



PGD Services Offered in India: A secondary analysis of Indian ART Clinic Websites

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ABSTRACT

Pre-implantation genetic diagnosis (PGD) is growing in popularity in assisted reproduction technologies (ART) clinics in India, where a growing imbalance in the male: female sex ratio is also observed. We examined the websites of ART clinics in India to determine whether PGD service might be offered for the purposes of selecting for male embryos. Of 147 Indian fertility clinics with websites identified in an earlier study, we re-examined 85 sites that still had functional URLs and content in English. We searched those sites for mentions of PGD and sex selection, and compared instances in which the two were coincident to state-level statistics on population sex ratio. 22 (15%) of the 85 websites overtly mentioned offering PGD services. No websites overtly mentioned offering sex determination and selection services, though one clinic suggested it was an option in special medical circumstances. There was an inverse relationship between the clustering of ART clinics that offer PGD and the skewness of the sex ratio in the states in which those clinics were clustered. While PGD might be offered for the purposes of sex selection in India, we found no indication of the advertising of such usage on the websites of Indian ART clinics.

KEYWORDS: *Pre-implantation diagnosis (PGD), sex determination, sex selection, infertility clinics, India*

INTRODUCTION

Pre-implantation genetic diagnosis (PGD) is a technology that has been in commercial use since 1990 (Robertson, 2003). Intended primarily as a diagnostic technique for identifying embryos with genetic disorders prior to potential implantation, it is promoted as a screening tool for detecting aneuploidy, single gene and X-linked diseases, as well as a host of heritable anomalies (Robertson, 2003).

The controversy surrounding PGD arises from its potential for identifying characteristics that are not medically problematic, but which have social implications, sex selection prime among them (Sills & Palermo, 2002). In India, sex ratios at birth skews decidedly masculine. According to India's census, for every 1000 males, there were only 940 females. Specifically, the analogous sex ratio for the ages 0-6 was 914 girls for every 1000 boys (Office of the Registrar General & Census Commissioner, 2011). Over seven million fewer girls than boys are born between the ages of 0-6 years. According to a landmark study by Jha et al (2011), these data suggest that 1.1 million girls that have gone "missing" since the last recorded census in 2001, a discrepancy that the authors assign to selective abortion deriving from in utero sex-identification technologies.

PGD for the purposes of sex selection is distinct from sex-selective abortion in that the former prevents the implantation of embryos of a given sex, while the latter actively terminates pregnancies with fetuses of a given sex.

Although explicitly selecting the sex of a fetus through abortion techniques is illegal in many parts of the world, there remains a demand for the procedure, particularly among ART clientele (Robertson, 2003). When foreign clientele seek such services in Indian clinics, the procedure becomes squarely within the domain of "reproductive tourism", which is the medical tourism phenomenon in which clients from wealthy countries seek reproductive technologies and surrogates in lower income countries, like India.

In an earlier study, we analyzed Indian ART websites to determine the extent to which India's ART clinics advertise reproductive tourism services on their websites (Deonandan et al, 2012). This study used the same methodology to investigate the extent to which those websites suggest that PGD services are offered for the possible purposes of sex selection. While PGD for sex selection cannot possibly be present to the same extent as sex-selective abortion, any indication that clients are seeking this new technology for sex-selective purposes adds a layer of social, medical, ethical, and legal complexity to an already opaque and politicized Indian ART sector.

METHODS

In a previous study, all Indian ART clinics with English language websites were identified (Deonandan et al, 2012). We re-examined those same sites and assessed the presence of the following terms: "Pre-implantation Diagnosis" or "PGD", "Sex Determination" and "Sex Selection". Websites were coded as being clear, unclear, or not clear in mentioning these terms. Due to the public nature of these data, we were informed by the Office of Research Ethics and Integrity of the University of Ottawa that no formal research ethics certification was required for this study.

RESULTS

Of the 147 fertility clinics identified in our previous study, 85 were found to be still active. Most clinics were located in Maharashtra (30 URLs identified, 16 functioning at the time of the study) and Gujarat (21 identified, 10 functioning). The names, URLs, and locations of all identified clinics with functioning websites are listed in Table 1.

