Journal of Racial and Ethnic Health Disparities (2018) 5:1077–1083
https://doi.org/10.1007/s40615-017-0456-8

Racial and Ethnic Differences in Pregnancy Rates Following Intrauterine Insemination with a Focus on American Indians

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Received: 27 August 2017 / Revised: 17 December 2017 / Accepted: 26 December 2017 / Published online: 9 January 2018

Abstract

Background No research exists on American Indian pregnancy rates following infertility treatment. Most racial/ethnic fertility research has focused on pregnancy following in vitro fertilization, with only rare studies looking at intrauterine insemination (IUI). The objective of our study was to compare fecundability following IUI by race/ethnicity, with a special focus on American Indians.

Methods This was a retrospective analysis of subjects undergoing IUI July 2007–May 2012 at a university-based infertility clinic. The primary outcome was positive pregnancy test, with a secondary outcome of ongoing pregnancy/delivery (OP/D). We calculated risk ratios (RR) and 95% confidence intervals (CI) using cluster-weighted generalized estimating equations method to estimate modified Poisson regression models with robust standard errors to account for multiple IUI cycles in the same patient.

Results A total of 663 females (median age 32) undergoing 2007 IUI cycles were included in the analysis. Pregnancy rates overall were 15% per IUI cycle. OP/D rates overall were 10% per IUI cycle. The American Indian patients had significantly lower pregnancy (RR 0.34, 95% CI 0.16–0.72) and OP/D rates (RR 0.33, 95% CI 0.12–0.87) compared to non-Hispanic whites when patient and cycle characteristics were controlled. Pregnancy and OP/D rates for blacks, Asians, and Hispanics did not differ from those of non-Hispanic whites.

Conclusions Our finding of lower IUI treatment success among American Indian patients is novel, as no published studies of assisted reproductive technology or other fertility treatments have examined this subgroup separately. Further investigation of patient and clinical factors that may mediate racial/ethnic disparities in fertility treatment outcomes is warranted.

Keywords Indians · North American · Infertility · Race · Ethnicity · Intrauterine insemination · Fecundability

Introduction

According to data from the 2006–2010 National Survey of Family Growth, infertility or impaired fecundity affects between 6 and 12% of the US population ages 15–44, depending on the definition used when assessing prevalence of this reproductive health condition [1]. The Centers for Disease Control and Prevention (CDC) recently identified infertility as a public health priority with considerable social, economic, and health consequences that extend beyond quality-of-life issues [2]. Clinical and population-based comparisons of the racial/ethnic burden of infertility have identified disparities in infertility prevalence and infertility care, but have been largely limited to evaluating African American and Hispanic minorities compared to whites [1, 3–6]. As a result, the prevalence of infertility and fertility treatment outcomes in American Indian/Alaska Native (AI/AN) populations is largely unknown. However, analysis of CDC data from the last 30 years reveals

Presentation: The data contained in this manuscript was presented at the 64th annual meeting of the Pacific Coast Reproductive Society, Rancho Mirage, CA, March 9–13, 2016.

This study was conducted in Oklahoma City, OK.

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that fertility rates (births per 1000 women) and total fertility rates (average number of children born to a woman over her lifetime) have dropped more for the AI/AN population than for any of the other ethnic populations studied [7]. The paucity of data, however, to monitor the detection, prevention, and management of infertility in underserved populations such as the AI/AN population serves as a major barrier to addressing reproductive health disparities.

The 2012 National Healthcare Disparities Report concluded that AI/ANs had poorer quality of and access to care than whites across a broad range of healthcare indices. However, infertility services were not specifically addressed in this report [8]. No study to date has reported on the prevalence of infertility or treatment outcome, in AI/AN populations. Furthermore, Oklahoma has a relatively large population of AI/ANs compared to the USA (9.1 vs. 1.2%), thus providing an opportunity to evaluate whether differences in infertility outcome are present for AI/ANs compared to other racial/ethnic groups [9]. Given this paucity of information in the literature, the objective of our study was to identify and compare the fecundability in intrauterine insemination (IUI) treatments by race and ethnicity with a special focus on the American Indian population in our clinic.

