

Original Research Article

Comparison of psychosocial strengths and difficulties in children born through assisted reproductive technology versus naturally conceived children

A. H. M. Kazi Mostofa Kamal^{1*}, Shah M. A. Uddin Bhuiyan², Luna Laila³,
M. Inamul Islam⁴, Anup K. Biswas⁵

¹Department of Psychiatry, Combined Military Hospital, Tangail, Bangladesh

²Department of Psychiatry, Combined Military Hospital, Dhaka, Bangladesh

³Department of Gynecology and Obstetrics, Combined Military Hospital, Dhaka, Bangladesh

⁴Department of Psychiatry, Combined Military Hospital, Cox's Bazar, Bangladesh

⁵Department of Embryology, Fertility Centre, Combined Military Hospital, Dhaka, Bangladesh

Received: 07 May 2024

Revised: 25 May 2024

Accepted: 27 May 2024

*Correspondence:

Dr. A. H. M. Kazi Mostofa Kamal,
E-mail: kazikamal920@yahoo.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Assisted reproductive technology (ART) is a set of medical interventions used to facilitate the conception process in couples suffering from fertility issues. ART encompasses several techniques, including ovulation induction (OI), artificial insemination, testicular sperm extraction (TESE), in vitro fertilization (IVF), and intracytoplasmic sperm injection (ICSI). This current study aimed to analyze the correlation between psychological strength and difficulties among children born by ART and normally conceived (NC) children.

Methods: The study was conducted in a longitudinal retrospective fashion, in Combined Military Hospital, Dhaka, Bangladesh, from December 2022 to June 2023. A total of 47 participants from the ART group and 50 participants from the NC group were selected as study subjects by purposive sampling technique. Data were gathered using a pre-designed questionnaire and analyzed using the statistical package for the social sciences (SPSS) version 23.0 computer program.

Results: The age range of the study participants was between 2 to 4 years old. A majority of the participants were female (53.2%), hailed from middle-class families (59.6%), lived in urban settings (42.6%), and identified as Muslim (72.3%). In terms of illnesses, a small proportion experienced physical ailments (6.4%) and psychiatric conditions (10.6%).

Conclusions: Despite persistent worries regarding the potential adverse developmental effects on children conceived by ART, research findings suggest that such children do not exhibit noteworthy physical, psychological, or developmental challenges when compared to those conceived naturally.

INTRODUCTION

Assisted reproductive technology (ART) is a set of medical interventions used to facilitate the conception process in couples suffering from fertility issues. In vitro fertilization (IVF) and Intracytoplasmic sperm injection (ICSI) are two of the most widely used ART techniques worldwide. The first baby conceived through IVF was born on 25 July 1978. Since then, more than 3.75 million

children have been born using ART. ART has advanced significantly over time since the pioneering works and achievements of Steptoe and Edwards. Various methods are incorporated in ART for example, ovulation induction (OI), IVF, artificial insemination (AI), testicular sperm extraction (TESE), and ICSI.¹ These technologies are becoming available all around the globe day by day. Consequently, there has been a noteworthy rise in the number of children born with the support of medically

assisted reproductive technologies over the past few decades.² Around 1% to 3% of births in Europe and 1% in the USA are estimated to be facilitated by IVF treatment.³ While these techniques have led to the successful conception of millions of children worldwide, like all medical interventions, ART is not without its potential drawbacks. These procedures are associated with some adverse outcomes, such as preterm delivery (PTD) and low birth weight (LBW). These negative outcomes are often linked to the higher incidence of multiple pregnancies resulting from IVF treatments. It's worth noting that even IVF singletons have a higher risk of PTD and LBW compared to naturally conceived (NC) singletons.³ These interventions are also hypothesized to be related to a series of lengthy neonatal and pediatric health issues as well as prolonged hospitalization, need for care in neonatal intensive care units (NICU), cerebral palsy (CP), visual and hearing impairment, and various neuro-developmental disorders (NDDs) like pervasive developmental disorder (PDD), and autism spectrum disorder (ASD). Individuals with NDDs encounter a myriad of challenges that can persist throughout their lives, affecting not only themselves but also their families and caregivers. These challenges encompass difficulties in communication, social interactions, emotional regulation, learning, and adaptive skills. Additionally, individuals with NDDs often require increased healthcare and educational support to address their unique needs.³ Additionally, MDDs increase the economic challenges with increased costs in the healthcare system, academic, and other support services.^{9,10} Certain studies have indicated a higher prevalence of neuropsychiatric and neurodevelopmental disorders among children conceived through ART, while others have found no significant difference compared to NC children.⁴ Additionally, research on behavioral and socio-emotional disorders such as attention deficit hyperactivity disorder (ADHD) and tic disorders has yielded inconsistent findings across various studies.⁵

