

Acceptance of Elective Single-embryo Transfer in a Resource-limited Setting: A Cross-sectional Questionnaire-based Study

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ABSTRACT

Background: While elective single-embryo transfer (eSET) has been advocated in select countries, the global acceptance of the eSET policy has been undermined due to various issues. It is imperative to understand the couples' perspectives regarding the number of embryos transferred. **Aims:** We planned a study to evaluate the knowledge and attitude of infertile couples undergoing assisted reproductive technology towards eSET in self-funded treatment cycles in a low-resource setting. **Settings and Design:** We conducted a cross-sectional study at a tertiary-level referral facility between February 2020 and September 2022. **Materials and Methods:** This was an interviewer-administered questionnaire-based survey in two stages. The first stage involved the assessment of the knowledge of the participants. Following this, participants were given an information pamphlet and the second stage of the interview was conducted to assess the attitude and change in preference for embryo transfer number. **Statistical Analysis Used:** The Chi-square and Fisher's exact test were applied to find an association between categorical variables. Logistic regression was used to assess the association between factors and outcomes. **Results:** eSET was the preferred choice for only 5.8% of the participants. Following our educational intervention using an information leaflet, there was a statistically significant increase in the preference for eSET ($P = 0.01$). Univariate logistic regression analysis revealed that participants with a monthly income of $\leq 50,000$ INR had a significantly higher preference for eSET. **Conclusion:** Continued emphasis on the risks of double-embryo transfer coupled with individualised selection criteria for eSET may help to achieve reasonable congruency between the clinician and couples' decision.

KEYWORDS: Assisted reproductive technology, attitude, elective single-embryo transfer, knowledge, self-funded cycle

INTRODUCTION

There has been an increase in the number of assisted reproductive technology (ART) cycles performed annually worldwide.^[1] The recent European Society of Human Reproduction and Embryology consensus reported a yearly increase of almost 8%–10% in the number of ART cycles conducted in Europe alone.^[1,2] While this rising trend of ART uptake

is likely to continue, the attendant risks of multiple pregnancies with the treatment remain an important concern, both at an individual and societal level. Compared with a singleton pregnancy, women carrying a multiple pregnancy are at an increased risk of maternal

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complications such as pre-eclampsia, and pre-term delivery as well as are associated with a higher risk of neonatal morbidity and mortality.^[3]

An earlier randomised controlled trial reported significantly lower multiple pregnancy rates with elective single-embryo transfer (eSET) as compared to double-embryo transfer (DET).^[4] Although the live birth rate (LBR) following fresh transfer was also found to be significantly lower in the eSET group as compared to DET, the cumulative LBR following frozen embryo transfer (FET) in the eSET group was comparable in both groups.^[4] The Cochrane update by Kamath *et al.* also reported an increase in the risk of multiple pregnancies with a higher number of embryos transferred.^[5]

In light of the current evidence, the embryo transfer policy has been revised from the transfer of multiple embryos to eSET, especially in women with a good prognosis.^[5,6] While the transition from triple-embryo transfer to DET has been easier, the acceptance of eSET in routine practice has been more difficult in certain parts of the world. While 38% of ART cycles in Europe and 71% of treatment cycles in the United States constituted eSET, only 10.2% of cycles in Southeast Asia constituted an elective transfer of a single embryo.^[7,8] The variation in the uptake of eSET as a policy is mainly due to concerns regarding the reduction in pregnancy rates following fresh eSET.^[7] Furthermore, the success of the eSET policy depends on a reliable cryopreservation program. Considering the patients' perspective, it entails increased cost and longer time to pregnancy. The global acceptance of the eSET policy has also been undermined by a lack of legislative policies in some parts of the world and inconsistencies in the availability and affordability of ART.^[7,8] This is especially relevant in low-resource settings where ART is mostly self-funded.