Materials and Methods

We conducted a retrospective chart review of all couples that underwent IUI between July 2007 and May 2012 at a university-based infertility practice. Demographic information was obtained including the woman's age, ethnicity, body mass index (BMI), total motile sperm count (TMC), duration of infertility, medication(s) used, and infertility diagnosis. Race and ethnicity were self-reported in the new-patient questionnaire. These were then categorized as white, black, Asian, and American Indian. No patients categorized themselves as Native Hawaiian or Alaska Native. Three American Indian patients described their ethnicity as Hispanic and were included in the American Indian category. All other Hispanic patients described their race as white. The primary outcome was positive pregnancy test per cycle, defined as a serum quantitative human chorionic gonadotropin (hCG) > 10 mIU/mL 15 days following IUI. The secondary outcome was ongoing pregnancy/delivery (OP/D). This was defined as an ongoing clinical pregnancy with two ultrasounds documenting fetal heart beat with good interval growth or live birth delivery past 24 weeks gestation. Cycles were excluded if race/ethnicity was not answered in the new-patient paperwork or if data for pregnancy outcome or covariates were missing. This study was approved by the Institutional Review Board at the University of Oklahoma Health Sciences Center (IRB no. 1798) and was conducted in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments.

Patient characteristics recorded at the first clinic visit during the study period were compared by race/ethnicity using chi-square tests or Fisher's exact tests for categorical variables and Kruskal-Wallis tests for continuous variables.

Data from all patient cycles were used to evaluate the association between race/ethnicity and IUI treatment outcome. We fit modified Poisson regression models with robust standard errors including a log link function and independent working correlation structure to estimate risk ratios (RR) and 95% confidence intervals (95% CI). Informative clustering may occur when the number of IUI cycles per couple is influenced by previous treatment outcomes. Thus, to address this concern, the cluster-weighted model was fit by weighting the generalized estimating equations (GEE) score equation by the inverse of the number of IUI cycles completed for each couple [10, 11]. Adjusted models controlled for female age (continuous), race/ethnicity (non-Hispanic white, Hispanic, American Indian, Asian, and Black), BMI (< 25, 25–29.9, ≥ 30 kg/m^2), duration of infertility (< 3 years, ≥ 3 years), infertility diagnosis (ovulatory, tubal, endometriosis, male factor, unexplained, other), medication used for ovulation induction or ovarian stimulation (none, clomiphene citrate/letrozole, gonadotropins), and total motile sperm count (TMC) (≤ 5, > 5–10, > 10–20, > 20–30, > 30 million). Effect measure modification by obesity status and number of IUI treatment cycles was examined in models stratified by BMI (< 30, ≥ 30 kg/m^2) and by cycle number (≤ 3, > 3). Interaction terms were added to the regression model to evaluate the statistical significance of differences in race/ethnicity associations observed across strata. Statistical analyses were performed using SAS 9.4 software (SAS Institute Inc., Cary, NC).

Results

A total of 2221 cycles were completed in the study timeframe on 719 women. Two hundred fifteenS cycles were excluded for 53 patients due to missing race/ethnicity, pregnancy outcome, or other covariate data. Thus, results are reported for 663 patients undergoing 2007 IUI cycles. Pregnancy rates overall were 15% per IUI cycle with median female age of 32 (interquartile range, 7) years old. OP/D rates overall were 10% per IUI cycle. The racial/ethnic distribution of participants was 80.2% non-Hispanic white, 4.3% black, 6.0% Asian, 4.5% Hispanic, and 5.0% American Indian (Table 1).

Infertility diagnoses of ovulatory disorders, tubal disease, endometriosis, and male factor conditions were similar for all racial/ethnic groups, but unexplained diagnoses occurred less frequently among American Indians and other diagnoses occurred more frequently among blacks in this patient population (Table 1). The distribution of age and BMI differed by race/ethnicity, with higher median age observed among blacks and higher BMI observed among American Indians. No

Table 1 Patient and intrauterine insemination cycle characteristics by race/ethnicity

