Research Article

Maternal and Paternal Age at Pregnancy for Low Incidence Trisomy Groups: Preliminary Findings and Implications

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Abstract

A number of studies have found a correlation between later maternal age and increased chances for conception of children with trisomy conditions while other studies have not. This inconsistency, along with collecting data on paternal age, deserves examination. The purpose of the present study is to examine maternal and paternal age at pregnancy related to children diagnosed with trisomy18, trisomy 13, and trisomy 9 mosaics. Results from 287 mothers and 285 fathers found that the majority of mothers were under the age of 35 (58.9% total). Paternal age closely mirrored mother's age with 54.7% of fathers under the age of 35. Implications for additional research and for healthcare professionals including genetic counselors working in clinical settings are provided.

Keywords: Trisomy 13; Trisomy 18; Trisomy 9; Maternal age at pregnancy; Paternal age at pregnancy

Maternal and Paternal Age at Pregnancy for Low Incidence Trisomy Groups: Preliminary Findings and Implications

The average age of first time mothers in the United States has increased from 21.4 years in 1970 to 25.0 years in 2006 [1]. This increase in maternal age means that all children, regardless of the presence of a genetic condition or other disability, are being born to older mothers. In 2011, births in the United States were primarily to women in the 25-29 year age range, closely followed by women in the 30-34 year age range. Births to women aged 20-24 years have slowly decreased since 1995 and births to women ages 35-39 has been slowly increasing since 1990 [2]. Despite the trend of older mothers, there are still many more births to younger women. In 2011 in the United States, there were 3,373,211 total births to women under the age of 35 in comparison to 580,379 births to women ages 35 and older [2].

The Centers for Disease Control and Prevention (CDC) report that Down syndrome (trisomy 21) occurs in 1/691 births. Edward syndrome (trisomy 18, t18) and Patau syndrome (trisomy 13, t13) are the most common autosomal trisomies after Down syndrome. Trisomy 18 occurs in 1/3762 births and trisomy 13 occurs in 1/7906 births [3]. The CDC also states that Down syndrome is increasing among mothers 35 years and older [4]. This statement about mothers' age has also been applied to t18 and t13 [5]. Furthermore, in the U.S. women over 35 are considered high-risk and routinely referred for diagnostic testing for Down syndrome and other genetic conditions regardless of prior genetic screening [6]. It is important to note that trisomies are the result of an error of chromosome separation. This causation is in contrast with conditions arising from specific maternal or paternal factors such as spina bifida related to limited maternal folic acid intake.

Irving and colleagues (2011) conducted a population-based study of one United Kingdom health region and found that 45% of t18 pregnancies were to mothers over the age of 35 as were 31% of t13 pregnancies. The authors report that between 1985 and 2007, the percentage of mothers over 35 increased from six to 15%. Additional studies draw similar conclusions. Observed increases in prevalence of t18 and t13 from 1989-2004 were attributed to changes in maternal age distribution [7]. Advanced maternal age has been associated with an increased risk of trisomy conditions including t18 and t13 [8]. Longitudinal studies have found an increase in the number of children born with a trisomy condition to older mothers. A twenty-year study in Europe found that the prevalence of trisomy 21, trisomy 18, and trisomy 13 for women aged 35 and over increased from 13% to 19% [9].

Despite studies described above that have found a correlation between maternal age and trisomy conditions, some have not. Goldstein & Nielson (1988) reported rates of t18 and t13 during a 10-year period (1977-1986) in Denmark. Of a total of 19 live born children with t18 or t13, all were born to mothers aged 34 and younger. During that same time period, 76 live born children with trisomy 18 were reported in Denmark, and seventy were to mothers 34 years and younger [10]. Data such as these are important for prenatal counseling so that parents to-be are aware that rare trisomy conditions can occur at any time during the childbearing years.

More recently, Texas births between 1999 and 2003 were examined and the following maternal age statistics were found. During the four-year period, there were 200 live births of infants with t18. One hundred seventeen were to mothers aged 34 and younger and 83 to mothers aged 35 and older. Of 140 live births of infants with t13, 104 were to mothers aged 34 and younger, and 36 to mothers age 35 and older [11]. An analysis of European births in 12 countries between 1980 and 2005 found mean maternal age for t13 to be 33.2 years (SD ± 6 years) and 34.6 (SD ± 6.3 years) for mothers with children with t18 [12]. Another European study screened 56,076 mothers in Finland and found 30 cases of t18 and 10 cases of t13. Mean maternal age was 34.2 and 31.1, respectively [13]. Furthermore, in Bruns' (2011) [14] analysis of long-term survivors with t13, mean maternal age was 30.7 years with a range from 19 to 45 years (SD ± 6.14). Fathers were slightly older (M=32.6 years; SD ± 7.43; range 19-49 years). Additional age data from Bruns and Campbell's (accepted for publication) [15] analysis of survivors living more than one year with t18 found mean maternal age to be 31.57 years (SD ± 6.27) and mean paternal age at birth to be 33.10 (SD ± 6.53). Bruns (2010) [16] reported maternal age at conception in her study of neonatal experiences for infants with t18 and mean age was 34.1 (SD ± 6.73).