Amongst other reasons influencing acceptance of eSET as a policy, the knowledge and attitude of the couples undergoing ART about the issues related to multiple pregnancies play an important role. In a cross-sectional study conducted on the Danish population, the majority of the women preferred having twins primarily due to a desire for siblings and to alleviate physical and psychological stress associated with multiple ART attempts.^[9] In another study from North America, authors reported that awareness regarding the risks of twin pregnancy following the use of educational aids led to a significant number of women altering their initial desire for the transfer of multiple embryos to single-embryo transfer.^[10]

Couples play a pivotal role in the decision-making process especially concerning the number of embryos

to be transferred and it is important to know the factors contributing to this decision. Current literature on the knowledge and attitude of infertile couples towards single and multiple-embryo transfer is largely based on studies conducted in developed countries where ART cycles are either funded by the government or the insurance companies reimburse the cost.^[9-11] Availability of funding for ART treatment and the economic condition of the infertile couple has an important bearing on the treatment-related decisions.^[12,13] There is a paucity of data about the attitudes of couples undergoing self-funded ART cycles in developing countries. We planned a study to evaluate the knowledge and attitude of infertile couples undergoing ART towards eSET in self-funded treatment cycles in a low-resource setting.

MATERIALS AND METHODS

We conducted a cross-sectional study at a tertiary-level referral facility between February 2020 and September 2022. Ethical approval was granted by the Institutional Review Board (IRB) before the study dated 2 December 2019 (IRB Min No: 12434), and the study was carried out in accordance with the Helsinki Declaration.

All couples who underwent transvaginal oocyte retrieval during ART and were awaiting fresh or frozen embryo transfer were invited to participate in the study. Eligible couples, who were willing to participate, were enrolled in the study after taking written informed consent. We included all couples with at least two embryos available for transfer. Couples with no fertilised oocyte or only a single fertilised oocyte or only a single-embryo available for fresh or frozen transfer were excluded from the study. We also excluded those couples who had at least one living child. As per department policy, preceding initiation of ART, all couples attended group counselling, where all aspects of ART treatment, including attendant risks and complications, were explained in detail and all treatment-related queries were addressed, including costs. Subsequently, specific case-related queries were clarified during ART treatment booking appointments by the treating clinician.

We conducted an interviewer-administered questionnaire-based survey in two stages for the couples. Each participant was interviewed individually. Only two investigators were assigned for conducting interviews based on availability and a similar format was used by both interviews to avoid bias. The first stage involved the assessment of the knowledge of the participants regarding the transfer of single versus multiple embryos and the risks associated with possible multiple pregnancies. The principal investigator who interviewed the participants was not involved in

performing the embryo transfer. The interview was conducted in English, as well as regional languages, as per the preference of the participant. After completion of the first stage, participants were given an information pamphlet containing relevant information related to single- versus multiple-embryo transfer as well as risks associated with multiple pregnancies.

Subsequently, the second stage of the interview was conducted on the same day after allowing adequate time for participants to reflect on the information given. In the second stage of the interview, a questionnaire-based structured interview was conducted by the investigator. The attitudes of the participants regarding eSET were captured by recording their responses. We also assessed whether there was any difference in the number of embryos decided by the participants prior to and after reading through the information pamphlet.

Sample size

According to a previous study by Ryan *et al.*, knowledge regarding risks in twin pregnancy improved from 61% to 93% following the use of educational tools.^[10] Assuming to achieve this difference with 7% precision and 95% desired confidence level, the study required a total of 190 participants (95 couples).

Statistical analysis

Continuous data such as female and male age was presented using mean and standard deviation. The number of patients and percentage were presented for categorical data. Based on the normality of the data, the parametric *t*-test was applied to the data. The Shapiro–Wilk or Kolmogorov–Smirnov tests or histogram with summary values was used to test the hypothesis of normal distribution. The Chi-square and Fisher’s exact test were applied to find an association between categorical variables. Further, logistic regression was used to assess the association between factors and outcomes. The point estimate was reported as an odds ratio (OR) with a 95% confidence interval (CI). All tests were two-sided at $\alpha = 0.05$ level of significance. All analyses were performed using Statistical Package for Social Sciences (SPSS) software Version 21.0 (Armonk, NY, USA: IBM Corp).

RESULTS

A total of 95 couples were recruited for the study. The responses of the 190 participants were recorded individually using an interviewer-administered questionnaire. About 64.2% of the male partners had completed graduation and 25.3% were working as professionals. The majority of the women (77.9%) were unemployed [Table 1a]. The mean female and male ages were 31.0 ± 4.3 and 36.9 ± 4.4 , respectively [Table 1b].