Several studies have highlighted challenges in social functioning and externalizing symptoms such as aggression, irritability, and other behavioral issues, including oppositional defiant disorder, conduct disorders, and hyperactive conditions. They showed both similar and advanced rates of incidence in children born by ART.^{6,7} A very recent and well-organized study of fertility treatments and NDD (ASD in particular) indicated potential correlations in a subcategory investigation for definite hormones applied in fertility management.⁸ A clear understanding of the claimed associations is very crucial for the planning, and policy making for preventive measures and intervention strategies at different levels of the health and administrative arena. The current study investigates the correlation between psychological strength and difficulties among children born by ART and NC children. This retrospective longitudinal study was designed to investigate and shed light on the issue, conducted at the fertility centre of CMH Dhaka, taking into account all relevant factors.

METHODS

This study, conducted retrospectively in a longitudinal manner at Combined Military Hospital, Dhaka, Bangladesh, from December 2022 to June 2023, aimed to compare the psychosocial strengths and difficulties between children born through ART and NC children, and to identify neurodevelopmental disorders. The study included children born between September 2017 and September 2022, specifically focusing on those born by ART and willing to participate. The strengths and difficulties questionnaire was used to measure the psychological strengths and difficulties among these children, and the diagnosis of neurodevelopmental disorders was made by the interviewer according to DSM-IV criteria. The sample size consisted of 47 children conceived by ART. Proper randomization determined the number of NC children, resulting in 50 participants. Prior to data collection, the nature, purpose, and procedure of the study were explained to the mothers or primary caregivers, who were informed of their freedom not to participate. Informed written consent was obtained from each respondent. After obtaining consent, the interviewer administered a questionnaire containing socio-demographic variables and the strengths and difficulties questionnaire.

Data were processed and analyzed using statistical package for the social sciences (SPSS) version 23.0.

RESULTS

The 47 cases from the ART group and 50 cases from the NC group were studied retrospectively and fulfilled the criteria.

Table 1: Baseline characteristics distribution among participants (n=97).

Variables	Frequency	Percentage
Gender		
Male	45	46.4
Female	52	53.6
Socioeconomic background		
Low socioeconomic families	21	21.6
Middle class families	58	59.8
Upper class families	18	18.6
Residence		
Urban	41	42.3
Rural	56	57.7
Religion		
Muslim	70	72.2
Hindu	24	24.7
Christian	3	3.1
Illness distribution		
Physical illness	6	6.2
Psychiatric illness	10	10.3

A majority of the participants were female, accounting for 53.2% of the total. Additionally, a significant portion of the participants hailed from middle-class families (59.6%), resided in urban areas (42.6%), and identified as Muslim

(72.3%). Illness distribution indicated that only a minority of them were suffering from physical illnesses (6.4%) and psychiatric illnesses (10.6%).

Table 2: Scoring of the strengths and difficulties questionnaire (SDQ) in total difficulty score between both ART and NC cases. The mean value, standard (std.) deviation, and std. error mean are shown in the emotional, conduct, hyperactivity, peer, and prosocial problems categories.

Problem categories	Group	No. of cases	Mean value	Std. deviation	Std. error mean
Emotional problem	ART group	47	2.2128	1.79294	0.26153
	NC group	50	2.2000	2.12852	0.30102
Conduct problem	ART group	47	4.0638	2.80841	0.40965
	NC group	50	4.4800	1.69320	0.23946
Hyperactivity problems	ART group	47	4.6809	2.51177	0.36638
	NC group	50	3.7600	1.95417	0.27636
Peer problems	ART group	47	3.4468	1.67862	0.24485
	NC group	50	2.9400	1.40567	0.19879
Prosocial problems	ART group	47	6.4255	2.41143	0.35174
	NC group	50	5.8600	1.92735	0.27257
Total difficulty score	ART group	47	14.4043	6.43246	0.93827
	NC group	50	13.3800	5.88630	0.83245

Table 3: Levene's test for equality of variances is depicted for each of the problem categories (emotional, conduct, hyperactivity, peer, and prosocial problems). The t-test for equality of means is shown with t-value, degree of freedom, sig. value (2 tailed) is shown. The upper and lower values for the 95% confidence interval are shown along with the mean value and standard error difference.