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In addition to t18 and t13, children and adults with trisomy 9 mosaic (t9m; no individuals with full t9 are reported as live births) are reported in the literature. Maternal age is reported for a very small number of cases as the majority of research describes sonographic findings and physical anomalies [17,18] or autopsy results [19]. More recently, Okumura, Hayakawa, Kato, Kuno and Watanabe (2000) [20] reported two cases of t9m with 24 and 25 year old mothers, respectively. Maternal age reported in Bruns's (2011) [21] series (n=14) revealed older mothers. Mean age was 34.9 years (range 25-41 years).

Clearly, there are inconsistencies regarding maternal age and low incidence trisomy conditions. For example, general statements in the literature claim trisomy conditions are more likely in mothers 35 and older. Yet, many studies do not report detailed information about maternal age or include paternal age. Given data describing rising maternal age, it is important for genetic counselors and other professionals who will interact with would-be parents receiving a rare trisomy diagnosis (e.g., neonatologists, pediatricians, neonatal nurses) to be aware that these conditions occur at all ages, and may not be occurring more commonly in older mothers.

The purpose of the present study is to examine maternal and paternal age at pregnancy with their children with full t18, full t13, and t9m. The results represent infants with full t18 and t13 as evidenced by parent report based on diagnostic information they received prenatally or shortly after their infant's birth.

Method

The Tracking Rare Incidence Syndrome (TRIS) project began in 2007 to collect, analyze, and disseminate data about children with rare incidence syndromes. To date, over 500 participants have enrolled in the project with over 150 providing longitudinal data on their child's progress. Results have been shared with clinical geneticists, nurses and other medical professionals.

The TRIS Survey is the data collection instrument. There are three versions: (a) TRIS Full Survey for children living two months or more, (b) TRIS Modified Survey completed for infants living up to 60 days, and (c) TRIS Follow-up Survey which is completed annually with updates to medical, therapy and developmental information. The data presented in this manuscript is from demographic items collected on the TRIS Modified and TRIS Full Survey. A more detailed description of the surveys is available in Bruns (2010, 2011a, 2011b) [14,16,10] and the project at http://web.coehs.siu.edu/Grants/TRIS/

Procedure

After receiving approval from Human Subjects Committee, parents were recruited through postings on trisomy-related listservs and Facebook groups, invitations on parent support organization websites such as Hope for Trisomy 18 and 13 (http://www.hopefortrisomy13and18.org/), announcements in related newsletters such as the one disseminated by the Support Organization for Trisomy 18, 13 and related disorders (SOFT; http://trisomy.org/) and contact with parents at SOFT Conferences.

To enroll, participants provide their name, phone number, state/province and country, e-mail address along with child's name, date of birth and death (if appropriate) and trisomy type. The TRIS Research Coordinator then sends each participant a login and password via email to access the survey within 48 hours. There is also a paper option.

The TRIS project's Web site (http://web.coehs.siu.edu/Grants/TRIS/) directs participants to a secure server with information about the TRIS Full and Modified Survey and a consent form. Participants use their log in and password to access the appropriate survey.

Participants

Between February 1, 2007 and February 1, 2013, 253 TRIS Full Surveys were completed for children and adults with t18, t13 and other rare trisomy conditions. Of the total, 70 (27.7%) represented children with full t18 between two and 394 months of age. At the time of survey completion, 75.7% were living (n=53). Mean age was 77.6 months (SD ± 91.1 months; range 3-394 months). The remainder was deceased (n=17, 24.3%). Mean age was 40.4 months (SD ± 68.9; range 2-258 months).