Of the 85 functional clinic websites, 22 (15%) overtly and clearly mentioned offering PGD services either by itself or as part of a service package. None of the examined websites overtly mentioned offering sex determination and/or selection services. Due to ethical and legal considerations, we have not indicated herein which clinics' websites made mention of PGD. However, those states with more equanimous sex ratios were the ones most likely to have clinics that mentioned PGD services.

DISCUSSION

Our analysis landed upon two main findings. First, about 15% clinics advertise that they explicitly offer PGD services, while none of them overtly offer sex determination or sex selection services. Second, states with a more skewed sex ratio do not have any fertility clinics whose websites advertise PGD services. Those regions with a female-to-male sex ratio approaching equanimity, on the other hand, are those with clinics whose websites do advertise PGD services.

It's a counterintuitive finding, if one were to presume that PGD services would be more aggressively marketed to populations with a demonstrated trend toward sex ratio imbalance. Occam's Razor dictates that the more likely interpretation is that PGD is being sought in these states for reasons other than sex selection. However, the media reports that Indian state governments are receiving complaints that PGD technology specifically is being used to select for the birth of boy babies (Vora, 2018). It is therefore conceivable that residents of states with skewed sex ratios are traveling to states with denser ART services, such as Maharashtra and Gujarat, to receive treatment. Regardless, the prevalence of ART with PGD is likely too small to have a measurable effect on population sex ratio statistics. Ratio skewness is more likely the result of infanticide and selective abortion.

The Malpani Infertility Clinic located in Maharashtra is the only clinic whose website had even a mild suggestion of sex determination and/or selection services, and that was in reference to cases of offspring possibly being at risk for sex-linked genetic disorders. They described a scenario of a woman carrying the gene for hemophilia; with PGD, the woman has the option in having a girl child, who would only have a 50% risk of being a carrier, rather than a boy who would surely be afflicted by the disease.

In 1994 the Indian government enacted the "Pre-Natal Diagnostic Techniques Act" (PNDT Act) in response to the discerning trend of increasing maleness. The Act was meant to "regulate and prevent the misuse of technologies for sex determination"; however, Subramanian & Selvaraj (2009) suggest that the PNDT Act's failure is evident in the increase of selective abortions in India since the Act was enacted.

Regardless of what services are actually available domestically, the Act can be seen as a disincentive for the advertising of PGD services on clinic websites, and would certainly discourage the linking of PGD with sex selection. There is further suspicion that Indian nationals are traveling to other locations, such as Thailand, to receive sex selection services via PGD (Strauss, 2010).

It remains a legal or philosophical question whether the PNDT Act actually applies to PGD, since the diagnostic process occurs at the in vitro blastocyst phase, rather than in utero. But the technology appears to be sliding toward the mainstream, as arguments are now common for the use of PGD in sex selection for the purposes of "family balancing" (Malpani A, 1998; Malpani et al, 2002). As one noted in one paper, "the merits and ethical aspects of this approach need to be discussed and debated in a public forum" (Malpani et al, 2002).

Table 1: List of 85 Indian ART Clinics with Functional Sites, with sex ratios from 2011 Census

| Indian State, Region or Territory | City | Clinic Name | URL |
|--|---------------|---|---|
| ANDHRA PRADESH Sex Ratio: F :M 0.94 : 1 | Hyderabad | DR PADMAJA IVF CENTER | http://www.drpadmajaivf.com/ |
| | Hyderabad | DR. RAMA'S INSTITUTE FOR FERTILITY | http://www.fertilityindia.com |
| | Hyderabad | KIRAN INFERTILITY CENTRE PVT. LTD. (KIC) | http://www.kiranivfgenetic.com |
| | Visakhapatnam | KRISHNA IVF CLINIC – CENTER FOR ASSISTED REPRODUCTION | http://www.krishnaivf.com |
| | Hyderabad | MATERNAL HEALTH & RESEARCH TRUST (MHRT) | http://www.mhrthospital.com/ |
| | Hyderabad | OASIS CENTRE FOR REPRODUCTIVE MEDICINE | http://www.oasisindia.in/ |
| | Karimnagar | PADMAJA FERTILITY CENTER | http://padmajafertility.com |
| ASSAM Sex Ratio: 0.954 : 1 | Guwahati | INSTITUTE OF HUMAN REPRODUCTION | http://www.ihrindia.com |
| CHANDIGARH Sex Ratio: 0.818 : 1 | Chandigarh | BEDI INFERTILITY CENTER & NURSING HOME | http://www.ivfbedi.com/ |
| | Chandigarh | JINDAL IVF & SANT MEMORIAL NURSING HOME | http://www.ivfchandigarh.com |
| CHATTISGARH Sex Ratio: 0.991 : 1 | Raipur | AYUSH FERTILE HOPE ICSI TEST TUBE BABY CENTRE | http://www.aayushivfraipur.com/ |
| | Raipur | RAIPUR FERTILITY RESEARCH CENTRE | http://raipurivf.com/ |
| | New Delhi | DELHI IVF & FERTILITY RESEARCH CENTRE | http://www.delhi-ivf.com/ |