Patient characteristic[a]	Overall *n* (%)	Non-Hispanic white *n* (%)	Black *n* (%)	Asian *n* (%)	Hispanic *n* (%)	American Indian *n* (%)	*p* value
Number of patients	663 (100.0)	528 (79.6)	26 (3.9)	45 (6.8)	34 (5.1)	30 (4.5)	
Number of cycles	2007 (100.0)	1609 (80.2)	86 (4.3)	120 (6.0)	92 (4.5)	100 (5.0)	
Infertility diagnosis[b]							
Ovulatory	237 (35.8)	191 (36.2)	8 (30.8)	17 (37.8)	11 (32.4)	10 (33.3)	0.96[c]
Tubal	32 (4.8)	28 (5.3)	2 (7.7)	1 (2.2)	0 (0.0)	1 (3.3)	0.59[d]
Endometriosis	74 (11.2)	63 (11.9)	2 (7.7)	3 (6.7)	1 (2.9)	5 (16.7)	0.34[d]
Other	75 (11.3)	53 (10.0)	7 (26.9)	7 (15.6)	5 (14.7)	3 (10.0)	0.08[d]
Unexplained	136 (20.5)	102 (19.3)	6 (23.1)	14 (31.1)	12 (35.3)	2 (6.7)	0.02[c]
Male factor	329 (49.6)	267 (50.6)	11 (42.3)	17 (37.8)	16 (47.1)	18 (60.0)	0.32[c]
Duration of infertility							0.65
≥ 3 years	265 (40.0)	217 (41.1)	11 (42.3)	17 (37.8)	11 (32.4)	9 (30.0)	
< 3 years	398 (60.0)	311 (58.9)	15 (57.7)	28 (62.2)	23 (67.7)	21 (70.0)	
Medications							0.45[d]
Clomiphene/letrozole	574 (86.6)	454 (86.0)	21 (80.8)	43 (95.6)	29 (85.3)	27 (90.0)	
Gonadotropins	49 (7.4)	41 (7.8)	3 (11.5)	2 (4.4)	3 (8.8)	0 (0.0)	
None	40 (6.0)	33 (6.3)	2 (7.7)	0 (0.0)	2 (5.9)	3 (10.0)	
	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)	
Age	31.0 (7.0)	31.0 (7.0)	34.0 (9.0)	33.0 (7.0)	32.5 (7.0)	31.0 (7.0)	0.01[e]
BMI (kg/m^2)	25.8 (10.2)	25.8 (10.3)	29.3 (8.2)	23.7 (5.7)	25.3 (6.4)	31.7 (11.8)	0.0002[e]
Total motile sperm count ($\times 10^6$)[f]	12.9 (18.2)	13.1 (17.4)	12.4 (9.3)	15.5 (21.5)	11.3 (13.4)	12.7 (27.4)	0.50[e]
Number of IUI cycles	3.0 (3.0)	3.0 (2.0)	2.0 (3.0)	3.0 (3.0)	2.5 (2.0)	2.5 (2.0)	0.75[e]

IQR interquartile range

[a] Characteristics recorded at first clinic visit during the study period

[b] Totals exceed 100% due to non-mutually exclusive diagnostic categories

[c] Chi-square test

[d] Fisher's exact test

[e] Kruskal-Wallis test

[f] On initial semen analysis

differences in duration of infertility, use of infertility medications, or TMC were observed by race/ethnicity.

Pregnancy rates were 66% lower among American Indian patients compared to those of non-Hispanic whites (adjusted RR = 0.34, 95% CI 0.16–0.72), controlling for TMC, female age, BMI, duration of infertility, medication, and infertility diagnosis (Table 2). Among all patients, pregnancy rates for blacks, Asians, and Hispanics did not differ from those in non-Hispanic whites. Because American Indian patients had a higher BMI compared to other racial/ethnic groups, we also examined analyses stratified by obesity (BMI < 30 and BMI ≥ 30). Pregnancy rates remained lower among American Indian

Table 2 Comparison of positive pregnancy test by race/ethnicity following intrauterine insemination treatment

Race/ethnicity	No. of pregnancies/cycles (%)	Unadjusted RR (95% CI)	Adjusted RR (95% CI)[a]
White	250/1609 (15.5%)	Reference	Reference
Black	10/86 (11.6%)	1.03 (0.51–2.06)	1.07 (0.56–2.06)
Asian	20/120 (16.7%)	1.21 (0.76–1.91)	1.22 (0.79–1.90)
Hispanic	15/92 (16.3%)	0.87 (0.48–1.59)	0.89 (0.51–1.57)
American Indian	7/100 (7.0%)	0.35 (0.17–0.73)	0.34 (0.16–0.72)

RR risk ratios, *95% CI* 95% confidence interval

[a] Controlled for total motile sperm count, female age, body mass index, duration of infertility, medication, and infertility diagnosis

Table 3 Comparison of positive pregnancy test by race/ethnicity following intrauterine insemination treatment stratified by body mass index