An additional 14.6% of completed surveys represented children with full t13 between 2 and 239 months of age (n=37) with over half (59.4%, n=22) living at the time of survey completion. Mean age was 47.5 months (SD ± 46.3 months; range 2-167 months). The deceased (n=15, 40.5%) represented a mean age of 50.3 months (SD ± 72.7 months; range 2-239 months). Finally, 19 (7.5%) were children diagnosed with t9m between 2 and 293 months of age. Almost all children were still living (n=18, 94.7%) Mean age was 67.4 months (SD ± 81.0 months; range 2-293 months). At the time of survey completion, only one child was deceased (nine months of age).

In addition, during the same time period, 171 TRIS Modified Surveys were completed for children and adults with t18, t13, and other rare trisomy conditions. Of the total, 51 (29.8%) represented children with full t18 between 0 and 62 days of age. Mean age was 9.8 days (SD ± 17.9 days). An additional, 112 (65.5%) represented children with full t13. Mean age was 8.8 days (SD ± 16.6 days). Finally, 1 (0.6%) represented children with t9 mosaic. The infant passed away on the day of birth.

In sum, a total of 121 parents with children with t18 completed a survey, 149 parents with children with t13, and 20 parents with t9 mosaic. In each group, the majority of parents were married (n=101, 83.5%, n=127, 85.2%, n=16, 80.0%, respectively). Mother's education level varied from less than a high school degree to master's or greater.

Table 1: Demographic data.

	Full t18 n(%) n=119	Full t13 n(%) n=148*	t9 mosaic n(%) n=20
Marital status			
Single	7 (5.7%)	1 (0.7%)	1 (5.0%)
Long-term relationship	3 (2.5%)	7 (4.7%)	1 (5.0%)
Partnered	0 (0.0%)	2 (1.3%)	0 (0.0%)
Married	101 (83.5%)	127 (85.2%)	16 (80.0%)
Separated	5 (4.1%)	1 (0.7%)	1 (5.0%)
Divorced	3 (2.5%)	6 (4.0%)	0 (0.0%)
Widowed	0 (0.0%)	1 (0.7%)	1 (5.0%)
Education level			
Less than 6 years	0 (0.0%)	8 (5.4%)	0 (0.0%)
7-9 years	1 (0.8%)	2 (1.3%)	0 (0.0%)
10-12 years	22 (18.2%)	25 (16.8%)	2 (10.0%)
13-16 years	56 (46.3%)	65 (44.0%)	9 (45.0%)
17-20 years	33 (27.3%)	37 (24.8%)	9 (45.0%)
More than 20 years	7 (5.8%)	11 (7.4%)	0 (0.0%)
Income level	N=118		
Low	13 (10.7%)	20 (13.4%)	2 (10.0%)
Middle	96 (79.3%)	115 (77.0%)	17 (85.0%)
High	9 (7.4%)	13 (8.7%)	1 (5.0%)

*3 marital status questions missing due to adoption

Interestingly, all participants resided in the United States, (Additional participants in the TRIS project represent countries including Australia, Canada, Germany and Norway). See Table 1 for additional information.

Analysis

Data was downloaded from the TRIS project website in .csv file format. Initial visual inspection identified instances of missing data. These files were then copied into SPSS 20.0 (SPSS, 2011) [22]. Analyses of frequencies and percentages were conducted. In addition to visual inspection and descriptive statistics reported for each trisomy group and survey type, an independent sample t-test was run to check for differences between parents' ages on the TRIS Full Survey compared with the TRIS Modified Survey. The null hypothesis was that mean ages would be equal across the two groups.

Table 2: Full t18 maternal age at pregnancy.

Full Survey (n=68*)		Modified Survey (n=51)	
	n (%)		n (%)
15-24 years	11 (16.2%)	15-24 years	9 (17.6%)
25-34 years	23 (33.8%)	25-34 years	15 (29.4%)
35-44 years	34 (50.0%)	35-44 years	26 (51.0%)
45-54 years	0 (0%)	45-54 years	1 (2.0%)
<35 years	34 (50.0%)	<35 years	24 (47.0%)
>35 years	34 (50.0%)	>35 years	27 (53.0%)

* two responses missing due to adoption

Table 3: Full t13 maternal age at pregnancy.

Full Survey (n=36*)		Modified Survey (n=112)	
	n (%)		n (%)
15-24 years	5 (13.9%)	15-24 years	24 (21.4%)
25-34 years	20 (55.5%)	25-34 years	52 (46.4%)
35-44 years	10 (27.7%)	35-44 years	35 (31.3%)
45-54 years	1 (2.7%)	45-54 years	1 (.9%)
<35 years	25 (69.4%)	<35 years	76 (67.8%)
>35 years	11 (30.5%)	>35 years	36(32.2%)

*one response missing due to adoption

Table 4: t9 mosaic maternal age at pregnancy.

