The relationship between socioeconomic status and perinatal outcomes in in vitro fertilization conceptions

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BACKGROUND: In vitro fertilization is the most used assisted reproductive technology in the United States that is increasing in efficiency and in demand. Certain states have mandated coverage that enable individuals with low income to undergo in vitro fertilization treatment.

OBJECTIVE: This study aimed to evaluate if socioeconomic status has an impact on the perinatal outcomes in in vitro fertilization pregnancies. We hypothesized that with greater coverage there may be an alleviation of the financial burden of in vitro fertilization that can facilitate the application of evidence-based practices.

STUDY DESIGN: This was a retrospective, population-based, observational study that was conducted in accordance with the Healthcare Cost and Utilization Project—Nationwide Inpatient Sample database over the 6-year period from 2008 to 2014 during which period 10,000 in vitro fertilization deliveries were examined. Maternal outcomes of interest included preterm prelabor rupture of membranes, preterm birth (ie, before 37 weeks of gestation), placental abruption, cesarean delivery, operative vaginal delivery, spontaneous vaginal delivery, maternal infection, chorioamnionitis, hysterectomy, and postpartum hemorrhage. Neonatal outcomes included small for gestational age neonates, defined as birthweight <10th percentile, intrauterine fetal death, and congenital anomalies.

RESULTS: Our study found that the socioeconomic status did not have a statistically relevant effect on the perinatal outcomes among women who underwent in vitro fertilization to conceive after adjusting for the potential confounding effects of maternal demographic, preexisting clinical characteristics, and comorbidities.

CONCLUSION: The literature suggests that in states with mandated in vitro fertilization coverage, there are better perinatal outcomes because, in part, of the increased use of best in vitro fertilization practices, such as single-embryo transfers. Moreover, the quality of medical care in states with coverage is in the highest quartile in the country. Therefore, our findings of equivalent perinatal outcomes in in vitro fertilization care irrespective of socioeconomic status possibly suggests that a lack of access to quality medical care may be a factor in the health disparities usually seen among individuals with lower socioeconomic status.

Key words: assisted reproductive technology, health disparities, IVF, obstetrical complications

Introduction

More than 6 million women cope with infertility every year in the United States.[1] Since the development of assisted reproductive technologies (ART) in the late 1950s, its use has increased, and ART births now compose nearly 1.8% of all births in the United States.[2] Among ART methods, in vitro fertilization (IVF) is the most used (96%). Irrespective of the growing efficiency and demand for IVF, there are access disparities; in the United States, it is estimated that each IVF cycle costs around $14,500.[3,4] In most states, IVF is considered an elective procedure, and the cost is often paid out of pocket. However, a few states have mandated insurance coverage for IVF.

Socioeconomic status (SES) examines the combination of education, social class, and income indicators of an individual.[5] In general, people with a lower SES demonstrate poorer health

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Why was this study conducted?

In vitro fertilization (IVF) is the most used assisted reproductive technology in the United States. Certain states provide mandated insurance coverage for IVF, thereby giving access to patients from both low and high socioeconomic backgrounds.

Key findings

Poor health outcomes among patients with a lower socioeconomic status have been hypothesized to be influenced by different factors, including access to care, disproportionately negative social determinants of health, and underlying health problems. In IVF deliveries, the absence of health discrepancies suggests that there may be a different cause for inferior outcomes. According to the American Health Rankings, IVF coverage is associated with better clinical care; therefore, the main cause of health discrepancies could be the consequence of poorer care provided to these patients.

What does this add to what is known?

This study provides new evidence that lower quality care is the cause of poor healthcare outcomes among women with low socioeconomic status.

outcomes and higher morbidity than those with a higher SES.[5,6] This can be explained or hypothesized to be caused by multiple factors, including a lack of adequate shelter, nutrition, or underlying health issues. There is also the possibility that the treatments provided by centers frequented by individuals of lower socioeconomic backgrounds are of lower quality.[7] Regarding infertility, irrespective of its public health, physiological, and social toll, there is limited access to treatment for those who cannot pay. In contrast, in states with mandated coverage, there is some evidence of greater IVF utilization rates across all population groups.[8] Serum cholesterol and phospholipid levels differ in populations with diverse SES.[9] Because the phospholipid levels in serum can influence the IVF and perinatal outcomes, it is valid to evaluate how SES could influence pregnancy outcomes in patients who conceived via IVF.[10,11]