Problem categories	Levene's test for equality of variances		t-test for equality of means						
	F	Sig.	t-value	Degree of freedom	Sig. (2 tailed)	Mean difference	Std. error difference	95% CI of the difference	
								Lower	Upper
Emotional problem									
Equal variances assumed	4.577	0.035	0.032	95	0.975	0.01277	0.40088	-0.78308	0.80862
Equal variances not assumed			0.032	93.901	0.975	0.01277	0.39876	-0.77899	0.80452
Conduct problem									
Equal variances assumed	8.227	0.005	-0.890	95	0.376	-0.41617	0.46763	-1.34453	0.51218
Equal variances not assumed			-0.877	74.626	0.383	-0.41617	0.47450	-1.36150	0.52916
Hyper-activity problems									
Equal variances assumed	2.011	0.159	2.022	95	0.046	0.92085	0.45541	0.01675	1.82495
Equal variances not assumed			2.007	86.844	0.048	0.92085	0.45892	0.00867	1.83303
Peer problems									
Equal variances assumed	2.633	0.108	1.616	95	0.109	0.50681	0.31366	-0.11589	1.12951
Equal variances not assumed			1.607	89.943	0.112	0.50681	0.31539	-0.11977	1.13339
Prosocial problems									
Equal variances assumed	2.235	0.138	1.280	95	0.204	0.56553	0.44194	-0.31182	1.44289

Continued.

Problem categories	Levene's test for equality of variances		t-test for equality of means						
	F	Sig.	t-value	Degree of freedom	Sig. (2 tailed)	Mean difference	Std. error difference	95% CI of the difference	
								Lower	Upper
Equal variances not assumed			1.271	88.032	0.207	0.56553	0.44499	-0.31879	1.44985
Total difficulty score									
Equal variances assumed	0.001	0.974	0.819	95	0.415	1.02426	1.25086	-1.45901	3.50752
Equal variances not assumed			0.817	92.889	0.416	1.02426	1.25432	-1.46662	3.51513

DISCUSSION

Despite ongoing concerns about potential adverse developmental outcomes in children conceived through assisted reproductive technology, the study findings suggest that these children do not encounter significant physical, psychological, or developmental challenges compared to naturally conceived children. Across all scores, the values predominantly clustered around the average, indicating no notable deviations. In a comparative prospective study conducted in 2016, no increase in mental health or cognitive developmental issues was observed for children conceived through ART at the age of 7–8 years.⁹ This finding was consistent with the results of a pilot study that compared 31 IVF families with 31 families with naturally conceived children when the children were aged 2 years and 8–9 years old. The study did not uncover any significant disparities between the reports provided by IVF parents and those of the control group regarding child behavior, parenting behavior, parenting pressure, and most of the goals of parenting.¹⁰ A study found that adolescents born through IVF exhibited lower levels of self-esteem compared to the control group. However, this difference in self-esteem was not indicative of a general trend among IVF adolescents, as the result was not significant when excluding two outliers.¹¹ Analysing the teacher's report form (TRF), marginally significant behavior problems were reported in children with IVF versus the control group.¹⁰ A longitudinal follow-up study also found higher incidences of physical aggression and greater rates of school suspension or expulsion among IVF adolescents compared to the matched control group. Interestingly, these differences were not observed during their teenage years.¹¹ Conversely, a study conducted in Belgium, which specifically examined socio-emotional development and language skills, reported a lower prevalence of behavioral problems, particularly externalizing problems, among children conceived through assisted reproductive technology.¹² A study carried out in Germany found no evidence indicating a higher prevalence of behavioral problems among children conceived through assisted reproductive technology.¹³ The study did not find strong evidence suggesting that children born through assisted reproductive technology are at a higher risk of developing psychosocial and developmental issues as they progress

into later stages of development and adolescence, contrary to what has been hypothesized in some literature.^{14,15} Overall, children born through ART were functioning well in terms of socio-emotional and other developmental parameters, showing little difference compared to naturally conceived children. While a few studies indicated a higher occurrence of behavioral problems among ART children, most studies did not report significantly more behavioral problems in the ART group compared to the control group.