Table 1a: Baseline demographic characteristics of the study population

Parameters	Number of couples (n=95), n (%)
Place	
Tamil Nadu	59 (62.1)
Other states	27 (28.4)
Foreign nationals	9 (9.5)
Family income (per month in INR)	
<20,000	18 (18.9)
20,000–50,000	50 (52.6)
>50,000	27 (28.4)
Wife education	
Primary	9 (9.5)
Secondary	13 (13.7)
Higher secondary	19 (20.0)
Graduate	43 (45.3)
Post-graduate	11 (11.6)
Husband education	
Primary	8 (8.4)
Secondary	12 (12.8)
Higher secondary	14 (14.7)
Graduate	44 (46.3)
Post-graduate	17 (17.9)
Wife occupation	
Unemployed	74 (77.9)
Unskilled	0
Semiskilled	1 (1.1)
Skilled	0
Clerical	0
Semiprofessional	3 (3.2)
Professional	17 (17.9)
Husband occupation	
Unemployed	4 (4.2)
Unskilled	8 (8.4)
Semiskilled	10 (10.5)
Skilled	6 (6.3)
Clerical	16 (16.8)
Semiprofessional	27 (28.4)
Professional	24 (25.3)

Around 78% of the couples were diagnosed with primary infertility and the mean duration of infertility was 7 years [Table 1b].

Amongst the couples, 68 (71.6%) were planned for frozen embryo transfer, 27 (28.4%) were blastocyst transfers and an average of five embryos (median and spread) were available for transfer [Table 1b]. The background knowledge regarding ART and embryo transfer number prior to our educational intervention is presented in [Tables 2a and 2b]. On initial assessment, while approximately three-fourths (76.8%) of the participants were aware of the lower risk of multiple pregnancies with eSET, the majority (64%) were not aware of the additional benefit of lower OHSS risk with

eSET [Table 2b]. Nine out of ten participants (91.6%) were aware of the increased risk of multiple pregnancy rates with the transfer of more than one embryo. Approximately 38%–55% of participants were aware of the attendant obstetrical complications such as an increased risk of miscarriage, gestational hypertension and diabetes mellitus, and postpartum haemorrhage associated with multiple pregnancies [Table 2b]. Approximately three fourth (78.4%) of the participants were aware of the higher risk of neonatal intensive care unit admissions following pre-term birth, commonly associated with multiple pregnancies. However, between 50% and 74% of participants did not identify feeding, caring for more than one infant, or physical and mental exhaustion as a problem with multiple pregnancies. This may be attributable to the availability of help and family support for the care of children for most of the participants (93.7%) [Table 2b].

Approximately one out of two participants (51.1%) preferred DET as compared to one in seven (13.7%) who preferred eSET after our educational intervention. In addition, one-third (32.1%) of participants preferred the transfer of more than two embryos, and 6 (3.2%) participants were unable to decide and preferred to opt for the treating clinicians' decision. Following our educational intervention using an information leaflet, there was a statistically significant increase in the preference for eSET (26 [13.7%] vs. 11 [5.8%]; OR 0.39; 95% CI 0.19 to 0.81; $P = 0.01$) [Table 3a]. Univariate logistic regression analysis revealed that participants with a monthly income of $\leq 50,000$ INR had a significantly higher preference for eSET (OR 0.18; 95%CI 0.41–0.79, $P = 0.02$) [Table 3b].