	BMI < 30 (n = 1360 cycles, 452 patients)		BMI ≥ 30 (n = 647 cycles, 211 patients)	
Race/ethnicity	No. of pregnancies/cycles (%)	Adjusted RR (95% CI)[a]	No. of pregnancies/cycles (%)	Adjusted RR (95% CI)[a]
White	163/1109 (14.7)	Reference	87/500 (17.4)	Reference
Black	8/41 (19.5)	2.27 (1.19–4.32)	2/45 (4.4)	0.37 (0.07–2.03)
Asian	17/106 (16.0)	1.25 (0.77–2.01)	3/14 (21.4)	1.34 (0.61–2.93)
Hispanic	9/70 (12.9)	0.89 (0.41–1.91)	6/22 (27.3)	1.30 (0.56–3.04)
American Indian	3/34 (8.8)	0.58 (0.20–1.68)	4/66 (6.1)	0.24 (0.10–0.62)

RR risk ratios, *95% CI* 95% confidence interval

[a] Controlled for total motile sperm count, female age, duration of infertility, medication, and infertility diagnosis

patients compared to non-Hispanic whites in both non-obese and obese groups (Table 3). However, the association among non-obese American Indian patients did not maintain statistical significance (BMI < 30, adjusted RR = 0.58, 95% CI 0.20–1.68; BMI ≥ 30, adjusted RR = 0.24, 95% CI 0.10–0.62; p for interaction = 0.24), possibly a consequence of the smaller sample size in this stratum. While the results did not differ by obesity status among Asians and Hispanics, non-obese blacks were observed to have a two-fold increased pregnancy rate compared to non-obese non-Hispanic whites (BMI < 30, adjusted RR = 2.27, 95% CI 1.19–4.32; BMI ≥ 30, adjusted RR = 0.37, 95% CI 0.07–2.03; p for interaction = 0.09). Obese blacks were not observed to have higher pregnancy rates compared to obese non-Hispanic whites, but this estimate was based on only two pregnancy events and should be interpreted with caution.

To examine whether the observed associations differed among patients with more cycles, we evaluated associations between race/ethnicity and IUI pregnancy rates separately for patients with three or fewer cycles and patients with more than thee cycles (Table 4). While lower pregnancy rates were observed for American Indian patients in both groups, the association became stronger among patients with three or fewer cycles (adjusted RR = 0.24, 95% CI 0.08–0.72) and was attenuated among patients with more than three cycles (adjusted RR = 0.63, 95% CI 0.24–1.69, p for interaction = 0.08).

Similar to our finding for pregnancy rates, OP/D rates were 67% lower for American Indian patients compared to those in non-Hispanic whites (adjusted RR 0.33, 95% CI 0.12–0.87) controlling for TMC, female age, BMI, duration of infertility, medication, and infertility diagnosis (Table 5). OP/D rates for blacks, Asians, and Hispanics did not differ from those of non-Hispanic whites. OP/D rates were not further stratified by BMI or number of cycles due to the small number of events.

Recognizing that smoking and alcohol use may affect pregnancy rates but can be more prone to reporting errors, we ran additional models controlling for smoking and alcohol use for both partners. Although the sample size was reduced to 1508 cycles due to missing values for one or both partners, the results remained essentially unchanged. With additional adjustment for male and female smoking and alcohol use, American Indians had significantly lower pregnancy (adjusted RR 0.31, 95% CI 0.13–0.75) and OP/D rates (adjusted RR 0.33, 95% CI 0.11–0.98).

As seen in Table 1, patients undergoing IUI underwent either a natural cycle (no hormonal medications), took clomiphene or letrozole oral medications, or took injectable gonadotropins for ovulation induction or ovarian stimulation. Knowing that pregnancy rates are typically higher with injectable gonadotropins compared to oral medications, we analyzed the data excluding the gonadotropins. The pregnancy rates (adjusted RR 0.34, 95% CI 0.17–0.72) and OP/D rates

Table 4 Comparison of positive pregnancy test by race/ethnicity following intrauterine insemination treatment stratified by number of treatment cycles

	Patients with ≤ 3 cycles (n = 841 cycles, 440 patients)		Patients with > 3 cycles (n = 1166 cycles, 223 patients)	
Race/ethnicity	No. of pregnancies/cycles (%)	Adjusted RR (95% CI)[a]	No. of pregnancies/cycles (%)	Adjusted RR (95% CI)[a]
White	140/665 (21.1)	Reference	110/944 (11.7)	Reference
Black	6/29 (20.7)	1.09 (0.55–2.18)	4/57 (7.0)	0.90 (0.31–2.63)
Asian	12/54 (22.2)	1.14 (0.70–1.87)	8/66 (12.1)	1.25 (0.55–2.83)
Hispanic	11/54 (20.4)	0.75 (0.42–1.45)	4/38 (10.5)	1.05 (0.51–2.20)
American Indian	3/39 (7.7)	0.24 (0.08–0.72)	4/61 (6.6)	0.63 (0.24–1.69)

