Physician recommendation for invasive prenatal testing: the case of the ‘precious baby’

Naama Srebnik1,*, Talya Miron-Shatz2, Jonathan J. Rolison3, Yaniv Hanoch4, and Avi Tsafrir1

1Department of Obstetrics and Gynecology, Shaare Zedek Medical Center, the Hebrew University, Jerusalem 91031, Israel 2Center for Medical Decision Making, Ono Academic College, Kiryat Ono 55000, Israel 3School of Psychology, Queen’s University, Belfast BT7 1NN, UK 4School of Psychology, University of Plymouth, Plymouth PL4 8AA, UK

*Correspondence address. Tel: +972-2-6555562; Fax: +972-2-6666053; E-mail: srebnikn@szmc.org.il

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STUDY QUESTION: Do clinicians manage pregnancies conceived by assisted reproductive technologies (ART) differently from spontaneous pregnancies?

SUMMARY ANSWER: Clinicians’ decisions about prenatal testing during pregnancy depend, at least partially, on the method of conception.

WHAT IS KNOWN ALREADY: Research thus far has shown that patients’ decisions regarding prenatal screening are different in ART pregnancies compared with spontaneous ones, such that ART pregnancies may be considered more valuable or ‘precious’ than pregnancies conceived without treatment.

STUDY DESIGN, SIZE AND DURATION: In this cross-sectional study, preformed during the year 2011, 163 obstetricians and gynecologists in Israel completed an anonymous online questionnaire.

PARTICIPANTS, SETTING, METHODS: Clinicians were randomly assigned to read one of two versions of a vignette describing the case of a pregnant woman. The two versions differed only with regard to the method of conception (ART; n = 78 versus spontaneous; n = 85). Clinicians were asked to provide their recommendations regarding amniocentesis.

MAIN RESULTS AND THE ROLE OF CHANCE: The response rate among all clinicians invited to complete the questionnaire was 16.7%. Of the 85 clinicians presented with the spontaneous pregnancy scenario, 37 (43.5%) recommended amniocentesis. In contrast, of the 78 clinicians presented with the ART pregnancy scenario, only 15 (19.2%) recommended the test. Clinicians were 3.2 (95% confidence interval [CI]: 1.6–6.6) times more likely to recommend amniocentesis for a spontaneous pregnancy than for an ART pregnancy.

LIMITATIONS AND REASONS FOR CAUTION: The study is limited by a low response rate, the relatively small sample and the hypothetical nature of the decision, as clinician recommendations may have differed in an actual clinical setting.

WIDER IMPLICATIONS OF THE FINDINGS: Our findings show that fertility history and use of ART may affect clinicians’ recommendations regarding amniocentesis following receipt of screening test results. This raises the question of how subjective factors influence clinicians’ decisions regarding other aspects of pregnancy management.

STUDY FUNDING AND COMPETING INTERESTS: There was no funding source to this study. The authors declare no conflicts of interest.

Key words: infertility / ART / prenatal diagnosis / decision making / prenatal screening

Introduction

Some pregnancies may be deemed more valuable than others. Indeed, Minkoff and Berkowitz (2005) coined the term ‘precious baby’ to refer to a pregnancy achieved by assisted reproductive technologies (ART) and/or at an advanced maternal age and posited that such pregnancies are managed differently than others. For example, they hypothesized that, compared with the general population, such babies are more frequently delivered by cesarean section in the absence of clinical indication. Thus far, researchers have provided only indirect evidence to support the claim of differential management of ART pregnancies, largely based on cesarean delivery rates. Indeed, significantly higher rates of elective...
and emergent cesarean delivery were noted among ART pregnancies compared with spontaneous pregnancies (Reubnoff et al., 1997). For example, in a study comparing cesarean delivery rates among nearly 17,000 spontaneous and in vitro fertilization (IVF) pregnancies, researchers found a rate of 29% for spontaneous pregnancies, but 50% for IVF pregnancies (Sullivan et al., 2010). Others have reported a rate of cesarean delivery up to six times higher for oocyte donation pregnancies compared with spontaneous pregnancies (Soderstrom-Anttila et al., 1998; Yaron et al., 1998; Sheffer-Mimouni et al., 2002). This may be partially explained by well-described obstetrical factors typical to this group of patients (e.g., a high rate of twin pregnancies). However, one report on oocyte donation pregnancies found that there was no medical indication for about half of the cesarean deliveries (Pados et al., 1994). This is consistent with differential management of ART pregnancies and deliveries irrespective of medical factors.