Amongst the couples who preferred eSET, almost 85% were of the opinion that the safety of the mother

and child was more important in spite of lower pregnancy rates, and they were comfortable with repeat embryo transfers if required [Table 4]. Amongst the couples who opted for double- or multiple-embryo transfers, the primary reason (78.5%) appears to be acceptance of higher maternal and neonatal complications in lieu of anticipated higher pregnancy rates. Although 38% of participants expressed concern about complications, 30.4% of participants preferred maximising success in a single cycle due to financial

Table 2a: Assessment of participant's knowledge regarding embryo transfer (before educational intervention)

Questions	Frequency (n=190), n (%)
What is an embryo?	
Oocyte	7 (3.7)
Organism resultant of fertilisation	173 (91.1)
Don't know	10 (5.3)
Success rate following eSET (%)	
<20	37 (19.5)
20–40	106 (55.8)
>40	41 (21.6)
Don't know	6 (3.2)
Number of embryos that can be transferred during an embryo transfer	
1	6 (3.2)
2–3	166 (87.4)
>3	13 (6.8)
Don't know	5 (2.6)
Cost involved in one IVF cycle (oocyte pick up and fresh transfer) (lakh)	
<1	15 (7.9)
1–2.5	152 (80.0)
>2.5	23 (12.1)
Additional cost involved with freezing embryo	
10,000–15,000	10 (5.3)
20,000–30,000	168 (88.4)
>30,000	7 (3.7)
Don't know	5 (2.6)
Cost of repeated transfers (frozen transfer)	
<15,000	8 (4.2)
15,000–20,000	80 (42.1)
>20,000	49 (25.8)
Don't know	53 (27.9)
What is higher-order pregnancy?	
<3	34 (17.9)
≥ 3	115 (60.5)
Don't know	41 (21.6)
Options available for managing higher order pregnancy (triplet)	
Conservative	11 (5.8)
Reduction	86 (45.3)
Don't know	93 (48.9)

IVF=*In vitro* fertilisation, eSET=Elective single-embryo transfer

Table 1b: Clinical characteristics of the study population (n=95)

Parameters	Number of couples (%)
Female age [‡]	31.0 \pm 4.3
Male age [‡]	36.9 \pm 4.4
Type of infertility	
Primary	74 (77.9)
Secondary	21 (22.1)
Duration of infertility (years) [†]	7 (5–10)
Type of transfer	
Fresh	27 (28.4)
Frozen	68 (71.6)
Stage of embryo	
Cleavage	68 (71.6)
Blastocyst	27 (28.4)
Number of available embryos [†]	5 (4–6)

[†]Presented as median (IQR), [‡]Presented as mean \pm SD.

IQR=Interquartile range, SD=Standard deviation

Table 2b: Assessment of participant's knowledge regarding embryo transfer (before educational intervention)

Questions	Yes, n (%)	No, n (%)	Don't know, n (%)
Awareness about having the option of choosing number of embryos transferred	97 (51.5)	39 (20.5)	54 (28.4)
Regulations regarding restriction on the maximum number of embryos which can be transferred	14 (7.4)	38 (20.0)	138 (72.6)
Main benefits with SET			
Reduced risk of multiple pregnancy	146 (76.8)	6 (3.2)	38 (20.0)
Reduced risk of OHSS	59 (31.1)	9 (4.7)	122 (64.2)
Main risk of SET-reduced pregnancy rates	125 (65.8)	39 (20.5)	26 (13.7)
Main risk of MET (>1 embryo)-increased risk of multiple pregnancy	174 (91.6)	3 (1.6)	13 (6.8)
Main benefit of DET-increased pregnancy rates	174 (91.6)	7 (3.7)	9 (4.7)
Main risk of transferring three embryos			
Higher-order pregnancy	63 (33.2)	8 (4.2)	119 (62.6)
High risk of OHSS	63 (33.2)	8 (4.2)	119 (62.6)
Complications associated with foetal reduction			
Miscarriage	67 (35.3)	5 (2.6)	118 (62.1)
Bleeding	65 (34.2)	8 (4.2)	117 (61.6)
Problems of twin babies in early childhood			
Feeding difficulty	49 (25.8)	141 (74.2)	-
Round-the-clock care	67 (35.3)	123 (64.7)	-
Physical and mental exhaustion for the mother	94 (49.5)	96 (50.5)	-
Enough help at home for managing two children	178 (93.7)	12 (6.3)	-
Awareness regarding risks of multiple pregnancies			
Pre-eclampsia	106 (55.8)	50 (26.3)	34 (17.9)
Gestational diabetes mellitus	102 (53.7)	52 (27.4)	36 (18.9)
Miscarriage	99 (52.1)	47 (24.7)	44 (23.2)
Pre-term birth	116 (61.1)	27 (14.2)	47 (24.7)
Operational interference at delivery	136 (71.6)	22 (11.6)	32 (16.8)
Post-partum haemorrhage	72 (37.9)	56 (29.5)	62 (32.6)
NICU admissions	149 (78.4)	19 (10.0)	22 (11.6)
Increased risk of congenital anomalies	64 (33.7)	72 (37.9)	54 (28.4)

