceive.
Emery <i>et al.</i> (2022) ^[20]	Cross-sectional	Resident population aged 15-79	Moldova	Questionnaire	Interviews conducted during the epidemic showed a 35% reduction in attempts to conceive. Also, due to the decreased access to family planning services during the epidemic, the use of intrauterine devices decreased, and the use of male condoms increased, but in general, the use of contraceptives remained unchanged.
Naya <i>et al.</i> (2021) ^[21]	Cross-sectional	440 participants aged 18 years or older	America	Questionnaire	The pandemic led to changes in the fertility preferences of 29.6% of participants. Of these, a majority of 61.6% tended to conceive later, while 23.9% tended to conceive earlier than previously planned. Changes in pregnancy plans were more likely in racial and ethnic minorities, sexual minorities, and those with mental health problems (anxiety and depression).
Malicka <i>et al.</i> (2021) ^[22]	Mixed methods	1000 respondents (507 men and 493 women) aged 18-49 years	Poland	Computer-assisted web interviews	Of the 234 people who had childbearing decisions before the outbreak, about 20% postponed or left it because of COVID-19. Delayed childbearing was significantly associated with lower financial security and worse psychological well-being of respondents. From respondents' perspective, limited access to healthcare services and fear of being left alone in the hospital were two main aspects related to fertility during the COVID-19 pandemic.
Kahn <i>et al.</i> (2021) ^[23]	Cross-sectional	1179 non-pregnant women who have at least delivered a live infant	America	Questionnaire	There were changes in the intentions of 49% of women who sought to conceive and 37% of those contemplating pregnancy before the pandemic. Of those who had not decided to get pregnant before the pandemic, only a small fraction thought about getting pregnant during the pandemic.
Lindberg <i>et al.</i> (2020) ^[24]	Quantitative	2009 women aged 18-49 years	America	Questionnaire	More than 40% of women reported that the COVID-19 pandemic changed their planning about the timing and number of offspring. Overall, 34% of women reported wanting later childbirth or fewer children because of the pandemic.
Flynn <i>et al.</i> (2021) ^[11]	Mixed methods	504 women aged 18-45 years	United Kingdom	Questionnaire	COVID-19 changed the fertility plans of 53% of the respondents as follows: 72% fertility delays, 27% anticipating fertility, and 1% cancellation of fertility plans. In terms of quality, the emerging theme was the suspension of clinical services and routine fertility.
Siemicka <i>et al.</i> (2021) ^[3]	Mixed methods	984 Polish men and women (aged 18-49 years), members of 8 Facebook groups	Poland	Questionnaire	Of the 62% of people planning to have children before the pandemic, 22% changed their intentions, of whom 74% delayed and 26% gave up completing the family size they had already planned.
Arpino <i>et al.</i> (2021) ^[14]	Cross-sectional	3286 young people aged 18 to 34 years	Italy	Questionnaire	Those suffering from the negative income shock caused by COVID-19 and those holding negative expectations about their future income and job were more likely to abandon the pre-pandemic fertility plans than their counterparts with better status. Also, those more vulnerable in terms of employment and financial status were more prone to indefinite suspension of childbearing plans in the short term.
Karp <i>et al.</i> (2021) ^[25]	Quantitative-longitudinal	9590 women aged 15 to 49 years (3518 from Burkina Faso and 5972 from Kenya)	America	Interview	During the epidemic, the use of contraceptives increased among women, especially in rural Burkina Faso and Kenya. Also, most women switched to more effective methods of family planning.
Micelli <i>et al.</i> (2020) ^[26]	Quantitative-correlational	1482 male and female, mostly with higher education (aged 18-46 years)	Italy	Questionnaire	Of the 18.1% of participants willing to have children before the pandemic, 37.3% withdrew due to the onset of the pandemic, concerns and uncertainty about future economic conditions, and fear of the consequences of pregnancy.

Contd...

Table 1: Contd...