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| | New Delhi | GAUDIUM IVF AND GYNAE SOLUTIONS – IVF SURROGACY CENTRE | http://www.ivfsurrogacycentre.com |
| | New Delhi | INTERNATIONAL FERTILITY CENTRE | http://internationalfertilitycentre.org |
| | New Delhi | KJIVF TEST TUBE BABIES AND LAPAROSCOPY CENTER | http://www.kjivf.com |
| | New Delhi | SOUTHEND FERTILITY & IVF CENTRE | http://southendivf.com |
| | New Delhi | SURROGACY CENTRE INDIA | http://www.surrogacycentreindia.com |
| GUJARAT Sex Ratio: 0.918 : 1 | Anand | AKANKSHA INFERTILITY CLINIC | http://ivf-surrogate.com/ |
| | Ahmedabad | BHAVISHI FERTILITY INSTITUTE | http://www.ivfclinic.com |
| | Ahmedabad | MAYFLOWER WOMEN'S HOSPITAL | http://mayflowerhospital.com/ |
| | Surat | ME AND MUMMY HOSPITAL_& IVF CENTRE | http://www.meandmummyindia.com |
| | Valsad | NADKANI IVF | http://nadkarniivf.info |
| | Ahmedabad | PULSE WOMEN'S HOSPITAL | http://pulse-hospital.com/ |
| | Navsari | RAMABEN HOSPITAL | http://www.ramabenhospital.in/ |
| | Ahmedabad | RESHAMBAI FERTILITY HOSPITAL | http://www.reshambaiivf.org |
| | Ahmedabad | SAFAL FERTILITY CENTRE | http://www.ivfbest.com |
| | Ahmedabad | VANI-IVF CENTER | http://www.vani-ivf.com/ |
| HARYANA Sex Ratio: | Ambala Cantt | LOOMBA IVF CENTRE | http://loombaiivf.com/ |

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| 0.877 : 1 | Hisar | NATIONAL FERTILITY AND TEST TUBE BABY CENTRE | http://www.nationalfertilitycentre.com/ |
| | Bangalore | BANGALORE ASSISTED CONCEPTION CENTRE (BACC) | http://www.milann.co.in |
| | Bangalore | CHERISH CENTRE FOR REPRODUCTIVE MEDICINE | http://cherishmedical.com/ |
| | Bangalore | GUNASHEELA IVF CENTRE | http://www.gunasheelaivf.com |
| | Bangalore | LIFE INFERTILITY CLINIC | http://www.lifeclinicivf.com/ |
| | Bangalore | SURE FERTILITY CENTRE | http://www.surefertility.com/ |
| KERALA Sex Ratio: 1.084 : 1 | Bourn Hall Clinic | BOURN HALL CLINIC | http://www.bournhall-clinic.in |
| | Kodungallur | CRAFT HOSPITAL & RESEARCH CENTRE | http://craftivf.com/ |
| | Thiruvananthapuram | K. J. K. HOSPITAL - FERTILITY RESEARCH AND GYNAEC CENTRE | http://www.kjkhospital.com/ |
| | Thiruvananthapuram | SAMAD HOSPITAL – INFERTILITY AND TEST-TUBE BABY CENTRE (3 centres in India) | http://www.samadhospital.com/ |
| | Kochi | VIJAYA FERTILITY CLINIC IVF & ENDOSCOPIC CENTRE | http://www.vijaya-ivf.com/ |
| | Indore | DISHA FERTILITY & SURGICAL CENTRE | http://dishafertility.com/ |
| | Jabalpur | IDEAL FERTILITY CENTRE | http://www.drbanerji-fertilityclinic.com/ |
| | Jalgaon | ASHAY HOSPITAL & TEST TUBE BABY CENTRE | http://www.ashaytesttubebabycentre.com/ |