NICU=Neonatal intensive care unit, SET=Single-embryo transfer, DET=Double-embryo transfer, MET=Multiple-embryo transfer, OHSS=Ovarian hyperstimulation syndrome

Table 3a: Preference for number of embryos transferred (before and after educational aid)

	Pre-intervention (n=190), n (%)	Post-intervention (n=190), n (%)	OR (95% CI)	P
SET	11 (5.8)	26 (13.7)	0.39 (0.19–0.81)	0.01*
DET	111 (58.4)	97 (51.1)	1.35 (0.90–2.02)	0.14
MET	57 (30.0)	61 (32.1)	0.91 (0.59–1.40)	0.66
Cannot decide	11 (5.8)	6 (3.2)	1.88 (0.68–5.20)	0.22

*Statistically significant. CI=Confidence interval, SET=Single-embryo transfer, DET=Double-embryo transfer, MET=Multiple-embryo transfer, OR=Odds ratio

and logistic constraints [Table 4]. Almost one out of three participants opted for DET and multiple-embryo transfer because of partner or family preference for twin pregnancy [Table 4].

Approximately two out of five participants preferred singleton births. Almost 96%–99% of them expressed concern about simultaneous expenses for two children and the safety of the mother as the main reasons for this decision [Table 4]. About 57.4% of the participants wanted twins, and 88% of them felt that the medical risks were acceptable and could be managed [Table 4]. About 55.3% of couples felt that foetal reduction could be made to decrease the maternal and neonatal risk

in higher-order pregnancies [Table 4]. We found no significant discordance (6.3% vs. 5.3%) between male and female partners in their responses for preference of single-embryo transfer. Utilisation of educational aid increased awareness of risks associated with multiple pregnancies from 61.1% to 96%.

DISCUSSION

The current study revealed that more than three fourth of the participants were aware of the benefits of eSET and the increased risk of maternal and neonatal complications associated with multiple pregnancies. Despite the awareness of the risk associated with

Table 3b: Univariate logistic regression analysis for possible predictive variables of participants which could influence the choice of elective single-embryo transfer versus multiple-embryos transfer (post-educational aid)

Variables	Levels	SET (n=26), n (%)	DET/MET (n=164), n (%)	OR (95% CI)	P
Age (years) [†]		34.2±6.6	33.9±5.0	1.01 (0.93–1.01)	0.83
Gender [‡]	Female	13 (50.0)	82 (50.0)	1.00 (0.44–2.29)	1.00
	Male	13 (50.0)	82 (50.0)		
Family income (per month in INR) [‡]	≤50,000	24 (92.3)	112 (68.4)	0.18 (0.41–0.79)	0.02*
	>50,000	2 (7.7)	52 (31.7)		
Education [‡]	Below graduate	11 (42.3)	64 (39.0)	0.87 (0.38–2.02)	0.75
	Graduate and above	15 (57.7)	100 (61.0)		
Infertility [‡]	Primary	20 (76.9)	128 (78.0)	1.06 (0.39–2.85)	0.89
	Secondary	6 (23.1)	36 (22.0)		
Duration of infertility (years) [†]		8.4±3.2	7.7±3.7	1.05 (0.94–1.17)	0.40

*Statistically significant, [†]Presented as mean±SD, [‡]Presented as frequency (%). CI=Confidence interval, OR=Odds ratio, SD=Standard deviation, SET=Single embryo transfer, DET=Double-embryo transfer, MET=Multiple-embryo transfer

multiple pregnancies, six out of every seven participants preferred the transfer of more than one embryo, citing lower pregnancy rates with eSET as the primary reason. A significant increase was seen in preference for eSET following an educational intervention. On further assessment of various parameters affecting the participant's decision for eSET, it was found that family income ≤50,000 INR was associated with a significantly higher uptake of eSET. Increased awareness of health-care expenses related to multiple pregnancies coupled with the increased cost of care and education of more than one child could be a contributory factor to the increase in acceptance of eSET following an educational intervention.