Author and publication year	Type of study	Sample size	Place of study	Data gathering tools	Result
Marteletto <i>et al.</i> (2020) ^[27]	Mixed methods	2382 women aged 18-34 years	Brazil	Interview	More than 75% of women preferred to postpone or avoid pregnancy due to economic concerns and fear of health consequences.
Coombe <i>et al.</i> (2021) ^[28]	Mixed methods	518 women aged 18-49 years	Australia	Free-text questionnaire	Most participants intended to delay or avoid childbearing in the pandemic, and only a limited number wanted to conceive due to the isolation caused by COVID-19.
Tan <i>et al.</i> (2021) ^[29]	Longitudinal survey	345 married women aged 25-34 years	Singapore	Interview and questionnaire	More than 15% of participants intended to delay fertility, and 5% reported downward revisions in the intended number of children. Impairment of mental well-being (stress) and loss of income played a significant role in changing fertility plans.
Muhaidat <i>et al.</i> (2021) ^[30]	Cross-sectional	213 women planning for fertility-related treatment	Jordan	Questionnaire	More than half of the participants were concerned about infecting themselves, their partners, or family members during treatment. They were also worried about contracting an infection during pregnancy if the treatment were successful. More than half of the participants decided to postpone treatment or examinations regardless of the availability or closure of such services. Contagious anxiety seemed to play a significant role.
Banaei <i>et al.</i> (2021) ^[31]	Cross-sectional	400 married Iranian women in their reproductive age	Iran	Checklist and questionnaire	The childbearing intention had a positive and significant relationship with the structures of planned behavior (awareness, mental norms and perceived behavioral control) during the COVID-19 pandemic but a significant negative correlation with anxiety and attitudes toward COVID-19. Anxiety related to COVID-19 mediated the fertility desire.

status declined during the COVID-19 pandemic were more likely to delay childbearing or preferred to have fewer children than other women.

Interpersonal relationships and gender roles in terms of task division

According to research, men's participation in household tasks and childcare is associated with fertility and childbearing intentions.^[33] Gender equality and balanced task division in family affairs enhance work–family balance and increase women's childbearing intention and likelihood.^[34] Social distancing measures to control the spread of the virus, including teleworking (working at home) and closure of schools and public care centers (responsible for children and elderly care), have imposed a heavy burden on families, particularly working parents.^[34,35] More domestic responsibilities due to the COVID-19 pandemic could adversely affect family relationships^[36] and childbearing intentions. In their study, Dommermuth *et al.*^[34] concluded that inequality in the household task division reduced the likelihood of having the first and subsequent children. Riederer *et al.*^[33] studied four European countries and stated that the effect of domestic task division on childbearing depended to some extent on couples' satisfaction with such a division of responsibilities.

Health-related factors

According to the results of studies, health-related factors include health emergencies and physical and psychological health.

Health emergencies

Health systems of countries worldwide implemented measures to prevent and control the virus during the COVID-19 pandemic. Accordingly, the quality and quantity of women's healthcare, including access to contraceptive methods, access to centers for assisted reproductive services, on-time diagnosis and treatment of gynecological diseases and prenatal care, were all affected, with subsequent impacts on women's fertility decisions.^[18] Access to health emergencies can be examined in three areas, that is, family planning, public health services and centers for assisted reproductive services.

Access to family planning services

The COVID-19 pandemic reduced access to contraceptives, particularly in developing countries, as it disrupted the supply and demand for family planning services. The closure of some contraceptive manufacturing companies, on the one hand, and transportation delays and strict customs clearance and import regulations, on the other hand, disrupted the process of providing family planning services. The use of services on the demand side also faced several obstacles such as avoiding in-person visits (due to fear of virus infection), lower purchasing power due to the economic downturn^[15] and cancellation of elective surgeries such as vasectomy and tubal ligation.^[18] Michael *et al.*^[37] referred to the fear of in-person visits to medical centers (77.9%), closure of sales centers (51.2%), travel restrictions (47.6%) and inaccessibility to healthcare providers (42.9%) as the

four main reasons for the lack of access to contraceptive methods.

Karp *et al.*^[25] also found that a limited number of women did not use contraceptives for epidemic-related reasons.