RR risk ratios, *95% CI* 95% confidence interval

[a] Controlled for total motile sperm count, female age, duration of infertility, medication, and infertility diagnosis

Table 5 Comparison of ongoing pregnancy/deliveries following intrauterine insemination treatment by race/ethnicity

Race/ethnicity	No. of ongoing pregnancy/deliveries per cycle (%)	Unadjusted RR (95% CI) 2007 cycles 663 patients	Adjusted RR (95% CI)[a] 2007 cycles 663 patients
White	169/1609 (10.5%)	Reference	Reference
Black	7/86 (8.1%)	1.15 (0.54–2.44)	1.31 (0.66–2.60)
Asian	14/120 (11.7%)	1.26 (0.74–2.15)	1.20 (0.72–2.01)
Hispanic	9/92 (9.8%)	0.67 (0.32–1.42)	0.70 (0.34–1.41)
American Indian	4/100 (4.0%)	0.31 (0.12–0.82)	0.33 (0.12–0.87)

RR risk ratios, *95% CI* 95% confidence interval

[a] Controlled for total motile sperm count, female age, body mass index, duration of infertility, medication, and infertility diagnosis

(adjusted RR 0.33, 95% CI 0.12–0.87) remained lower for American Indian women compared to those of non-Hispanic white women, while there was no observed difference for blacks, Asians, or Hispanics (data not shown).

Discussion

This is the first study to evaluate fertility treatment outcomes in American Indian women. Our results indicate that American Indians had lower fecundability when undergoing IUI treatment compared to non-Hispanic whites.

Unfortunately, there has been little research evaluating racial/ethnic-specific pregnancy outcomes following less aggressive fertility treatments such as IUI. Previously published clinical studies have evaluated racial and ethnic disparities in outcomes of assisted reproductive technology primarily using IVF, however not specifically for the American Indian population. For example, studies have shown a significantly lower proportion of clinical pregnancy after IVF among black females compared to white women [12, 13] with further study indicating this was most likely due to uterine fibroids or tubal pathology [14]. A recent study also observed that Asian women were less likely to achieve pregnancy and live birth after IVF treatment compared to white women [13]. In contrast to the IVF studies, our study did not find statistically lower pregnancy rates in blacks or Asians compared to non-Hispanic whites in IUI treatments. Although it is unclear why our study results are inconsistent with the racial/ethnic differences reported for IVF, we speculate that good prognosis patients achieve pregnancy with these less aggressive treatments, while poor prognosis patients progress to IVF, which may disproportionately affect minorities in terms of success. Furthermore, no study has evaluated infertility treatment outcomes in the American Indian population until now. One reason for this lack of published data is small sample sizes within many study populations that result in inclusion of the American Indian population in the "other" racial/ethnic group or they are excluded altogether in published articles [1, 3, 15–17].

One aspect to consider when evaluating racial/ethnic disparities in infertility and treatment outcomes is the potential for disproportionate distribution of conditions that adversely affects fertility such as tubal disease associated with *Chlamydia*. Pelvic inflammatory disease results from untreated *Chlamydia* infection and is a leading cause of tubal infertility [18]. In 2014, AI/ANs had the second highest *Chlamydia* rate (668.8 per 100,000) in the USA, 3.7 times higher than the rate for whites (180.6 per 100,000) [19]. However, the rate of *Chlamydia* infection in blacks was six times higher than that in whites. In our study, only a small portion of the blacks and American Indian subjects had tubal disease (Table 1) and the diagnoses were controlled for in the adjusted analysis. There may be underlying, undiagnosed medical conditions that could impact fecundability, such as diabetes and heart disease, that have a higher prevalence in AI/AN populations, and are related to metabolic syndrome [20]. AI/AN adults are 50% more likely to be obese than non-Hispanic whites [21]. The median BMI of the American Indian subjects in our study was also higher than that in non-Hispanic whites [median 31.7 (interquartile range, 11.8) versus 25.8 (interquartile range, 10.3), respectively]. While our analyses controlled for potential confounding due to the female partner's BMI, we did not have data on the male BMI or comorbid conditions that could have affected conception. We were, however, able to control for the TMC and male infertility diagnoses. Further exploration of BMI as a potential effect measure modifier did not provide evidence of differences in American Indian pregnancy rates by obesity status. However, the small number of events within obese and non-obese subgroups limited the precision of stratum-specific estimates and power to detect heterogeneity of effects.