A cross-sectional study conducted in the UK that included 100 infertile women reported that only 5% of the participants preferred eSET.^[14] About 59% of women believed that twin pregnancy was a better outcome and 84% of women believed that multiple pregnancies were associated with increased maternal complications.^[14] Another questionnaire-based study conducted on 54 Nigerian women undergoing self-funded ART cycles found that only 5.6% of women desired eSET.^[11] About 39.2% of women who opted for multiple-embryo transfer cited the cost of repeated cycles as a factor for their preference. The current study results are broadly in agreement with the findings of these studies.^[11]

In a study by de Lacey *et al.*, (n = 150), conducted in Australia post-adoption of legislative policies for eSET, almost 58% (87 women) indicated a preference for eSET.^[15] On the contrary, Ryan *et al.*, in their study, amongst 110 infertile American couples, found that only 22% of the participants preferred eSET if given a choice in spite of an existing mandatory eSET policy.^[16] The main concern for most couples was lower pregnancy rates with eSET. It was further reported that there

was almost 40% increase in the proportion of subjects opting for eSET (22% to 61%) following the use of an educational aid to describe the risks and benefits of eSET vs. DET.^[16] The current study found an increase of 8% for preference eSET following an educational intervention. The difference in results could be attributed to cultural factors and the availability of funded ART cycles.

In a study conducted in the Danish population that included 818 participants, where the common practice was DET and up to three cycles were reimbursed, an electronic mail-based questionnaire evaluation suggested that about 40% of the participants desired singleton pregnancy due to inadvertent risks to the fetus and mother.^[9] The main reasons for about 60% of participants preferring twins were the desire for siblings (23.3%), a positive attitude towards twins (22.5%), and a desire to minimise physical and psychological stress associated with multiple IVF treatments (19.3%).^[9] It is noteworthy that only 6.2% of participants chose to opt for eSET in future cycles highlighting the physical and psychological effects of undergoing ART.^[9] This finding also suggests that couples' convictions regarding twin pregnancies were deep and unaffected by other factors such as considerations of the treatment costs and neonatal care.

The pressure to succeed with fewer attempts of ART cycles is high amongst clinicians and patients, particularly in settings where the cost of treatment is solely borne by the patients, making acceptance of eSET challenging.^[13,14] Almost all studies reporting a higher preference for DET suggest that although most couples are aware of complications with twins, they find it more acceptable as opposed to the risk of lower success rates and the need for repeat embryo transfers with eSET.^[9,14,15] This effect is further

Table 4: Assessment of the attitude of participants towards elective single-embryo transfer and reasons for preference for singleton or twin births (post-educational aid)