Access to public health services

While having general health is an important contributing factor in childbearing decisions, and prenatal care is a major element in the prevention of maternal and fetal adverse outcomes, access to public health services was the main challenge for fertility during the pandemic because all human resources and physicians had to focus on the pandemic-related services instead of non-emergency healthcare services.^[4,38] In a study conducted by Sienicka *et al.*,^[3] the majority of those changing their childbearing plans were either concerned about the limited access to physicians and other parental care facilities or worried about delivery in the hospital. The study indicated the strongest association between changing fertility plans and concerns about access to healthcare. Lindberg *et al.*^[24] showed in another study conducted by the Guttmacher Institute in the United States that about a quarter of women (28%) at the reproductive age were concerned about access to sexual and reproductive healthcare during the pandemic and 33% delayed or cancelled healthcare due to the epidemic.

Access to assisted reproductive services

Given the increase in childbearing age, assisted reproductive technologies (ARTs) contribute to a large share of births at the age of 40 and above.^[39] However, most ART cycles were restricted or cancelled during the COVID-19 pandemic due to the possibility of sexually transmitted SARS-CoV-2 virus, its impacts on male and female fertility and its teratogenic effect on the fetus.^[40,41] While younger women preferred to delay their treatment due to the suspension or closure of fertility centers,^[42,43] many older infertile women were concerned about losing their window of fertility and sought to continue their treatment.^[44] In a study conducted by Tokgoz, nearly half of infertile women (44.6%) preferred to delay their pregnancy plans due to the COVID-19 pandemic.^[42] Kamath *et al.*^[43] also reported similar results. However, in a study conducted by Ben-Kimhy *et al.*^[44] 38.19% of patients whose fertility treatment was cancelled due to the pandemic experienced psychological distress, and 72% of patients preferred to resume their treatment.

Physical and psychological health

As shown by the studies, the debilitating biological effects of the disease on the one hand^[12] and anxiety, psychological distress and fear of infection transmission, on the other hand, led people toward delay in pregnancy.^[4] The pandemic was an unexpected event, disrupting the psychological well-being of community

members through an increase in stressors. The COVID-19 outbreak and the increase in morbidity and mortality led to different psychological problems such as depression, stress and anxiety.^[31] Financial fluctuations and economic uncertainty due to the pandemic also resulted in psychological stress for all social strata.^[6] Mimoun *et al.*^[45] found that people on unpaid leave by employers due to a pandemic experienced more stress than those unemployed before the pandemic. Kirubarajan *et al.*^[46] conducted a systematic review and found that disruptions and delays in reproductive services, including the closure of assisted reproductive centers, had adverse psychological health consequences such as poor mood, anxiety and suicide. In a survey conducted by Dondero and Marteleto, 90.2% of women preferred to avoid pregnancy during a pandemic, and half of them were concerned about infection during pregnancy.^[27] Silverio-Murillo *et al.*^[47] tracked the calls made to a call center and found a significant increase in the impairment of psychological health and the number of anxiety-related calls.

Factors indirectly related to fertility decisions during the COVID-19 pandemic

Factors indirectly related to fertility decisions in the pandemic include social distancing and social media.

Social distancing

Quarantine and social distancing led to the complete or partial closure of many jobs, along with an increase in unemployment, financial fluctuations, uncertainty, and economic recession, all of which resulted in psychological problems.^[6] On the other hand, social distancing and restrictions led to the cancellation of celebrations and mass gatherings such as wedding ceremonies. The prohibition of family and social gatherings limited relationships and interactions with family members and others, necessarily mediated by technology. Since virtual interactions cannot thoroughly replace interpersonal contacts, social isolation affects mental health and family relationships negatively, contributing as a barrier to receiving social support and affecting fertility goals adversely in the medium term.^[4]