Full Survey (n=19)		Modified Survey (n=1)	
	n (%)		n (%)
15-24 years	1 (5.3%)	15-24 years	0 (0%)
25-34 years	8 (42.1%)	25-34 years	1 (100%)
35-44 years	10 (52.6%)	35-44 years	0 (0%)
45-54 years	0 (0%)	45-54 years	0 (0%)
<35 years	9 (47.4%)	<35 years	1 (100%)
>35 years	10 (52.6%)	>35 years	0 (0%)

Table 5: Maternal Mean, Mode, Range and Standard Deviation across trisomy conditions.

	Mean	Mode	Range	Standard deviation
t18				
Full Survey (n=68*)	32.7	39 (n=8)	19-42	+6.5
Modified Survey (n=51)	33.1	40 (n=5)	19-45	+7.4
t13				
Full Survey (n=36**)	31.0	32,4 (n=4)	19-45	+6.3
Modified Survey (n=112)	30.6	29 (n=9)	18-45	+6.7
t9 mosaic				
Full Survey (n=19)	34.8	32,4(n=3)	24-41	+4.8
Modified Survey (n=1)	26.0	26 (n=1)	26-26	+0.0

*two missing due to adoption
** one missing due to adoption

Results

Overall, results reveal maternal age as largely contradictory to what is widely reported in the literature. Paternal age varied across groups. In addition, all data discussed below is from parents with a child with full t18 full t13 or t9m.

Overall, data from the TRIS Full and Modified Surveys indicated mothers with children with full t18 were almost evenly distributed between the under and over 35 age groups (n=58, 61, respectively). A majority of mothers with children with full t13 were under versus over the age of 35 during pregnancy (n=101, 47 respectively). Finally, the t9 mosaic group was split with 10 mothers under 35 and 10 mothers 35 years and over. Fathers with children with full t18 were closely distributed between the under and over 35 age groups (n=58, 61, respectively). They were generally younger than 35 years if their child was diagnosed with full t13 and older for children with t9m.

Maternal data

Visual inspection of the age ranges for mothers with children with full t18 (total n=119, TRIS Full Survey=68, TRIS Modified Survey=51) shows an equal number of women who were 35 and over compared with those who were younger than 35 for the TRIS Full Survey (n=34, 50 %). Mothers completing the TRIS Modified Survey showed slightly more women in the 35 and older age range (n=27, 53%) than younger than 35 (n=24, 47%). See Table 2 for more information on mothers with children with full t18. Mean age at pregnancy of mothers completing the TRIS Full Survey and TRIS Modified Survey for their children with full t18 are 32.7 years and 33.1 years respectively.

Age ranges for mothers with children with full t13 (total n=148; TRIS Full Survey=36, TRIS Modified Survey=112) completing the TRIS Full Survey show a majority in the 25-34 years age range (n=20, 55.5%). Age ranges for mothers with children with full t13 who completed the TRIS Modified Survey also shows a majority in the 25-34 years age range (15-24 age range: 21.4%; 25-34 age range: 46.4%; 35-44 age range: 31.3%; 45-54 age range: .9%). See Table 3 for more information. The means for the full 13 groups (31.0 years, 30.6 years, respectively) are similar and both under 35 years of age.

For the t9m group (n=20, TRIS Full Survey=19, TRIS Modified Survey=1), data indicates equal age distribution between mothers under and over 35 years of age at pregnancy. A slim majority of mothers completing the TRIS Full Survey were in the 35-44-age range (n=10, 52.6%) at pregnancy. Table 4 provides additional information. The mean age for t9m was 34.8 years. Table 5 provides additional information on mothers' ages, but importantly, the mean is below 35 across all surveys.

An independent t-test found no significant difference in mother's age across surveys (Table 2). Independent t-test for all mothers with infants with full t18 (p=.778; α=.05); mothers with infants with full t13 (p=.473; α=.05) and for mothers with infants with t9 mosaic (p=.089; α=.05) indicated no significant differences in age at pregnancy across groups.

Paternal data

Visual inspection of TRIS Full Survey results for paternal age for children with full t18 shows 47% (n=32) of fathers were in the 35-44 age range and most fathers overall were over 35 years of age (n=38, 55.8%). Data from the TRIS Modified Survey indicated slightly younger ages with 23 in the 25-34-age range (45.0%) and under 35 years of age (n=28, 54.9%) compared with 45% who were 35 and older (n=23). Mean age of fathers completing the TRIS Full Survey and TRIS Modified Survey for their children with full t18 are 34.8 years

Table 6: Full t18 paternal age at pregnancy.