Questions	Yes, n (%)	No, n (%)	Don't know, n (%)
Decision (n=190)			
SET	26 (13.7)		
DET	97 (51.1)		
MET	61 (32.1)		
Can't decide	6 (3.2)		
Reason for preference for SET (n=26)			
Lower pregnancy rate is acceptable but the safety of mother and child is important	22 (84.6)	4 (15.4)	
Do not mind repeat embryo transfer (logistically and financially)	17 (65.4)	9 (34.6)	
Lower risk of OHSS	5 (19.2)	21 (80.8)	
Don't want twin pregnancy due to increased medical complications to mother and child	25 (96.2)	1 (3.8)	
Want only one child	4 (15.4)	22 (84.6)	
Partner's and family's choice	4 (15.4)	22 (84.6)	
Other reasons	0	26 (100)	
Reasons for preference of double or MET (n=158)			
Increase the chance of pregnancy in one cycle but worried about complications	60 (38.0)	98 (62.0)	
To complete family in a single IVF cycle	34 (21.5)	124 (78.5)	
Multiple pregnancy complications are acceptable and will manage but success is important	124 (78.5)	34 (21.5)	
Prefer maximising success in first cycle due to financial and logistical constraints	48 (30.4)	108 (68.4)	
Partner's and family choice	50 (31.6)	108 (68.4)	
Other reasons	10 (6.3)	148 (93.7)	
Preference for singleton or twin births (n=190)			
Singleton	74 (38.9)		
Twin	109 (57.4)		
Cannot decide	7 (3.7)		
Will opt for foetal reduction in case of higher order pregnancies	105 (55.3)	61 (32.1)	24 (12.6)
Reasons for preferring singleton births			
Happy with one child (complete family)	8 (10.8)	66 (89.2)	
Risk to mother and baby is less	71 (95.9)	3 (4.1)	
Currently planning one child. Will consider this in future	31 (41.9)	43 (58.1)	
Cannot bear expenses of two children at the same time	73 (98.6)	1 (1.4)	
Partner's and family choice	13 (17.6)	61 (82.4)	
Other reasons	1 (1.4)	73 (98.6)	
Reasons for preferring twin births			
Want to complete family in one treatment cycle	60 (55.0)	49 (45.0)	
Want to have twin babies since they are a joy	85 (78.0)	24 (22.0)	
Want to go through only one pregnancy	27 (24.8)	82 (7.2)	
Immediate and extended family have twins and everybody wants a twin	8 (7.3)	101 (92.7)	
Medical risks are acceptable, can manage	96 (88.1)	13 (11.9)	
Other reasons	15 (13.8)	94 (86.2)	

SET=Single-embryo transfer, DET=Double-embryo transfer, MET=Multiple-embryo transfer, IVF=*In vitro* fertilisation, OHSS=Ovarian hyperstimulation syndrome

compounded by financial and logistic constraints in the self-funded treatment, as suggested by the current study findings.

While most studies reported either the individual opinion of the women or the joint decision of the couples, in our study, we considered the individual opinion of each participant.^[13,15,17] We included women undergoing their first embryo transfer since a previous experience with an ART cycle could have influenced their preferences and introduced bias. In addition, the interviewer was

not involved in the clinical decision for the number of embryos or performing the embryo transfer. We resorted to the use of a structured questionnaire-based survey administered by an interviewer to record the responses of the included participants. This method helped to minimise attrition, as seen with other methods, including online or postal surveys. However, we agree that a structured interview may have restricted the ability of participants to express their thoughts and beliefs regarding embryo transfer in an uninhibited manner. The current study is

one of the first to assess the knowledge and views of infertile couples undergoing self-funded ART treatment in a low-resource setting. Considering that the psychosocial ramifications of infertility for the affected couples are quite widespread, along with financial considerations linked to self-funded ART cycles, it was important to understand the couple's decision-making process.

The results of the study will help us recognise important barriers to acceptance of eSET, especially from the patient's perspective. Policymakers should acknowledge this information while drafting legislative policies for embryo transfer numbers. A blanket policy for eSET may not be advisable, especially for couples undergoing self-funded ART cycles. Consideration must be given to providing financial assistance for ART with a focus on low-cost ART programs since the availability of funds seems to be a key factor influencing the couple's decision. The socio-cultural factors and undue pressure on women for motherhood in our society may contribute to the lower acceptance of eSET amongst women. The strategy of reducing the risk of multiple pregnancies by limiting the number of embryos transferred needs to be balanced against the attendant risk and wishes of the couples undergoing ART treatment.

CONCLUSION

The study findings suggest low acceptance of eSET in resource-limited settings. Affordability and availability of ART services and lower success rates following a single attempt with eSET seem to be major barriers to acceptance. However, a significant improvement in preference for eSET was seen following an educational intervention. Although absolute numbers were low, this difference represents an opportunity for change in approach. Continued emphasis on the risks of DET coupled with individualised selection criteria for eSET may help to achieve reasonable congruency between the clinician and couples' decision.

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Author contributions

MSK conceived the hypothesis. NPJ and MS carried out data collection and data entry. TJ and RK performed the analysis along with inputs from MSK and ATK. NPJ, MSK, and TJ drafted the manuscript, which was improved by ATK. All the authors appraised and approved the manuscript.

Consent to participate and publication

Written informed consent was taken prior to recruitment to the study.