Social media

The use of media increases when natural disasters or other crises happen.^[48] In the meantime, media contributed positively during the COVID-19 outbreak, promptly providing effective, vital and reliable information for the better management of the pandemic across geographical boundaries. However, the media also played a negative role by spreading a sense of uncertainty about the future. The public felt more economic insecurity due to the broadcast of negative news by the media.^[49] Widespread news about the higher risk of COVID-19 for pregnant women, such as ICU admission and mortality, higher

rates of stillbirth, or the spread of false information about the effects of the vaccine on future of fertility, would all influence fertility decisions.^[50] Barra showed a significant correlation between the incidence of anxiety or depression with the time spent on the news related to COVID-19 in infertile women whose IVF treatment was canceled or delayed due to the COVID-19 pandemic.^[51] Guetto *et al.*^[17] compared daily time spent watching television and surfing the Internet for the latest news and information, stating that the increased television watching hours during quarantine was associated with reduced fertility intention.

Discussion

This review study aimed to examine childbearing decisions and the related factors during the COVID-19 pandemic. As shown by the results of the studies reviewed, the COVID-19 crisis affected the childbearing process, leading to a more negative fertility response compared to previous health crises.^[29] Although these changes differed in societies with different economic and social conditions, the greater tendency to delay childbearing was confirmed on the whole. According to the experience of the previous health crises, anxiety and insecurity resulting from the crisis would lead to behavioral changes and avoidance of pregnancy.^[27]

The factors related to childbearing decisions were not new and had adverse effects on fertility before the pandemic as well; however, they seemed to have more pronounced and intense effects during the COVID-19 pandemic.^[22] As shown by the studies, economic conditions were among the factors related to fertility decisions in the COVID-19 pandemic. Economic crises have always been accompanied by changes in life plans, including the fertility intention, and led to individuals' refusal of any long-term commitments such as marriage and childbearing.^[4,40] Economic conditions contributed to parenting programs in various ways such as increased unemployment, limited access to housing, uncertainty about the future, and job stability.^[39] The economic uncertainty caused by the COVID-19 pandemic affected psychological health and well-being and would have forced individuals to delay parental responsibilities.^[20] The impact of the economic recession during the COVID-19 crisis seems to vary within and between countries, depending on the previous economic and social conditions. For example, the economic recession would potentially have insignificant effects on fertility in countries such as Germany and France with robust social welfare, a good labor market, and special policies to maintain jobs.^[32] In the same vein, Zhu showed in a study in China that the decline in income did not have a significant effect on fertility intention. This unexpected finding could be justified considering the Chinese habit

of keeping some money in reserve.^[10] On the other hand, the effects of economic recession are different in social groups within countries. Informal occupations such as laborers, street vendors, and domestic workers, whose jobs depend on social interactions, suffered more from the economic recession.^[16] Finally, the pattern of disease spread in different regions influenced childbearing decisions. Luppi *et al.*,^[32] in a study of five European countries found that more people cancelled or postponed their fertility plans in Germany, France, and Britain, where most cases of infection were identified (red zones), but this was not the case in Italy and Spain. The researcher justified this difference considering the better economic performance of the two countries. Women-dominated jobs suffered more during the epidemic, and women lost their jobs more than men^[24] because women were generally employed in temporary, service, and crisis-hit jobs. Hence, many of them lost their jobs due to the closure of industries, leading to a decline in their income and subsequent financial crises, which in turn led to the cancelation of fertility plans.^[4,19] According to what was mentioned, the adoption of policies to protect small businesses, particularly self- and informal employment, cash and non-cash subsidies to poor families and informal workers, financial support for affected businesses and support for women-dominated occupations may be effective strategies to address the economic consequences of crises such as the current pandemic.

Based on studies, interpersonal relationships and gender roles in terms of task division were other factors related to fertility decisions in the COVID-19 pandemic. Some studies have shown strengthened traditional attitudes and norms and greater gender inequality across the communities with the spread of infectious diseases.^[52] It seems that the COVID-19 pandemic exacerbated gender inequality in terms of task division in some areas, leaving most domestic affairs to women because outsourcing of some services such as child and elderly care, laundry, housekeeping, etc., was not possible.^[6] Thus, in societies with more involvement of women in the labor market, the gender gap and the normalization of household affairs for women in the COVID-19 crisis led to the avoidance of pregnancy. Therefore, it is necessary to consider such underlying social norms and gender roles and relations that lead to greater vulnerability of women. In this regard, public campaigns should be adopted to promote the division of household tasks and encourage men to participate in domestic affairs.