Current research on IVF covers the impact of SES on the number of singleton or multiple births and on differences in uptake. A review conducted in 2020 found differences in IVF treatment success according to SES, indicating that children were more likely to be conceived via ART among individuals with high income than among those with low income.[12] Many studies have also detected significant differences in the number of IVF cycles by SES.[3,13] A few studies have examined the effect of SES on IVF perinatal outcomes. One population-based cohort study used the Finnish birth registry to examine births that occurred from 2006 to 2010 (n=291,004 total; n=5647 IVF) for differences in the outcomes of IVF and non-IVF pregnancies according to different SES levels.[14] This study concluded that although there were differences in the prevalence of IVF treatments between individuals with low and those with high SES (individuals with high SES used IVF more frequently that individuals with low SES), there were no significant differences in the perinatal outcomes. This Finnish-based study has certain limitations in its application to the United States and other countries with more diverse populations and privately funded healthcare systems.[15] We decided to investigate the IVF group based on SES because SES is well known to consistently play a role in health outcome disparities. However, the single previous study conducted in a Scandinavian IVF population failed to detect this relationship. Therefore, further study in an American population was required. Moreover, the scarcity of data and information on the role of SES on ART pregnancy outcomes warrants further study. This study aimed to examine the effect of lower SES on IVF outcomes based on a large US population database of hospital admissions.

Materials and Methods

We conducted a retrospective, population-based study on data from the Healthcare Cost and Utilization Project —Nationwide Inpatient Sample (HCUP-NIS) database that were collected over 7 years from 2008 to 2014. The HCUP-NIS is the largest inpatient sample database in the United States and is composed of information of inpatient hospital stays submitted by hospitals in 48 states and the District of Columbia. Each year, the database provides information related to 7 million inpatient stays, including patient characteristics, diagnosis, and procedures. The data are representative of 20% of admissions in US hospitals and geographically represent more than 96% of the US population. In 2015, the data coding in the HCUP-NIS was changed from the International Classification of Diseases, 9th Revision, (ICD-9) codes to ICD-10 codes, therefore, data from 2015 onward were not included. There are some differences between the ICD-10 and ICD-9 codes, and therefore, including both would have led to major flaws in this study.

Deliveries were evaluated inclusively by using the ICD-9 codes for delivery-related discharge diagnoses (650.xx, 677.xx, 651.xx-676.xx where the fifth digit is 0, 1, or 2) and birth-related procedural diagnoses (72.x, 73.x, 74.0 −74.2). Within this group, all women with IVF were identified by the use of the ICD-9 diagnostic code 23.85. All women who underwent IVF were stratified by family income, which was listed as quartile grouping in the database. The lowest quartile was compared with the combination of the other quartiles. It should be noted that the quartile groupings were based on the entire group of subjects in the database and not only on those who underwent IVF. As such, the lowest quartile of SES contained <25% of the IVF subjects. Therefore, this lowest socioeconomic group reflected the lowest SES demographic of

the United States given that the database contained information on 20% of all hospital admissions in the country.

The demographic characteristics, maternal baseline characteristics, and pregnancy outcomes of all women in the study population were identified using the respective ICD-9 codes. Baseline clinical characteristics included patient age, race, insurance type, previous cesarean delivery (CD), multiple gestation, smoking history, obesity (body mass index [BMI] >30 kg/m^2), preexisting hypertension (HTN), preexisting diabetes mellitus, and preexisting thyroid disease. Delivery outcomes included preterm prelabor rupture of membranes (PPROM), preterm birth (ie, before 37 weeks of gestation), placental abruption, CD, operative vaginal delivery, spontaneous vaginal delivery (SVD), maternal infection, chorioamnionitis, hysterectomy, and postpartum hemorrhage. Neonatal outcomes included small for gestational age (SGA) neonates, defined as birthweight <10th percentile, intrauterine fetal death (IUFD), and congenital anomalies.

Low SES translated into a yearly family earning of <US$39,000, whereas the higher SES group earned at least US$39,000 yearly as a family.