Patient preferences may account for differential obstetrical management of ‘precious babies’. Indeed, there is ample evidence that pregnant women perceive ART and spontaneous pregnancies differently. For example, women who conceived through IVF experienced higher levels of pregnancy-related anxiety, especially with regard to health defects (McMahon et al., 1997) and pregnancy loss (Hjelmstedt et al., 2003a, b), compared with those who conceived by natural conception. The conception method may also impact women’s decision to undergo invasive prenatal procedures. Women who have conceived via an ART procedure are less likely to agree to invasive procedures like chorionic villus sampling (CVS) or amniocentesis. A large cohort study of ART pregnancies revealed that the age-corrected invasive testing rate was significantly lower among ART pregnancies compared with that of the general population (Gjerris et al., 2008). In another study, women explicitly mentioned infertility as a key factor in their decision to forgo invasive procedures (Moyer et al., 1999).

Do clinicians show a similar tendency and manage pregnancies differently depending on the method of conception? Currently, there is little empirical data on this question. We sought to explore this question using clinician recommendations for prenatal diagnosis of Down syndrome as a case in point. Many women perform tests to rule out this relatively common hereditary disorder of the fetus. While definitive diagnosis requires an invasive procedure (i.e., CVS or amniocentesis), several non-invasive serological and sonographic tests are available to identify pregnancies with a high risk of Down syndrome. In these high-risk cases, the risk associated with an invasive diagnostic procedure is deemed medically worthwhile relative to the potential benefit. The initial screening tests are estimated to detect 60–95% of all Down syndrome fetuses (Simpson, 2012). As these tests provide a numerical calculated risk for Down syndrome in each pregnancy, it is likely that, above a certain cutoff value, clinicians would recommend an invasive diagnostic procedure. We explored whether clinicians would provide different recommendations for ART and non-ART pregnancies, while holding maternal age and prenatal screening results constant.

**Materials and Methods**

Prior to data collection, we obtained approval for the study from the institutional review board committee of the Shaare Zedek Medical Center. We emailed a link to an anonymous online questionnaire to the directors of the four regional branches of the Israeli Society for Obstetrics and Gynecology and to the chairs of obstetrics and gynecology departments at Israeli hospitals, requesting that they distribute the link to all their staff members. Thus, we had the potential to reach all ~1,200 obstetricians/gynecologists and OB/GYN residents in Israel (Shen et al., 2010). We presented the survey both in the email and in the first screen of the survey website as a survey about ‘clinical decision making regarding pregnancy’.

All Israeli citizens are entitled to prenatal care covered by national health insurance including a serological screening test for Down syndrome, including alphafetoprotein, human chorionic gonadotrophin (hCG) and estriol, and an anatomic scan at mid-trimester. In addition, many women elect to perform such tests as Nuchal translucency, first trimester serological tests (pregnancy-associated plasma protein-A and free β-subunit of hCG) and an additional anatomic scan at 14–16 weeks. In Israel, a positive screening test result is defined as a risk of 1 : 380 or higher for Down syndrome (Israel Ministry of Health, 2007). According to Israeli guidelines, women with a positive screening test result (second trimester screening test result, or combined first and second trimester screening test results, higher than 1 : 380) are advised to have a diagnostic test (CVS or amniocentesis) for karyotyping, which is fully covered by the national health insurance. Amniocentesis is covered for all women age 35 and older, although the Israel Ministry of Health recommends that the decision to test be based on screening test results rather than solely on age. Amniocentesis is usually performed in hospitals and not in the community facilities where most women receive prenatal care. However, some clinicians who offer prenatal care also perform amniocentesis themselves and receive additional payment for performing the test.