Full Survey (n=68*)		Modified Survey (n=51)	
	n (%)		n (%)
15-24 years	4 (5.8%)	15-24 years	5 (9.8%)
25-34 years	26 (38.2%)	25-34 years	23 (45.0%)
35-44 years	32 (47.0%)	35-44 years	21 (41.1%)
45-54 years	6 (8.8%)	45-54 years	2 (3.9%)
<35 years	30 (44.1%)	<35 years	28 (54.9%)
>35 years	38 (55.8%)	>35 years	23 (45%)

* two responses missing due to adoption

Table 7: Full t13 paternal age at pregnancy.

Full Survey (n=36*)		Modified Survey (n=110)**	
	n (%)		n (%)
15-24 years	5 (13.8%)	15-24 years	13 (11.8%)
25-34 years	18 (50.0%)	25-34 years	54 (49.1%)
35-44 years	11 (30.6%)	35-44 years	40 (36.4%)
45-54 years	2 (5.5%)	45-54 years	3 (2.7%)
<35 years	23 (63.8%)	<35 years	67 (60.1%)
>35 years	13 (36.1%)	>35 years	43 (39.1%)

* one response missing due to adoption
** two responses not provided on survey

and 33.7 years, respectively. See Table 6 for more data on paternal age for fathers with children with full t18.

Data from the TRIS Full Survey for fathers with children with full t13 (n=36) indicated a younger group with 50.0% (n=18) in the 25-34-age range. Overall, most fathers in this group were under 35 (n=23, 63.8%) at pregnancy. Data from the TRIS Modified Survey followed a similar pattern with most fathers in the 25-34-age range (n=54, 49.1%), and most under the age of 35 (n=67, 60.1%). The paternal age means for the full 13 groups (32.1 years, 33.1 years) are similar. See Table 7 for more information.

Paternal age for fathers who completed the TRIS Full Survey with infants with t9m revealed 63.2% were 35 and older (n=12), with most in the 35-44-age range (57.9%) (n=11). One father was represented in the Modified Survey data for t9 mosaic and was identified as in the 25-34 years age group. The mean age for the t9m fathers was 36.2 years. See Table 8 for additional information.

While paternal age means were mostly under the age of 35, with t9m being the exception, they were slightly higher than mothers' mean ages (Table 9). In addition, no statistical differences were found for any group (full t18, full t13, t9 mosaic) when independent t-tests were run (p=.391; α=.05, p=.483;α=.05, p=.480; α=.05, respectively).

Discussion

Results indicate similar numbers of mothers aged under and over age 35 at pregnancy (full t18: n=119, 58 under 35, 61 were 35 and over; full t13: n=148, 101 under 35, 47 were 35 and over; t9m: n=20, 10 under 35, 10 35 and over). More specifically, mothers of children with full t18 and t9m were closely split between those under and over 35 years at pregnancy. Fathers followed a similar pattern (full t18: n=119, 58 under 35, 61 were 35 and over; full t13: n=146, 90 under 35, 56 were 35 and over; t9m: n=20, 8 under 35, 12 were 35 and over).

Previous studies have reported that trisomy conditions are more common in mothers over the age of 35 [4,5,7]. However, data described here also found a more than expected number of mothers under the age of 35. These results are similar to those reported in Goldstein and Nielson and Vendola et al. It is also important to note available data on trends related to pregnancy age for mothers having

Table 8: t9 mosaic paternal age at pregnancy.

Full Survey (n=19)		Modified Survey (n=1)	
	n (%)		n (%)
15-24 years	1 (5.3%)	15-24 years	0 (0.00%)
25-34 years	6 (31.6%)	25-34 years	1 (100%)
35-44 years	11 (57.9%)	35-44 years	0 (0.00%)
45-54 years	1 (5.3%)	45-54 years	0 (0.00%)
<35 years	7 (36.9%)	<35 years	1 (100%)
>35 years	12 (63.2%)	>35 years	0 (0.00%)

Table 9: Paternal Mean, Mode, Range and Standard Deviation across trisomy conditions.