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| MAHARASHTRA Sex Ratio: 0.925 : 1 | Dombivli | AKRUTI IVF CENTRE | http://akruti-ivf.co.in/ |
| | Mumbai | BABIES AND US FERTILITY IVF AND ICSI CENTRE | http://www.infertilityindia.com/index.htm |
| | Mumbai | BOMBAY FERTILITY CLINIC & IVF CENTRE | http://www.drjatinshah.com |
| | Mumbai | CENTER FOR HUMAN REPRODUCTION, DR L H HIRANANDANI HOSPITAL | http://www.hiranandanihospital.org/content/ivf-clinic.html |
| | Mumbai | DEPARTMENT OF ASSISTED REPRODUCTION (IVF) & GENETICS | http://www.ivfclinicindia.com |
| | Mumbai | DR.PRAMILA BHATIA NURSING HOME | http://drpramilabhatia.com/ |
| | Mumbai | FERTILITY CLINIC & IVF CENTRE | http://www.ivfcentremumbai.com/ |
| | Mumbai | GYNAECWORLD | http://www.gynaecworld.com |
| | Aurangabad | JILLA HOSPITAL – INFERTILITY MATERNAL AND CHILD CARE CENTER | http://www.jillahospital.com/ |
| | Mumbai | MALPANI INFERTILITY CLINIC | http://www.drmalpani.com/ |
| | Pune | MOTHER HOPE FERTILITY CLINIC | http://www.motherhopefertility.com |
| | Mumbai | ROTUNDA – THE CENTRE FOR HUMAN REPRODUCTION | http://www.iwannagetpregnant.com/ |
| | Mumbai | SHRUTI NURSING HOME | http://latestinivf.com |
| | Mumbai | SOUTHERN CROSS FERTILITY & IVF CENTRE | http://www.southerncrossfertility.com/ |
| | Mumbai | YASHODA INFERTILITY & HEALTHCARE SERVICES | http://yihs.in |

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| PUDUCHERRY Sex Ratio: 1.038 : 1 | Thattanchavady | SRISHTI ASSISTED FERTILITY AND ADVANCED LAPAROSCOPY (SAFAL) CENTER | http://fertility-clinic.in |
| PUNJAB Sex Ratio: 0.893 : 1 | Jalandhar | AMARJEET FERTILITY CENTRE | http://www.amarjeetfertilitycentre.com |
| | Ludhiana | IQBAL NURSING HOME & HOSPITAL | http://iqbalnursinghome.com/ |
| | Jalandhar | SANTAAN FERTILITY & TEST TUBE BABY CENTRE | http://www.santaan-ivf.com |
| | Amritsar | SATJOT HUMAN REPRODUCTION AND RESEARCH CENTRE | http://satjotfertility.com |
| | Jalandhar | SHIVAM INFERTILITY & IVF CENTRE | http://www.shivamivfcentre.com |
| | Ludhiana | SOFAT INFERTILITY & WOMEN CARE CENTRE | http://www.sofatinfertility.com/ |
| | Jalandhar | VIRK FERTILITY CENTRE | http://www.virkinfertilitycentre.com |
| RAJASTHAN Sex Ratio: 0.926 : 1 | Jaipur | AASTHA FERTILITY CARE | http://www.aasthafertility.com/index.htm |
| | Jaipur | BAHETI HOSPITAL & CENTRE FOR REPRODUCTIVE HEALTH CARE | http://www.baheti-ivf.com |
| | Jaipur | GENESIS FERTILITY CENTRE | http://www.ivfinindia.com |
| | Udaipur | INDIRA IVF AND INFERTILITY CENTRE | http://www.indiraivf.com/ |
| | Udaipur | NEELKANTH IVF CENTRE | http://neelkanthivfcentre.com/ |
| | Udaipur | R.K. HOSPITAL & INFERTILITY (IVF) CENTER | http://www.rkivf.com |
| | Bikaner | PRATAP PRASUTI GRIH | http://www.prataphospital.com/ |
| | Jaipur | SHIVANI FERTILITY & MOTHER CARE | http://www.jaipurivf.com/ |