Statistical analysis

All analyses were performed using SPSS 23.0 (IBM Corporation, Chicago, IL) software for all analyses. Chi-square and Fisher exact tests were used to compare the baseline characteristics between women who underwent IVF with low SES and those with higher SES. Subsequently, logistic regression analyses were conducted to explore the associations among IVF, pregnancy, and delivery outcomes in women based on SES grouping through the estimation of odds ratios (ORs) and 95% confidence intervals (CIs). The regression models were adjusted for the potential confounding effects of maternal demographic, preexisting clinical characteristics, and concurrently occurring conditions with a P value <.05 considered significant for chi-square tests. This study used exclusively publicly accessible, anonymized data; therefore, according to articles 2.2 and 2.4 of the Tri-Council Policy Statement (2018), institutional review board approval was not required.

Results

This study examined 10,439 IVF births recorded in the United States registry database between 2008 and 2014. Of those, 9735 (93.2%) births were associated with a higher SES, and 704 (6.7%) births were associated with the lowest SES group. Low SES was defined as the lowest (25%) quartile of individuals based on yearly family income in the entire group of more than 9 million deliveries. As such, the lowest quartile of income for IVF did not consist of 25% of the IVF population, instead it comprised 6.7% of the group.

Table 1 shows the demographic and health characteristics of the low and high SES groups. Mothers in the low SES category were younger, more racially diverse, more likely to have Medicaid insurance, and less likely to be privately insured than their counterparts in the higher SES group. SES in this cohort did not have a significant effect on health or medical issues, nor on the pregnancy history of the mother except for rates of smoking and thyroid diseases (P value <.05).

In Table 2, the pregnancy and delivery outcomes of the mothers in the low and higher SES groups are presented. Regarding pregnancy outcomes, there was no statistical difference between the mothers in the higher- and those in the low-income groups in terms of all parameters assessed when controlling for confounding effects, including the rates of pregnancy-induced HTN, gestational hypertension, preeclampsia, eclampsia, preeclampsia and eclampsia superimposed hypertension, and placenta previa. Regarding the delivery outcomes, there was no significant differences between mothers in the high- and those in the low-income groups except for hysterectomy in which case patients in the lower-income group were more prone to be affected.

Lastly, Table 3 details the neonatal outcomes including SGA, IUFD, and congenital anomalies for patients in the high- and lower-income groups. There was no significant difference in any of the 3 parameters between mothers in the high- and those in the lower-income groups.

Discussion

Principal findings

In this study, it was determined that there were no statistical differences in the perinatal outcomes of IVF births between mothers with high SES and those with low SES despite a robust database of more than 10,000 unique deliveries among women who underwent IVF. One exception is related to hysterectomy in which case patients with a lower SES were more likely to undergo the procedure; however, the incidence rates of hysterectomy were small, and the data should be viewed with caution because this finding is unreliable.

Results in the context of what is known

These findings are in contrast with those of spontaneous pregnancies in which significant differences in the adverse outcomes by socioeconomic and racial inequalities are well documented.[16–18] Most studies have found that women with a lower SES who conceived spontaneously have higher risks for pregnancy complications. Race has been shown to be an independent risk factor for pregnancy complications and live birth in ART.[19] The disparities in ART hypothesis underlines obstacles to IVF care for marginalized groups, including delays in accessing treatment, provider factors, the patient-physician relationship, and greater rates of tubal and uterine pathologies that are linked to adverse outcomes.[20] Nevertheless, only 1 study has examined the relationship between SES and IVF outcomes; irrespective of the differences in European and American healthcare systems and their populations, there is uniformity between the results of this study and those of the 2013 Finnish study of IVF deliveries that indicated that there was no significant difference in the perinatal outcomes on the basis of SES.[14]

TABLE 1
Maternal characteristics of the women who underwent in vitro fertilization based on socioeconomic status

Characteristics	Lower socioeconomic status (%) n=704	High socioeconomic status (%) n=9735	*P* value
Age (y)			.001
<25	2.8	1.5	
25–34	46.7	42.1	
≥35	50.4	56.3	
Race			.0001
Asian and Pacific Islander	7.5	11.0	
Black	8.8	5.6	
Hispanic	8.2	5.2	
Native American	0.7	0.5	
White	63.2	67.5	
Other	6.1	4.5	
Medical insurance plan type			.0001
Medicare	0.0	0.0	
Medicaid	9.3	2.9	
Private including HMO	84.5	94.1	
Self-pay	2.0	1.3	
No charge	0.0	0.0	
Other	3.6	1.6	
Obesity (BMI ≥30)	5.8	5.4	.63
Previous CD	12.6	13.4	.56
Smoking during pregnancy	1.1	0.4	.011
Chronic HTN	3.6	3.7	.80
Pregestational DM	1.4	1.2	.54
Thyroid disease	11.9	14.6	.048
Multiple gestation	29.6	30.7	.59