The health emergency conditions were also associated with the fertility decisions during the COVID-19 pandemic. The pandemic disrupted access to ART, family planning, and other medical services. According to the World Health Organization (WHO), 90% of the

105 countries surveyed faced disruptions in health services during the crisis.^[53] However, access to women's selected contraceptive methods is vital for their sexual health and fertility, and any disruptions in such services, particularly more effective methods prescribed by service providers,^[28] would limit fertility selection at the individual level. Although many countries replaced in-person services with new methods such as telemedicine, these did not apply to all social strata due to the lack of internet access or the required facilities and infrastructures. As the Guttmacher Institute indicated, only 24% of women taking pills could refill their prescription through telemedicine with healthcare providers.^[24] Thus, governments have to provide policies for equitable access to sexual, reproductive and public health services during crises. Also, as the age of childbearing increases, and many conceptions at older ages are through ART,^[40] effective policies and measures are required during the pandemic to fulfill the fertility intentions of the couples.

According to studies, physical and psychological health were additional factors related to fertility decisions in the COVID-19 pandemic. The unknown nature of COVID-19 and concerns about its maternal and fetal risks changed public opinion about pregnancy decisions.^[6] As shown by the studies, women were concerned about the unknown outcomes of the emerging disease during pregnancy^[54] and were uncertain whether they could receive optimum pregnancy care.^[16] Some women were also concerned about being left alone during and after delivery and the failure of the others to provide them and their babies with informal support.^[22] This perceived health insecurity changed their fertility intentions, resulting in the delay of the pregnancy.^[17] Accordingly, the quality and quantity of the remote referral platforms should allow access to all pregnant mothers, while appropriate educational content is required to inform families about the effect of COVID-19 on the health of mothers and children. Another effective measure can be the education and empowerment of people to take care of themselves. Social distancing was another influential factor on fertility decisions, affecting economic outcomes, psychological well-being, and gender roles in terms of task division. Social distancing and quarantine affected family and social life, and childbearing was affected by financial insecurity resulting from quarantine practices and other psychological consequences.^[22]

According to studies, social media in the form of radio, television or other social networks (Instagram, Facebook, Reddit, Twitter, and LinkedIn), affected psychosocial health significantly and directed individual decisions in uncertain conditions. Although social networks were very successful in virtual education and the dissemination of scientific information and guidelines during the

pandemic, the information bombardment, the provision of too much information about infections, mortalities, and health system failures, and the dissemination of false information led to a sense of uncertainty about the future while spreading economic uncertainty and leading to the abandonment of fertility decisions.^[17] On the other hand, unethical behaviors penetrated some medical articles, leading to the publication of incorrect content,^[54] which, in turn, resulted in more anxiety and threat to childbearing.

Limitations and recommendations

One of the limitations of the current study was the lack of access to the data of some databases or the full text of the articles. Another limitation was the absence of articles in languages other than English and Persian. Due to the persistence of the disease, it is recommended that studies be conducted in the form of a systematic review and meta-analysis in this field.

Conclusion

According to the results, most people completely cancelled or delayed their previous childbearing plans during the COVID-19 pandemic. Economic and health concerns were the most common factors affecting the delay or avoidance of pregnancy in the pandemic. Therefore, preventive policies such as providing employment opportunities to access labor markets seem essential to address the economic insecurity and establish a sense of security for the future. It is also possible to improve fertility intentions through modifications in existing policies and protection of livelihoods of the crisis-hit strata. In addition, health policymakers and planners have to prioritize the expansion of reproductive health services to women in a secure environment while improving the quality and quantity of outpatient care and virtual counseling, taking into account the needs of women in crises.

Acknowledgments

We should thank the Vice-chancellor for Research of Isfahan University of Medical Sciences for their support. This article was derived from a Ph.D. thesis in reproductive health with project number 399719 (ethics code: IR.MUI.RESEARCH.REC.1399.610).