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| | Jaipur | VIVEKANAND HOSPITAL & FERTILITY CENTRE | http://www.vivekanandfertility.com/ |
| TAMIL NADU Sex Ratio: 0.995 : 1 | Arumbakkam | CHENNAI FERTILITY CENTER AND RESEARCH INSTITUTE (CFC&RI) | www.chennaifertilitycenter.com/ |
| | Chennai | ISWARYA FERTILITY CENTRE AND WOMEN'S HOSPITAL (4 centers in India) | http://iswaryafertility.com |
| | Chennai | MIRACLE ADVANCED REPRODUCTIVE CENTRE | http://www.miracleivf.com/ |
| | Chennai | PRASHANTH FERTILITY RESEARCH CENTRE | http://www.pfrcivf.com/ |
| | Chennai | SHRUSHTI FERTILITY RESEARCH CENTRE | http://www.motherababy.com/ |
| | Kanyakumari | SUDHA SUNDAR FERTILITY CLINIC | http://sudhasundarfertility.com/index.html |
| UTTAR PRADESH Sex Ratio: 0.963 : 1 | Agra | MALHOTRA TEST TUBE BABY CENTRE | http://www.malhotrahospitals.com |
| UTTARAKHAND Sex Ratio: 0.908 : 1 | Dehradun | SAINI IVF FERTILITY RESEARCH CENTRE | http://www.sainiivf.com |
| WEST BENGAL Sex Ratio: 0.941 : 1 | Kolkata | AMRI FERTILITY CLINIC & IVF CENTRE | http://www.amrihospital.com/clinic/ivf_centre/ |
| | Kolkata | GENOME-THE FERTILITY CLINIC (3 centers in India) | http://www.lifeatgenome.com/ |

REFERENCES

Deonandan R, Loncar M, Rahman P, Omar S. Measuring reproductive tourism through an analysis of Indian ART clinic Websites. *International Journal of General Medicine*, 2002;5:763- 773.

Jha P, Kesler MA, Kumar R, Ram F, Ram U, Aleksandrowicz L, BAssani DG, Chandra S, Bantha JK. (2011). Trends in selective abortions of girls in India: analysis of nationally representative birth histories from 1990 to 2005 and census data from 1991 to 2011. *The Lancet*, 2011;377(9781):1921-1928.

Office of the Registrar General & Census Commissioner. Provisional Populations Totals—Statement 13 (Sex Ratio of Total population). New Delhi: Government of India, 2011.

Malpani A. Sex – selection by IVF: the freedom to choose. *Indian Journal of Medical Ethics*. 1998;6(2).

Malpani A, Malpani A, Modi D. Preimplantation sex selection for family balancing in India. *Human Reproduction*. 2002;17(1):11-12.

Robertson JA. (2003). Extending preimplantation genetic diagnosis: the ethical debate. Ethical issues in new uses of preimplantation genetic diagnosis. *Human Reproduction*, 2003;18(3):465-71.

Sills ES, Palermo GD. Preimplantation Genetic Diagnosis for Elective Sex Selection, the IVF Market Economy, and the Child—Another Long Day's Journey into Night? *J Assist Reprod Genet*. 2002 Sep; 19(9): 433–437.

Strauss RR. To ensure prized baby boy, Indians flock to Bangkok. *Times of India*. Dec 27, 2010. <https://timesofindia.indiatimes.com/india/To-ensure-prized-baby-boy-Indians-flock-to-Bangkok/articleshow/7169495.cms>

Subramanian SV, Selvaraj S. Social analysis of sex imbalance in India: before and after the implementation of the Pre-Natal Diagnostic Techniques (PNDT) Act. *Journal of Epidemiology & Community Health* , 2009;63:245–252.

Vora P. Is a fertility treatment test being misused to select male embryos? Yes, alleges one Mumbai woman. *Scroll.in*. April 30, 2018. <https://scroll.in/pulse/876910/is-a-fertility-treatment-test-being-misused-to-select-male-embryos-yes-alleges-one-mumbai-woman>