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Conflict of interest

Dr. Mohan Shashikant Kamath is the Associate Editor of JHRS. He has had no role in peer-review process or editorial decisions.

Data availability statement

Data will be made available at request to the corresponding author pending institutional regulations.

REFERENCES

1. European IVF-monitoring Consortium (EIM)‡ for the European Society of Human Reproduction and Embryology (ESHRE), Wyns C, Bergh C, Calhaz-Jorge C, De Geyter C, Kupka MS, *et al.* ART in Europe, 2016: Results generated from European registries by ESHRE. *Hum Reprod Open* 2020;2020:hoaa032.
2. International Committee for Monitoring Assisted Reproductive Technologies (ICMART). Available from: <https://www.icmartivf.org/>. [Last accessed on 2021 Jun 17].
3. Bhattacharya S, Kamath MS. Reducing multiple births in assisted reproduction technology. *Best Pract Res Clin Obstet Gynaecol* 2014;28:191-9.
4. McLernon DJ, Harrild K, Bergh C, Davies MJ, de Neubourg D, Dumoulin JC, *et al.* Clinical effectiveness of elective single versus double embryo transfer: Meta-analysis of individual patient data from randomised trials. *BMJ* 2010;341:c6945.
5. Kamath MS, Mascarenhas M, Kirubakaran R, Bhattacharya S. Number of embryos for transfer following *in vitro* fertilisation or intra-cytoplasmic sperm injection. *Cochrane Database Syst Rev* 2020;8:CD003416.
6. Practice Committee of Society for Assisted Reproductive Technology, Practice Committee of American Society for Reproductive Medicine. Elective single-embryo transfer. *Fertil Steril* 2012;97:835-42.
7. Bergh C, Kamath MS, Wang R, Lensen S. Strategies to reduce multiple pregnancies during medically assisted reproduction. *Fertil Steril* 2020;114:673-9.
8. Chiware TM, Vermeulen N, Blondeel K, Farquharson R, Kiarie J, Lundin K, *et al.* IVF and other ART in low- and middle-income countries: A systematic landscape analysis. *Hum Reprod Update* 2021;27:213-28.
9. Højgaard A, Ottosen LD, Kesmodel U, Ingerslev HJ. Patient attitudes towards twin pregnancies and single embryo transfer – A questionnaire study. *Hum Reprod* 2007;22:2673-8.
10. Ryan GL, Sparks AE, Sipe CS, Syrop CH, Dokras A, Van Voorhis BJ. A mandatory single blastocyst transfer policy with educational campaign in a United States IVF program reduces multiple gestation rates without sacrificing pregnancy rates. *Fertil Steril* 2007;88:354-60.
11. Okohue JE, Onuh SO, Ikimalo JI, Wada I. Patients' preference for number of embryos transferred during IVF/ICSI: A Nigerian experience. *Niger J Clin Pract* 2010;13:294-7.
12. Jain T, Harlow BL, Hornstein MD. Insurance coverage and outcomes of *in vitro* fertilization. *N Engl J Med* 2002;347:661-6.
13. Pinborg A, Loft A, Schmidt L, Andersen AN. Attitudes of IVF/ICSI-twin mothers towards twins and single embryo transfer. *Hum Reprod* 2003;18:621-7.
14. Rai V, Betsworth A, Beer C, Ndukwe G, Glazebrook C. Comparing patients' and clinicians' perceptions of elective

- single embryo transfer using the attitudes to a twin IVF pregnancy scale (ATIPS). *J Assist Reprod Genet* 2011;28:65-72.
15. de Lacey S, Davies M, Homan G, Briggs N, Norman RJ. Factors and perceptions that influence women's decisions to have a single embryo transferred. *Reprod Biomed Online* 2007;15:526-31.
 16. Ryan GL, Zhang SH, Dokras A, Syrop CH, Van Voorhis BJ. The desire of infertile patients for multiple births. *Fertil Steril* 2004;81:500-4.
 17. Murray S, Shetty A, Rattray A, Taylor V, Bhattacharya S. A randomized comparison of alternative methods of information provision on the acceptability of elective single embryo transfer. *Hum Reprod* 2004;19:911-6.