We presented participants with a clinical scenario as part of a larger survey on views concerning invasive prenatal testing. Here, we report on data relevant to decisions on amniocentesis in spontaneous and ART pregnancies. The amniocentesis scenario described the case of a 37-year-old woman at 18 weeks gestation who had normal biochemical and sonographic screening test results for Down syndrome (i.e., a risk of <1 : 380). The scenario stated that all benefits and risks of performing or avoiding amniocentesis were discussed with the patient. Clinicians were randomly assigned to receive one of two versions of the scenario, describing either a spontaneous conception (n = 85) or a conception in the fourth IVF cycle following 3 years of infertility (n = 78).

We asked the clinicians to indicate their recommendation regarding amniocentesis after reading the scenario by selecting one of five options:

(i) I would recommend performing amniocentesis.
(ii) I would recommend performing amniocentesis if the risk according to screening test results is high in my opinion.
(iii) I would recommend avoiding amniocentesis.
(iv) I would refuse to state my opinion.
(v) None of the above reflects my opinion.

We informed the clinicians that their recommendation would affect the patient’s decision; thus, amniocentesis was a relevant option for the patient. After choosing an option, participants responded to a number of demographic questions (age, years of experience performing amniocentesis, etc.) and rated the degree of risk associated with amniocentesis by rating the statement ‘The risks of amniocentesis are negligible’, on a scale from 1 (completely disagree) to 5 (highly agree). Participants also reported the number of amniocenteses they performed annually.

**Statistical analyses**

We first computed a χ² test to examine whether clinicians’ recommendations were influenced by the method of conception described in the scenario. We then conducted a binary logistic regression analysis on whether or not clinicians recommended performing amniocenteses (Option 1) in the scenario, including demographic characteristics, years of experience, gender and clinical settings (hospital, community or both), and the degree of risk clinicians associated with amniocentesis as predictors. We further examined whether clinicians’ recommendations were influenced by the number of amniocenteses they perform each year. This analysis was conducted separately for clinicians
Results

Demographics

A total of 163 obstetrician/gynecologists completed the questionnaire. Of these, 44 (27%) were females. The participant age ranged from 34 to 75 years (M = 52.8, SD = 8.6), with years of experience after completing residency ranging from 0 to 40 (M = 17.8, SD = 9.5). About half (55%) of our sample reported not performing amniocentesis at all, 16% reported performing fewer than 10 amniocentesis procedures annually, 16% reported performing 10–50 and 14% reported performing >50 per year (Table I). Ten residents also completed the questionnaire, but were excluded from the analysis due to their relatively small number and the desire to limit the sample to experts.

Responses to the amniocentesis scenarios

Overall, across the spontaneous and ART pregnancy scenarios, the majority of clinicians either recommended amniocentesis without further qualification (Option 1; n = 52, 31.9%) or recommended amniocentesis if the risk according to screening test results was high in their opinion (Option 2; n = 51, 31.3%). Smaller proportions of clinicians recommended avoiding amniocentesis (Option 3; n = 21, 12.9%), refused to state their opinion (Option 4; n = 12, 7.4%) or stated that none of the options reflected their opinion (Option 5; n = 27, 16.6%). Thus, despite considerable variation in clinicians’ recommendations, a large proportion of them would recommend amniocentesis.

As hypothesized, the clinicians’ recommendations were influenced by whether or not the scenario described a spontaneous conception or a conception in the fourth IVF cycle following 3 years of infertility. Table II provides the proportion of clinicians who endorsed each possible recommendation for the two scenarios. Fewer clinicians recommended amniocentesis when the scenario described the IVF pregnancy (n = 15 of 78, 19.2%) compared with that described a spontaneous pregnancy (n = 37 of 85, 43.5%). Clinicians were 3.2 (95% confidence interval [CI]: 1.6–6.6) times more likely to recommend the test for a spontaneous pregnancy than for an ART pregnancy.