Limitations

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

Since the inception of ART, there has been a notable increase in the number of couples undergoing ART procedures to aid in conception, consequently leading to a significant rise in the number of children born through ART. In the coming future, this trend will be even more escalated. No study could provide hard-rock evidence of negative correlations. There is still a lack of studies exploring the long-term developmental outcomes and any possible detrimental psychological effects of ART on children. It represents a hollow gap of significant information regarding the issue.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Bauquis C. The world's number of IVF and ICSI babies has now reached a calculated total of 5 million. Brussels: ESHRE. 2012.
2. Sullivan EA, Zegers-Hochschild F, Mansour R, Ishihara O, De Mouzon J, Nygren KG, et al. Assisted reproductive technology report 2004. Hum Reprod. 2013;28(5):1375-90.

3. Ferraretti AP, Goossens V, De Mouzon J, Bhattacharya S, Castilla JA, Korsak V, et al. European IVF-monitoring (EIM), Consortium, for the European Society of Human Reproduction and Embryology (ESHRE). *Hum Reprod.* 2012;27(9):2571-84.
4. Knoester M, Helmerhorst FM, Vandenbroucke JP, van der Westerlaken LA, Walther FJ, Veen S, et al. Cognitive development of singletons born after intracytoplasmic sperm injection compared with in vitro fertilization and natural conception. *Fertil Steril.* 2008;90(2):289-96.
5. Sandin S, Nygren KG, Iliadou A, Hultman CM, Reichenberg A. Autism and mental retardation among offspring born after in vitro fertilization. *JAMA.* 2013;310(1):75-84.
6. Hvidtjørn D, Schieve L, Schendel D, Jacobsson B, Svaerke C, Thorsen P. Cerebral palsy, autism spectrum disorders, and developmental delay in children born after assisted conception: a systematic review and meta-analysis. *Arch Pediatr Adolesc Med.* 2009;163(1):72-83.
7. Källén AJ, Finnström OO, Lindam AP, Nilsson EM, Nygren KG, Otterblad Olausson PM. Is there an increased risk for drug treated attention deficit/hyperactivity disorder in children born after in vitro fertilization? *Eur J Paediatr Neurol.* 2011;15(3):247-53.
8. Hvidtjørn D, Grove J, Schendel D, Schieve LA, Sværke C, Ernst E, et al. Risk of autism spectrum disorders in children born after assisted conception: a population-based follow-up study. *J Epidemiol Community Health.* 2011;65(6):497-502.
9. Punamäki RL, Tiitinen A, Lindblom J, Unkila-Kallio L, Flykt M, Vänskä M, et al. Mental health and developmental outcomes for children born after ART. *Hum Reprod.* 2016;31(1):100-7.
10. Colpin H, Soenen S. Parenting and psychosocial development of IVF children. *Hum Reprod.* 2002;17(4):1116-23.
11. Golombok S, Ilioi E, Blake L, Roman G, Jadva V. A longitudinal study of families formed through reproductive donation. *Develop Psychol.* 2017;53(10):1966.
12. Nekkebroeck J, Bonduelle M, Desmyttere S, Van den Broeck W, Ponjaert-Kristoffersen I. Socio-emotional and language development of 2-year-old children born after PGD/PGS, and parental well-being. *Hum Reprod.* 2008;23(8):1849-57.
13. Ludwig AK, Hansen A, Katalinic A, Sutcliffe AG, Diedrich K, Ludwig M, et al. Assessment of vision and hearing in children conceived spontaneously and by ICSI: a prospective controlled, single-blinded follow-up study. *Reprod Biomed Online.* 2010;20(3):391-7.
14. Wagenaar K, Ceelen M, Van Weissenbruch MM, Knol DL, Delemarre-van de Waal HA, Huisman J. School functioning in 8- to 18-year-old children born after in vitro fertilization. *Eur J Pediatrics.* 2008;167:1289-95.
15. Hart R, Norman RJ. The longer-term health outcomes for children born as a result of IVF treatment. *Hum Reprod Update.* 2013;19(3):244-50.

Cite this article as: Kamal AHMKM, Bhuiyan SMAU, Laila L, Islam MI, Biswas AK. Comparison of psychosocial strengths and difficulties in children born through assisted reproductive technology versus naturally conceived children. *Int J Res Med Sci* 2024;12:1887-91.