Factors controlled for in the adjusted analysis included maternal age, race, medical insurance type, rates of smoking, and thyroid disease. Note that any group with <12 data entries were listed as absolute numbers and as percentages according to the recommendations of the Database guidelines. Race and ethnicity were categorized according to the data provided by the Healthcare Cost and Utilization Project partner organizations. The other category was used to classify participants who did not meet White, Black, Hispanic, Asian or Pacific Islander, or Native American descriptors. Other did not include missing or invalid categories.

BMI, body mass index; *CD*, cesarean delivery; *DM*, diabetes mellitus; *HMO*, health maintenance organization; *HTN*, hypertension.

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It is well documented that cost is the biggest constraint to access and use of IVF service, accounting for more than 80% of the anxiety among IVF candidates.[21] However, 8 states have mandated insurance coverage for one or multiple IVF cycles. These mandates help to facilitate uptake of IVF by reducing the cost burden of treatment and offering insurance for a lifetime maximum or a certain number of cycles.[22] In contrast with states that do not offer mandated coverage, these states can have up to 3 times greater uptake of ART and ensure better access to unmet infertility service needs.[19,22]

In Arkansas, Connecticut, Hawaii, Illinois, Maryland, Massachusetts, New Jersey, and Rhode Island, there is mandated coverage for fertility treatment. In a study of more than 130,000 IVF deliveries conducted by Peipert et al,[8] it was shown that mandated insurance coverage for IVF was not only associated with greater uptake of IVF, but better pregnancy outcomes, including lower multiple birth rates and higher live birth rates. One key factor in IVF outcomes is the frequency and quality of embryos transferred; it is proven that transfer of 1 embryo as opposed to >1 is associated with better birth rates and health outcomes in IVF treatment.[23] Increasing the number of embryos transferred influences the chance of multiple order pregnancies, which is associated with miscarriages (both frequency and later onset), higher rates of preterm birth, intensive care unit admissions, gestational diabetes mellitus, preeclampsia, and death.[24] Cynthia Farquhar examined a policy change in New Zealand in which clinics that provided more cycles of single embryo transfers were subsidized and noted that for those using ART, many opted for multiple embryo transfers because it was cheaper than undergoing multiple cycles of single embryo transfer.[25] When reducing the financial pressure of IVF treatment, these states adopted IVF practices that are proven to be associated with better outcomes; as such, evidence-based medicine is applied in the clinical setting and quality improvement can be shown, which is possibly reflected in more equal perinatal outcomes.

Furthermore, it is possible that these states generally provide more holistic health insurance coverage that leads to better health and associated perinatal outcomes.[3] When interpreting the general health outcomes of these states using the American Health Rankings, except for Arkansas, these states rank in the upper quartile of health outcomes in the country.[26] Moreover, certain states among those indicated to cover IVF have significantly higher levels of clinical care and access to care.[26] As such, the better overall quality of healthcare in those states may have eliminated the differences in outcomes in terms of pregnancy complications associated

TABLE 2
Pregnancy and delivery outcomes among women who underwent in vitro fertilization based on socioeconomic status