Characteristics of respondents to the amniocentesis scenarios

Next, we conducted a logistic regression analysis including demographic characteristics and risk ascribed to amniocentesis to determine whether any specific factor would help predict clinicians’ recommendations to undergo amniocentesis. Clinicians rated the risks associated with amniocentesis by responding to the statement ‘The risks of amniocentesis are negligible’, on a 6-point scale ranging from 1 (completely disagree) to 6 (highly agree). The clinicians’ responses are provided in Table I. The more clinicians agreed that the risks of amniocentesis were negligible, the more likely they were to recommend the test (odds ratio [OR]: 1.63; 95% CI: 1.23–2.15). Clinicians with greater years of experience were more likely to recommend the test (OR: 1.07; 95% CI: 1.03–1.12). Gender (OR: 1.34; 95% CI: 0.52–3.46) or clinical setting

### Table I Demographic characteristics of clinicians (N = 163).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Spontaneous pregnancy (N = 85)</th>
<th>ART pregnancy (N = 78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>52.76 (8.96)</td>
<td>52.86 (8.34)</td>
</tr>
<tr>
<td>Range</td>
<td>34–75</td>
<td>36–67</td>
</tr>
<tr>
<td>Gender (% of clinicians)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>27.40</td>
<td>26.90</td>
</tr>
<tr>
<td>Males</td>
<td>72.60</td>
<td>73.10</td>
</tr>
<tr>
<td>Years of experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>18.30 (9.28)</td>
<td>17.22 (9.76)</td>
</tr>
<tr>
<td>Range</td>
<td>0–40</td>
<td>0–37</td>
</tr>
<tr>
<td>Place of work (% of clinicians)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td>35.70</td>
<td>35.90</td>
</tr>
<tr>
<td>Community</td>
<td>39.30</td>
<td>29.50</td>
</tr>
<tr>
<td>Community and hospital</td>
<td>25.00</td>
<td>34.60</td>
</tr>
<tr>
<td>Number of physicians who perform the amniocentesis test by the number of tests they perform each year (% of clinicians)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 50</td>
<td>14.30</td>
<td>14.30</td>
</tr>
<tr>
<td>Between 10 and 50</td>
<td>13.10</td>
<td>18.20</td>
</tr>
<tr>
<td>Fewer than 10</td>
<td>14.30</td>
<td>16.90</td>
</tr>
<tr>
<td>None</td>
<td>58.30</td>
<td>50.60</td>
</tr>
<tr>
<td>The risks of amniocentesis are negligible (% of clinicians)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completely disagree</td>
<td>16.50</td>
<td>19.50</td>
</tr>
<tr>
<td>Disagree</td>
<td>32.90</td>
<td>27.30</td>
</tr>
<tr>
<td>Uncertain</td>
<td>3.50</td>
<td>13.00</td>
</tr>
<tr>
<td>Agree</td>
<td>28.20</td>
<td>23.40</td>
</tr>
<tr>
<td>Highly agree</td>
<td>18.80</td>
<td>16.90</td>
</tr>
</tbody>
</table>

### Table II Clinicians’ recommendations regarding amniocentesis (N = 163).

<table>
<thead>
<tr>
<th>Clinical scenario</th>
<th>Recommendation</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous</td>
<td>I would recommend performing amniocentesis.</td>
<td>37 (43.5)</td>
</tr>
<tr>
<td>ART pregnancy</td>
<td>I would recommend performing amniocentesis if the risk according to screening test results is high in my opinion.</td>
<td>22 (25.9)</td>
</tr>
<tr>
<td></td>
<td>I would recommend avoiding amniocentesis.</td>
<td>5 (5.9)</td>
</tr>
<tr>
<td></td>
<td>I would refuse to state my opinion.</td>
<td>8 (9.4)</td>
</tr>
<tr>
<td></td>
<td>None of the above reflects my opinion.</td>
<td>13 (15.3)</td>
</tr>
<tr>
<td></td>
<td>I would recommend performing amniocentesis.</td>
<td>15 (19.2)</td>
</tr>
<tr>
<td></td>
<td>I would recommend performing amniocentesis if the risk according to screening test results is high in my opinion.</td>
<td>29 (37.2)</td>
</tr>
<tr>
<td></td>
<td>I would recommend avoiding amniocentesis.</td>
<td>16 (20.5)</td>
</tr>
<tr>
<td></td>
<td>I would refuse to state my opinion.</td>
<td>4 (5.1)</td>
</tr>
<tr>
<td></td>
<td>None of the above reflects my opinion.</td>
<td>14 (17.9)</td>
</tr>
</tbody>
</table>
(hospital versus both hospital and community = OR: 0.66; 95% CI: 0.26–1.71; community versus both hospital and community = OR: 1.02; 95% CI: 0.40–2.64) did not significantly predict clinicians’ recommendations for amniocentesis.