Financial support and sponsorship

Isfahan University of Medical Sciences.

Conflicts of interest

There are no conflicts of interest.

References

1. Vaiarelli A, Bulletti C, Cimadomo D, Borini A, Alviggi C, Ajossa S, et al. COVID-19 and ART: The view of the Italian society of fertility and sterility and reproductive medicine. *Reprod Biomed Online*

- 2020;40:755-9.
2. Fumagalli S, Ornaghi S, Borrelli S, Vergani P, Nespoli A. The experiences of childbearing women who tested positive to COVID-19 during the pandemic in northern Italy. *Women Birth* 2022;35:242-53.
 3. Sienicka A, Pisula A, Pawlik KK, Kacperczyk-Bartnik J, Bartnik P, Dobrowolska-Redo A, *et al.* The impact of COVID-19 pandemic on reproductive intentions among the Polish population. *Ginekol Pol* 2021. doi: 10.5603/GP.a2021.0135.
 4. Voicu M, Badoi D. Fertility and the COVID-19 crisis: Do gender roles really matter? *Eur Soc* 2021;23:S199-214.
 5. Safdari-Dehcheshmeh F, Noroozi M, Taleghani F, Memar S. Explaining the pattern of childbearing behaviors in couples: Protocol for a focused ethnographic study. *J Educ Health Promot* 2022;11:71.
 6. Ullah M, Moin AT, Araf Y, Bhuiyan AR, Griffiths MD, Gozal D. Potential effects of the COVID-19 pandemic on future birth rate. *Front Public Health* 2020;8:578438.
 7. Tan J, Dahan MH, Ata MB, Nair S, Shoham Z, Tan SL. Trends in fertility practice during the Covid-19 pandemic: A global survey of 299 clinics representing 228,500 IVF cycles. *Fertil Steril* 2020;114:E528.
 8. Sobotka T, Matysiak A, Brzozowska Z. Policy responses to low fertility: How effective are they? 2019. Available from: <https://www.unfpa.org/publications/policy-responses-low-fertility-how-effective-are-they>.
 9. Vignoli D, Tocchioni V, Mattei A. The impact of job uncertainty on first-birth postponement. *Adv Life Course Res* 2020;45:100308.
 10. Zhu C, Wu J, Liang Y, Yan L, He C, Chen L, *et al.* Fertility intentions among couples in Shanghai under COVID-19: A cross-sectional study. *Int J Gynaecol Obstet* 2020;151:399-406.
 11. Flynn AC, Kavanagh K, Smith AD, Poston L, White SL. The impact of the COVID-19 pandemic on pregnancy planning behaviors. *J Health Psychol* 2021;2:71-7.
 12. Mughal M, Javed R. Perturbed nuptiality, delayed fertility: Childbirth effects of Covid19. *J Popul Res (Canberra)* 2021;1-9. doi: 10.1007/s12546-021-09270-4.
 13. Boberg-Fazlic N, Ivets M, Karlsson M, Nilsson T. Disease and fertility: Evidence from the 1918–19 influenza pandemic in Sweden. *Econ Hum Biol* 2021;43:101020.
 14. Arpino B, Luppi F, Rosina A. Changes in fertility plans during the COVID-19 pandemic in Italy: The role of occupation and income vulnerability. 2021. Available from: <https://ideas.repec.org/p/osf/socarx/4sjvm.html>.
 15. UNFPA. The impact of COVID-19 on human fertility in the Asia-Pacific region. 2020. Available from: <https://asiapacific.unfpa.org/en/publications/impact-covid-19-human-fertility-asia-pacific-region>.
 16. United Nations: Department of Economic and Social Affairs (DESA). A review of research related to the impact of the COVID-19 pandemic on fertility. 2021. Available from: https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesapd_2021_egm_inf_7_background_note.pdf.
 17. Guetto R, Bazzani G, Vignoli D. Narratives of the future shape fertility in uncertain times. Evidence from the COVID-19 pandemic. *Universita'degli Studi di Firenze, Dipartimento di Statistica, Informatica*; 2020. Available from: https://ideas.repec.org/p/fir/econom/wp2020_11.html.
 18. Coutinho RZ, Lima LCd, Leocádio VA, Bernardes T. Considerations about the COVID-19 pandemic and its effects on fertility and sexual and reproductive health of Brazilian women. *SciELO Brasil* 2020;37:e0130.