Outcomes	(%) LSS n=704	(%) HSS n=9735	Crude OR (95% CI)	Adjusted OR (95% CI)	Adjusted *P* value
Pregnancy outcomes[a]					
Pregnancy-induced hypertension	15.3	15.4	1.00 (0.81–1.23)	1.00 (0.80–1.24)	.97
Gestational hypertension	5.0	5.1	0.98 (0.69–1.39)	1.01 (0.70–1.46)	.95
Preeclampsia	9.8	9.1	1.08 (0.83–1.40)	1.06 (0.81–1.39)	.67
Preeclampsia or eclampsia superimposed on preexisting HTN	0.9 (n=6)	1.4	0.63 (0.28–1.42)	0.62 (0.27–1.41)	.25
Placenta previa	1.6	3.0	0.52 (0.28–0.95)	0.56 (0.30–1.03)	.062
Delivery outcomes[b]					
PPROM	4.8	4.2	1.15 (0.80–1.65)	1.11 (0.77–1.62)	.58
Preterm delivery	20.2	20.1	1.01 (0.83–1.22)	0.93 (0.76–1.14)	.48
Abruptio placenta	1.7	2.0	0.84 (0.47–1.51)	0.89 (0.49–1.61)	.70
Chorioamnionitis	3.4	3.1	1.11 (0.73–1.69)	1.06 (0.69–1.65)	.78
Operative vaginal delivery	5.7	4.9	1.16 (0.83–1.62)	1.22 (0.86–1.72)	.27
CD	59.8	60.2	0.99 (0.84–1.15)	0.99 (0.84–1.17)	.90
SVD	34.5	34.9	0.98 (0.84–1.16)	0.97 (0.82–1.15)	.720
Hysterectomy	1.0 (n=7)	0.3	3.04 (1.34–6.90)	3.10 (1.33–7.19)	.009
PPH	7.0	7.4	0.94 (0.70–1.27)	0.97 (0.72–1.33)	.87
Wound complications	0.6 (n=4)	1.1	0.50 (0.18–1.36)	0.41 (0.13–1.30)	.13
Transfusion	2.4	3.3	0.72 (0.44–1.18)	0.694 (0.42–1.16)	.16
Others					
Maternal infection	3.8	3.5	1.10 (0.74–1.63)	1.05 (0.69–1.58)	.82
VTE	0.1 (n=1)	0.1	1.38 (0.18–10.82)	1.36 (0.16–11.46)	.78
DIC	0.4 (n=3)	0.6	0.67 (0.21–2.13)	0.68 (0.21–2.18)	.51

CD, cesarean delivery; *CI*, confidence interval; *DIC*, disseminated intravascular coagulation; *HSS*, high socioeconomic status; *HTN*, hypertension; *LSS*, low socioeconomic status; *OR*, odds ratio; *PPH*, postpartum hemorrhage; *PPROM*, preterm premature rupture of membranes; *SVD*, spontaneous vaginal delivery; *VTE*, venous thromboembolism.

[a] Pregnancy outcomes: summary of maternal conditions during gestation; [b] Delivery outcomes: events surrounding childbirth relating to maternal and neonatal outcomes.

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TABLE 3
Neonatal outcomes among the women who underwent in vitro fertilization based on socioeconomic status

Outcomes	(%) LSS	(%) HSS	Crude OR (95% CI)	Adjusted OR (95% CI)	Adjusted *P* value
SGA	6.5	6.6	0.99 (0.73−1.35)	1.03 (0.75−1.41)	.84
IUFD	0.6 (n=4)	0.5	1.13 (0.41−3.14)	1.32 (0.47−3.72)	.60
Congenital anomalies	1.3	1.2	1.05 (0.53−2.07)	1.12 (0.56−2.24)	.74

Factors controlled for in the adjusted analysis included: maternal age, race, medical insurance type, rates of smoking, thyroid disease and rates of hysterectomy.

CI, confidence interval; *HSS*, high socioeconomic status; *IUFD*, intrauterine fetal demise; *LSS*, low socioeconomic status; *OR*, odds ratio; *SGA*, small for gestational age.

Fotovati. Relationship between socioeconomic status and perinatal outcomes in in vitro fertilization. Am J Obstet Gynecol Glob Rep 2024.

with IVF. This is an important finding, because it suggests that the differences in outcomes for women with different SESs in the general population seen in other studies is not because of the underlying healthcare status, nutrition, or other social determinant and that it is, in fact, primarily because of a lower quality of healthcare provided in these lower SES communities.

In addition, there are other factors that could make this subgroup of patients with lower SES amenable to favorable outcomes. It is well documented that even among states with mandated coverage, disparities in access to IVF exist. Although decreasing financial barriers improves uptake of IVF, those who end up using IVF are disproportionately more often White, highly educated, and of much higher SES than the general population.[27] A retrospective cohort study conducted in 2010 examined uptake and outcomes of ART among minority women with enhanced military access.[28] It concluded that although ART uptake quadrupled in certain subgroups, such as African American women, there was decreased uptake among other minority groups such as Hispanic women. Moreover, it did not find that increased uptake correlated with better outcomes in these groups.