The only published data with numbers specific for AI/AN and fertility are gleaned from the National Vital Statistics Report published by Hamilton et al. [22]. Over the past 30 years, Hamilton et al. [22] reported a decrease in birth rates for the AI/AN population, more so than all other races. In 2014, the number of births per 1000 women was lowest among AI/AN (women at 44.8 per 1000) women compared

to other racial groups (63.2 per 1000 white women, 64.6 per 1000 black women, and 60.7 per 1000 Asian/Pacific Islander women). In addition, the birth rate dropped more quickly for the AI/AN population compared to other racial groups from 1980 to 2014. In 1980, the birth rate for AI/AN women was 20.7 per 1000 women and 9.9 per 1000 women in 2014, whereas the birth rate for all racial groups was 15.9 per 1000 women in 1980 and 12.5 per 1000 women in 2014 [22]. This information points to an overall decrease in fertility among the AI/AN population, but unfortunately, does not provide information on potential causes or treatments sought, if any. In this study, we measured pregnancy success following IUI treatment and did not measure infertility in the population. Therefore, we cannot conclude from these data that the prevalence of infertility is higher in AI/AN women without further research.

This was the first study to examine infertility treatment outcomes by race/ethnicity including American Indians in less aggressive fertility treatments. Another strength is that we reported ongoing pregnancy/delivery rates in addition to pregnancy rates. By applying methods that address informative clustering among repeated observations (also referred to as non-ignorable cluster size), our analyses accounted for potential bias that may be introduced as the outcome of prior treatment cycles influences the number of IUI cycles per patient [10, 11]. Although the large sample size allowed for comparisons across several racial/ethnic subgroups, the small sample size within each racial/ethnic subgroup limited precision and statistical power to detect modest differences in treatment outcomes. Our research is novel in reporting decreased success of IUI for the American Indians in our clinic. However, it is reflective of a select local American Indian population with access to infertility services and does not include Alaska Natives. These results may not be generalizable to other geographic regions. In Oklahoma, infertility evaluation and treatment are not generally covered by Indian Health Services. Therefore, American Indian patients seen in our clinic are paying out of pocket or have secondary insurance coverage. It is possible that characteristics of patients with and without resources to seek infertility treatment may differ in ways that also impact treatment success. We did not collect socioeconomic factors or measures of psychosocial stress on couples seeking treatment nor were obstetrical testing and complications collected that might impact delivery.

Our study identifies disparities in treatment outcome among infertile American Indian women. These findings are consistent with the CDC National Vital Statistics Reports that demonstrate lower birth rates in AI/AN women. It is unclear if poorer response to infertility treatment correlates with factors contributing to the underlying condition of infertility or whether social, cultural, or medical factors influencing treatment-seeking behaviors may explain observed differences in treatment outcomes. This information would be vital for identifying and correcting important deficiencies in access to care, and for better characterizing treatment outcome differences in infertility services.

In our clinic, statistically significant lower pregnancy and OP/D rates were found in American Indian females undergoing IUI treatment when compared to those in non-Hispanic whites, while no differences were observed for other racial/ethnic groups. Decreased success of IUI treatment among our American Indian patients is concerning and our findings need to be replicated in other diverse clinic populations. However, in addition to IUI treatment success rates, overall infertility prevalence in AI/AN populations is an issue that needs to be studied further. In seeking to understand infertility among AI/AN populations, we must include an evaluation of access to quality fertility health services. While disparities in infertility services have not been specifically examined, poorer healthcare quality and reduced access to care are known concerns for AI/ANs across a range of medical services [8]. With the goal to safeguard reproductive health, it is imperative to prevent reproductive health disparities. This requires monitoring race-specific infertility, treatment outcomes, and related risk factors in order to identify, guide, and implement effective public health action strategies.

Acknowledgements Thank you to Brooke Storer, MD, and Ruchika Vij, MD, for data collection and support.

Funding This project is supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under 1 R40MC29449-01-00. Support is also provided by Oklahoma Shared Clinical and Translational Resource Institute NIGMS U54 GM104938. The information, content, and/or conclusions are those of the authors and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS, or the USA.

Compliance with Ethical Standards

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. For this type of study, formal consent is not required.

Conflict of Interest The authors declare that they have no conflict of interest.

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