 19. Lin TK, Law R, Beaman J, Foster DG. The impact of the COVID-19 pandemic on economic security and pregnancy intentions among people at risk of pregnancy. *Contraception* 2021;103:380-5.
 20. Emery T, Koops JC. The impact of COVID-19 on fertility behaviour and intentions in a middle income country. *PLoS One* 2022;17:e0261509.
 21. Naya CH, Saxbe DE, Dunton GF. Early effects of the COVID-19 pandemic on fertility preferences in the United States: An exploratory study. *Fertil Steril* 2021;116:1128-38.
 22. Malicka I, Mynarska M, Świdarska J. Perceived consequences of the COVID-19 pandemic and childbearing intentions in Poland. *JFR* 2021;33:674-702.
 23. Kahn LG, Trasande L, Liu M, Mehta-Lee SS, Brubaker SG, Jacobson MH. Factors associated with changes in pregnancy intention among women who were mothers of young children in New York city following the COVID-19 outbreak. *JAMA Netw Open* 2021;4:e2124273.
 24. Lindberg LD, VandeVusse A, Mueller J, Kirstein M. Early impacts of the COVID-19 pandemic: Findings from the 2020 Guttmacher survey of reproductive health experiences. 2020. Available from: <https://www.guttmacher.org/report/early-impacts-covid-19-pandemic-findings-2020-guttmacher-survey-reproductive-health>.
 25. Karp C, Wood SN. Contraceptive dynamics during COVID-19 in sub-Saharan Africa: Longitudinal evidence from Burkina Faso and Kenya. *BMJ Sex Reprod Health* 2021;47:252-60.
 26. Micelli E, Cito G. Desire for parenthood at the time of COVID-19 pandemic: An insight into the Italian situation. *J Psychosom Obstet Gynaecol* 2020;41:183-90.
 27. Marteleto LJ, Dondero M. Navigating women's reproductive health and childbearing during public health crises: Covid-19 and Zika in Brazil. *World Dev* 2021;139:105305.
 28. Coombe J, Kong F, Bittleston H, Williams H, Tomnay J, Vaisey A, *et al.* Contraceptive use and pregnancy plans among women of reproductive age during the first Australian COVID-19 lockdown: Findings from an online survey. *Eur J Contracept Reprod Health Care* 2021;26:265-71.
 29. Tan PL, Ryan J, Lim-Soh, JW. Epidemics and fertility change: Responses to Zika and COVID-19 in Singapore. 2021. Available from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3919334.
 30. Muhaidat N, Alshrouf MA. Infertility management disruption during the COVID-19 outbreak in a middle-income country: Patients' choices, attitudes, and concerns. *Patient Prefer Adherence* 2021;15:2279-88.
 31. Banaei M, Nia HS, Mokhtarian-Gilani T, Kariman N. The role of the COVID-19 pandemic on childbearing intentions in Iranian women: A path analysis. 2021. Available from: <https://assets.researchsquare.com/files/rs-368798/v1/0b948f1a-bcf8-4f0e-96bd-c376766a560d.pdf?c=1631880221>. [Last accessed on 2022 Mar 25].
 32. Luppi F, Arpino B, Rosina A. The impact of COVID-19 on fertility plans in Italy, Germany, France, Spain, and the United Kingdom. *Demogr Res* 2020;43:1399-412.
 33. Riederer B, Buber-Ennsner I, Brzozowska Z. Fertility intentions and their realization in couples: How the division of household chores matters. *J Fam Issues* 2019;40:1860-82.
 34. Dommermuth L, Hohmann-Marriott B, Lappegård T. Gender equality in the family and childbearing. *J Fam Issues* 2017;38:1803-24.
 35. Del Boca D, Oggero N, Profeta P, Rossi M. Women's and men's work, housework and childcare, before and during COVID-19. *Rev Econ Househ* 2020;18:1001-17.
 36. Kreyenfeld M, Zinn S. Coronavirus and care: How the coronavirus crisis affected fathers' involvement in Germany. *Demogr Res* 2021;44:99-124.
 37. Michael TO, Agbana RD, Ojo TF, Kukoyi OB, Ekpenyong AS, Ukwandu D. COVID-19 pandemic and unmet need for family planning in Nigeria. *Pan Afr Med J* 2021;40:186.
 38. Hall KS, Samari G, Garbers S, Casey SE, Diallo DD, Orcutt M, *et al.* Centring sexual and reproductive health and justice in the global COVID-19 response. *Lancet* 2020;395:1175-7.