	Mean	Mode	Range	Standard deviation
t18				
Full Survey (n=68*)	34.8	39 (n=8)	19-50	+ 6.8
Modified Survey (n=51)	33.7	28, 3 (n=4)	20-47	+ 7.2
t13				
Full Survey (n=36**)	32.1	26, 3 (n=3)	19-49	+ 7.3
Modified Survey (n=110***)	33.1	34 (n=12)	19-84	+8.0
t9 mosaic				
Full Survey (n=19)	36.2	41(n=4)	23-48	+ 5.7
Modified Survey (n=1)	32	n/a	n/a	n/a

*two missing due to adoption
**one missing due to adoption
***two responses not provided on the survey

children without trisomy conditions. In a 2009 report, the Center for Disease Control reported that approximately one in 12 first births were to women aged 35 years and over. This was in sharp contrast to one in 100 45 years ago [1]. This report's also indicated the same trend toward older first time mothers across developing countries.

Furthermore, the paternal age data included in this study is new for the field. Few researchers have included this variable [12] and none with describing the samples sizes described here. There is a need for the field to examine paternal age for trends similar to investigations of maternal age. This is especially true when, as data indicate here, pregnancy with a child with full t18, full t13 and t9 mosaic can occur at any time at the childbearing years.

Limitations

While the sample described here was larger than what is currently reported in the literature, it represents parents who self-selected to participate in the project. Age at pregnancy may be younger overall since participation requires knowledge of online survey methodology, which some older parents may not be familiar or comfortable with.

Conversely, the sample was small especially for parents with children with t9m but the overall prevalence rate for this group is lower compared to full t18 and full t13 (Jones, 2013). The samples for full t18 and full t13 were also larger due to the second author's personal contact with some mothers and, in turn, mothers' contacts with other parents to join the TRIS project. Information was also shared via groups such as the Living with Trisomy 13 online support group. The overall sample may not be representative of the larger population of mothers and fathers with a child with one of these genetic conditions.

In addition, non-completion of TRIS Survey items resulted in an incomplete data set for analysis. There were two children with full t18 and one child with full t13 who were adopted. As such, age of biological parents was not available. There are also two Modified TRIS Surveys for children with t13 where paternal information was not included.

An additional limitation is the limited diversity of participants. While data from parents from various countries are represented, most were married, English-speaking and identified as middle-class. The TRIS Survey is currently only available in English with plans for translation to Spanish. Additional outreach efforts via Facebook and other social media are underway. Finally, access to the Internet was required for participation. A high-speed connection is recommended as completion of TRIS project surveys requires up to several hours to complete. Currently, high-speed access is available in many areas but this was not the case when the project began in 2007.

Implications

This study presents a number of implications for genetic counselors. The first is that, the widely reported caution of conceiving a child with a trisomy condition over the age of 35 is not necessarily accurate. Additional risk factors outside of age must be examined when advising mothers and fathers. Data here reports women as young as 15 years of age having a child with a trisomy condition. To emphasize, while there were many women over the age of 35 who completed the TRIS survey, there were also many under the age of 35. This age has been reported in the literature and widely cited in the media. Schulevitz [23] reports that the risk of a fetus with a rare trisomy condition is 2-3% for a pregnancy during 20-29 years, and 30% over 40. These statistics do not paint the full picture. As the data here indicates, mother of any age can have a child with t18, t13 or t9m. It becomes critical to continue to collect data on age at pregnancy and ensure that genetic counselors share the most current data as well as emphasize individual decision-making rather than solely based on prenatal diagnosis [24,11,12].

A second implication is the need for additional investigation into paternal age at pregnancy. Studies that have been conducted to examine paternal age are usually focused on chromosomal anomalies that are of paternal origin such as Klinefelter and XYY syndrome [12]. Researchers should increase examination of paternal age when researching trisomy conditions. It would also be of interest to examine a relationship between maternal and paternal age (e.g., tendency of having a partner of similar age) and the incidence of rare trisomy conditions. Resulting findings would be valuable for genetic counselors and for professionals they work with. Accurate counseling is critical for decision-making. In addition, there is a need to investigate maternal and paternal age for additional subtypes such as t18 mosaic and partial t9 to better inform would-be parents of the probability of conceiving a child with these conditions.

Conclusion

The present study examined maternal and paternal age at pregnancy resulting in an infant with t18, t13 or t9m. Overall, findings were largely contradictory to what is widely reported in the available literature. Data from TRIS project surveys demonstrated mean maternal age across t18, t13 and t9m groups as largely under the age of 35. Paternal age closely followed the same pattern. The data described here assists to create a more accurate picture to share with would-be parents of the possible relationship between age at pregnancy and likelihood of infants with rare trisomy conditions. This increased awareness is not intended to dissuade continuation of such pregnancies but to enhance discussion of these conditions with would-be across the range of childbearing age.

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