We further examined whether clinicians’ recommendations were influenced by the number of amniocenteses they perform each year. We conducted our regression analyses separately for clinicians who perform amniocentesis in the community and those who perform amniocentesis privately. Clinicians who perform fewer than 10 tests (OR: 1.11; 95% CI: 0.36–3.41), between 10 and 50 tests (OR: 0.82; 95% CI: 0.26–2.61), and >50 tests (OR: 0.81; 95% CI: 0.26–2.56) in the community per year were not significantly more likely to recommend amniocentesis than those who do not perform amniocentesis in the community. Clinicians who perform fewer than 10 tests (OR: 1.66; 95% CI: 0.47–5.90), between 10 and 50 tests (OR: 3.28; 95% CI: 0.87–12.33), and >50 tests (OR: 0.89; 95% CI: 0.29–2.68) privately per year were also not significantly more likely to recommend amniocentesis than those who do not perform amniocentesis privately.

**Discussion**

Do obstetricians and gynecologists manage ART pregnancies (of so-called ‘precious babies’) differently from spontaneous ones? Specifically, do clinicians provide different invasive prenatal screening recommendations depending on the method of conception? Despite the small response rate, our results indicate that they may indeed do so. Clinicians were 3.2 times more likely to recommend amniocentesis in the course of a spontaneous pregnancy when compared with an ART pregnancy. Our data further show that clinicians’ years of experience and their perception that amniocentesis carries a low risk were associated with a greater likelihood of recommending the test, irrespective of the method of conception. However, the clinicians’ gender and clinical setting (community versus hospital) did not predict their recommendation.

Previous studies offer only suggestive evidence of a ‘precious baby’ phenomenon, largely through the examination of cesarean delivery rates among ART pregnancies (Sullivan et al., 2010) and oocyte donation pregnancies (Soderstrom-Antilla et al., 1998; Yaron et al., 1998). Our investigation was specifically designed to examine clinicians’ views independent of external influences (e.g. patient preference), thereby providing direct evidence of the phenomenon among clinicians.

We chose clinician recommendation for a Down syndrome diagnostic test (amniocentesis) as a case in point, because such recommendations are presumably based on validated, objective screening test results and on standardized criteria and cutoff points.

In addition to the objective risks associated with amniocentesis (Seeds, 2004), our data reveal that clinicians’ subjective risk assessments also determine their recommendations. Clinicians who deemed the risk of amniocentesis as negligible appeared more likely to recommend the test for both spontaneous and ART pregnancies. It seems that physician confidence in the test is an important factor in his/her decision about whether or not to recommend the test. Indeed, we also found that more experienced clinicians were more likely to recommend the test, perhaps reflecting confidence in the test and/or familiarity with the procedure. Our findings can be explained by the tendency toward loss aversion (Tversky and Kahneman, 1991). When considering a procedure that may endanger a pregnancy, the value ascribed to loss of that pregnancy may seem greater if the pregnancy was achieved by tremendous effort, thereby swaying the decision toward avoiding the procedure so as not to incur even the smallest risk of endangering the pregnancy. This interpretation is supported by the finding that clinicians who deemed the risk of amniocentesis to be negligible were more likely to recommend the test.