39. Fostik A. COVID-19 and fertility in Canada: A commentary. *Can Stud Popul* 2021;48:217-24.
40. Aassve A, Cavalli N, Mencarini L, Plach S, Livi Bacci M. The COVID-19 pandemic and human fertility. *Science* 2020;369:370-1.
41. Chandi A, Jain N. State of assisted reproduction technology in the coronavirus disease 2019 era and consequences on human reproductive system. *Biol Reprod* 2021;105:808-21.
42. Tokgoz VY, Kaya Y, Tekin AB. The level of anxiety in infertile women whose ART cycles are postponed due to the COVID-19 outbreak. *J Psychosom Obstet Gynaecol* 2020; 19:1-8.
43. Kamath MS, Joseph T, Karuppusami R, Chinta P, Pal A, Nallamilli SR, *et al.* Knowledge, anxiety levels and attitudes of infertile couples towards COVID-19 and its impact on self-funded fertility treatment: A cross-sectional questionnaire survey. *Hum Reprod Open* 2021;2021:hoab039. doi: 10.1093/hropen/hoab039.
44. Ben-Kimhy R, Youngster M, Medina-Artom TR, Avraham S, Gat I, Haham LM, *et al.* Fertility patients under COVID-19: Attitudes, perceptions, and psychological reactions. *Hum Reprod* 2020;35:2774-83.
45. Mimoun E, Ben Ari A. Psychological aspects of employment instability during the COVID-19 pandemic. *Psychol Trauma* 2020;12(S1):S183-5.
46. Kirubarajan A, Patel P, Tsang J, Prethipan T, Sreeram P, Sierra S. The psychological impact of the COVID-19 pandemic on fertility care: A qualitative systematic review. *Hum Fertil (Camb)* 2021;11:1-8.
47. Silverio-Murillo A, Hoehn-Velasco L, Balmori de la Miyar JR, Rodríguez A. COVID-19 and women's health: Examining changes in mental health and fertility. *Econ Lett* 2021;199:109729.
48. Venegas-Vera AV, Colbert GB, Lerma EV. Positive and negative impact of social media in the COVID-19 era. *Rev Cardiovasc Med* 2020;21:561-4.
49. Mirmohammadkhani M, Bemanalizadeh M, Yazdi M, Goli P, Mohebpour F, Saffarieh E, *et al.* Knowledge, attitudes, and practices toward COVID-19 among Persian birth cohort participants. *J Educ Health Promot* 2021;10:358.
50. Schaler L, Wingfield M. COVID-19 vaccine -can it affect fertility? *Ir J Med Sci* 2021; 1971: 1-3.
51. Barra F, La Rosa VL. Psychological status of infertile patients who had *in vitro* fertilization treatment interrupted or postponed due to COVID-19 pandemic: A cross-sectional study. *J Psychosom Obstet Gynaecol* 2020;30:1-8.
52. Varnum MEW, Grossmann I. Pathogen prevalence is associated with cultural changes in gender equality. *Nat Hum Behav* 2016;1:0003.
53. Mickler AK, Carrasco MA. Applications of the high impact practices in family planning during COVID-19. *Sex Reprod Health Matters* 2021;29:1881210.
54. Goel A, Gupta L. Social media in the times of COVID-19. *J Clin Rheumatol* 2020;26:220-3.