Furthermore, another study conducted in 2006 looked to characterize the socioeconomic and racial disparities in IVF access in states with mandated insurance. It noted that there were significant delays in seeking IVF treatment among Black women with infertility than among White women and among those with lower education levels and lower household income.[19] The study further discussed issues of clinic proximity, cultural barriers, and institutional barriers. In examining Table 1, one can note that those who accessed IVF in both the higher and lower SES subgroups were predominantly White and may not reflect the diversity of the state in which they received treatment. This may also explain the similarities with the Finnish study in which the populations treated in both systems may be predominantly White. Consequently, although these populations were compared along socioeconomic lines, potential confounders like race, education, and geographic location present limitations.

Equally important, patients who seek out fertility treatment may be more likely to seek comprehensive antenatal care and take vitamins or medications during their pregnancy irrespective of SES. A study completed in Germany noted that among couples who used intracytoplasmic sperm injection (ICSI), the patients attended check-ups, consultations with gynecologists, and routine medical examinations more regularly than patients with spontaneous pregnancies.[29] It was shown that both patients who used ART and their doctors demonstrated greater caution and care in terms of their treatment. Regarding preeclampsia, note that it is also common practice among IVF patients to be prescribed aspirin to improve pregnancy success, which may be protective against developing pregnancy-associated hypertension.[30]

Correspondingly, IVF patients may form a distinct subset of the pregnant women who seek out better prenatal care. However, this hypothesis would again argue that the discrepancies in pregnancy outcomes seen among women in the low SES groups in the general population is the consequence of the quality of care they receive. It is possible that women of low SES who underwent IVF are more compliant with the use of prenatal vitamins or care than women who did not undergo IVF. However, it is unlikely that this is the sole cause of our findings, again arguing for a role based on the delivery of care. Further research is needed to rule out if there are compounding factors that influence ART outcomes in women with low SES.

Regarding hysterectomy, the only pregnancy outcome that differed significantly in this analysis, it is possible that because it is a procedure that is performed at the provider's discretion, it may reflect differential access to providers who can perform uterus-sparing treatments and the price associated with such treatments.[31] One study conducted by Gartner et al[31] showed that women with lower SES and non-White race had increased rates of hysterectomy. Another study conducted in Korea similarly concluded that patients with lower income were more likely to undergo a hysterectomy because of the delay in seeking medical treatment, because conservative approaches are more readily available to individuals with higher income, and because of the perception among individuals with lower income that hysterectomy is a cheaper and safer option.[32] This is in the context of new, uterus-sparing alternatives. Nevertheless, given the limited data and incidence of hysterectomy in our study, these findings are unreliable.

Strengths and limitations

The major limitations of our study reside in its retrospective nature. The fact that our study was built on a database registry has its intrinsic limitations, mainly data coding accuracy and consistency. Most likely, the data are quite specific but with reduced sensitivity, which would not affect the validity of our findings. This would have led to some women who underwent IVF being excluded from the cohort. It should be noted that subjects were included only once per pregnancy because of the design of the database; however, they could be included more than once if they had 2 IVF conceptions and 2 deliveries in the study period. A strength is that this was the first American study to evaluate the role of SES on IVF outcomes. It is also only the second study in the literature to perform such an evaluation. It is possible that these data suffer from undetected selection bias. The conclusions of the article, which were based on the quality of medical care in states with mandated IVF coverage and excellent outcomes among women with lower SES, were based on judgment, and other undetected factors may be at play.

Conclusion

This study indicates that, overall, SES does not have a significant impact on the perinatal outcomes in IVF pregnancies, even when controlling for maternal characteristics such as race, age, or comorbidities. Because this study examined both patients with low and high SES who underwent IVF and who had access to infertility treatment, it is possible that there was greater overall access to better evidence-based practices that better mitigated the adverse pregnancy outcomes associated with socioeconomic inequalities. Nevertheless, both the general population who utilized IVF and patients with lower SES who had access to IVF through state mandates may represent a distinct population that is more amenable to favorable outcomes. To confirm if the quality of care delivered was the principal cause of health disparities, further studies that compare ART outcomes for different SES levels in the United States are recommended. These findings have important implications in that they suggest that the disparities in the quality of care delivered to mothers are solely attributable to the types of medical institutions and providers to which they have access. ■

CRediT authorship contribution statement

Misha Fotovati: Writing – review & editing, Writing – original draft, Investigation. **Ahmad M. Badeghiesh:** Investigation, Formal analysis, Data curation. **Haitham A. Baghlaf:** Investigation, Formal analysis, Data curation. **Michael H. Dahan:** Investigation, Formal analysis, Conceptualization.

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