Although the screening results for the scenarios in the survey were described as normal, a large proportion of the clinicians recommended invasive prenatal testing, with a slightly larger proportion recommending testing if they deemed the screening test results to be high. This is not in accord with the Ministry of Health guideline that the decision to test be based on screening test results and suggests that clinicians generally adopted a more liberal cutoff than that set by the Ministry. A cutoff is established considering false-negative and false-positive rates in the context of the need to minimize the number of invasive tests. Thus, clinicians’ adoption of a more liberal risk cutoff may result in more invasive tests and potentially a higher rate of complications. It is beyond the scope of the present study to evaluate the reasons for clinician adoption of a subjective cutoff that deviates from established guidelines, though this is an important topic for further examination.

That experts form judgments in a manner not necessarily consistent with rational decision making has been shown repeatedly in clinical psychologists (Oskamp, 1965; Ben-Shakhar et al., 1998), human resource managers (Miron-Shatz and Ben-Shakhar, 2008), accountants (Cloyd and Spilker, 1999; Cloyd et al., 2000) and clinicians (Ubel et al., 2011; Wegwarth et al., 2011). Interestingly, even highlighting information already known to clinicians (e.g. the notion of their own mortality) affects their risk assessments for patients (Amdt et al., 2009). This suggests that clinicians are not immune to assess biases or the effects of information salience on their decisions and risk assessments. Awareness of such biases is the first step toward helping to optimize the way clinicians make decisions under uncertainty. The next step would be to emphasize an evidence-based approach in physician decision making that relies on objective information and proven benefit of testing and other recommendations.

Our study has a number of limitations. First, we are unable to ascertain the true representativeness of our sample. The survey was broadly distributed, potentially reaching all obstetrician/gynecologists and ob/gyn residents in Israel (~1200; Shen et al., 2010), but was completed by only 14% of them (or 16% of the ~1000 obstetrician/gynecologists, as residents were ultimately excluded from analysis). However, in the absence of data on how many failed to receive the email link to the survey, we cannot report a true response rate. Still, because confounding factors like age, gender and clinical settings (hospital versus community) did not affect the results, a selection bias for respondent answers appears to be unlikely. Further, our sampling rate is higher than the 7% of Israeli physicians sampled in a recent national survey (Asher et al., 2012) and comparable with those of other surveys of the membership of large medical associations (Raffi et al., 2012; Ghaderi et al., 2013). Secondly, we had a relatively small sample size. Thirdly, as the decisions clinicians faced were hypothetical, their recommendation may have been different in an actual clinical setting. This limitation notwithstanding, our approach allowed us to examine the variable of interest, whether the pregnancy was perceived as ‘precious’, in a controlled manner. Finally, the clinicians’ personal attitude toward Down syndrome may have influenced their recommendation on prenatal testing, although random assignment to each scenario should have eliminated any between-group difference.

Because risk perception by the women, and risk presentation by physicians, are so crucial to the comprehension of the decision process, the field has benefited from studies that have recorded the interaction...
around physician recommendation for amniocentesis (Marteau et al., 1993), as well as from work that has traced women’s use of decision aids regarding amniocentesis (Durand et al., 2013). The field could benefit from interviews and qualitative analysis of responses from physicians regarding their considerations in recommending amniocentesis to women who conceived either naturally or through ART; therefore, further qualitative investigation is warranted.

In conclusion, our findings show an effect of fertility history and use of assisted reproductive techniques on clinicians’ recommendations regarding performing amniocentesis following receipt of screening test results. Even without a medical indication, more clinicians would recommend amniocentesis to a woman with normal screening test results in a spontaneous pregnancy than to a pregnant woman with such screening test results after infertility treatments. Thus, clinicians do not appear to be immune to the ‘precious baby’ phenomenon.

**Authors’ roles**

N.S., T.M.-S., J.J.R., Y.H. and A.T. were involved in the data collection and analysis, and the writing and critical revision of the manuscript. N.S., T.M.-S., Y.H. and A.T. also contributed to the study design and conception.

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**Conflict of interest**

The authors declare no conflicts of interest.

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