

Knowledge on impact of lifestyle and demographic factors on fertility

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Abstract

Introduction

International research suggests individuals of reproductive age have inadequate awareness of fertility leading to consequences of delayed childbearing and increased demand for Assisted Reproductive Techniques (ART).

The aim of this study was to assess and compare the knowledge of fertility and ART between outpatient attendees at a tertiary maternity unit and university students.

Methods

This was a quantitative cross-sectional study. An online validated questionnaire, The Fertility Awareness Survey, was distributed by email. Participants were recruited in the outpatient setting and via the affiliated University student database. Descriptive and inferential statistics were completed on SPSS V26.

Results

Of 480 respondents, 37% (n=178) were clinic attendees and 63% (n=302) were students. Over 95% correctly believed smoking (n=468,97.5%) and alcohol (n=454,94.5%) negatively impact ability to conceive.

The student population revealed more gaps in knowledge, notably regarding perception of fertility, ART and associated success rates. Fifty-three percent (n=95) of clinic attenders correctly believed assistance should be sought after one year of trying to conceive for individuals below 35 years compared to only 44% of students (n=133).

Conclusion

This provides insight into the knowledge and awareness of fertility and ART in an Irish population. Whilst reassuring that there is a foundation of knowledge, there are still evident gaps to be addressed.

Introduction

Research indicates individuals have inadequate awareness of fertility and consequences of delayed childbearing¹. Age of first pregnancy and number of pregnancies have steadily risen since the 80s². In Ireland, from 1975 to 2015 the average age of first time mothers increased by 7.5 years among married women and 6.3 years for those unmarried³. This delay is associated with increased infertility rates and rising need for Assisted Reproductive Techniques (ART)^{4,5,6}. Advanced maternal age and use of ARTs increase the risk of adverse maternal and fetal outcomes and the risk of permanent childlessness^{7,8}.

Delayed childbearing cannot be attributed to one factor but a combination of societal, economic, and personal reasons. With this in mind, this delay may be of increasing concern following the impact of COVID-19 on individuals' travel, careers, financial burdens, or relationships.

Additionally, with increased contraceptive availability and ARTs, there may be an enhanced perception that one can control their fertility and postpone childbearing. Therefore, it is imperative to reveal what knowledge our population has, paying particular attention to students' knowledge to address gaps in knowledge .

Over the last decade studies have reported a definite gap in knowledge regarding fertility risk factors, namely age-related fertility decline. Numerous studies portrayed inaccurate overestimation of the age at which fertility decline starts among the population in question^{1,5,6,9,10,11}. A global survey of almost 17,500 people highlighted that overall level of knowledge regarding fertility and reproductive biology was very poor⁴.

Consequently, individuals' false confidence in ARTs has been highlighted. There is an incorrect understanding of ART success rates which is of concern as many would consider using such technologies^{1,5,6,10}. Research shows many women believe IVF can be used as an alternative to natural measures if they wait too long to start a family^{1,12,13,14,15}.

The aim of this research was to answer the question posed, as replicated from Daniluk et al. (2012), what exactly do individuals of childbearing age know about fertility, ART and what are their attitudes to both?

Comparisons were made between university students and outpatient attendees at a tertiary maternity unit in order to identify any gaps in knowledge between the two groups in order to provide targeted education at different stages of life. Further comparisons were made between students from the college of medicine and health and other courses to ascertain if medical trainees have adequate knowledge of fertility or if further training is required.

Methods

This was a quantitative cross-sectional study. Four hundred and eighty participants were recruited. The survey was disseminated via email to those who consented at out-patient clinics in Cork University Maternity Hospital and to all students in University College Cork via email database. Data was collected between April and July 2020 for both populations. Inclusion criteria was anyone aged over 16, regardless of childbearing status. Students from all courses were included.

An online validated questionnaire, The Fertility Awareness Survey (FAS), developed by Daniluk et al. (2012) was distributed. It includes demographic questions and two self-ratings; one on fertility knowledge and the other on knowledge of assisted human reproduction (AHR). The study was approved by the Clinical Research Ethics Committee (CREC) in Cork, Ireland.

Ordinal categorical answers were applied in a Likert scale ranging from definitely agree (1) to definitely disagree (5). For the purposes of reporting results, “definitely not” and “probably not” were considered a “No” response, and “probably” and “definitely” were considered a “Yes” response, while a response of “uncertain” was interpreted as indicating that the participant did not know the answer.

Both male and female versions of the study were used. Differences in the two versions lay in gender-specific actions related to egg or sperm freezing and difficulty to conceive. To ensure suitability to the Irish population specific elements of the FAS were adapted or removed e.g., cost of ART and currency.

Recruitment information clarified all males or females of child-bearing age could participate in the study and all data was confidential. All participants answered the survey in English.

All data was collected via Google forms which was easily accessible for both populations. Data was then coded and compiled into a Microsoft Excel spreadsheet. Descriptive and inferential statistics with independent t tests and Chi square tests were completed on SPSS V26. Comparisons were made both between students and outpatient attendees with subset analysis of students comparing students from the college of medicine and health and all other students.

Results

Demographics

Of 480 respondents, 37% (n=178) were clinic attendees and 63% (n=302) were students. The sample was comprised of predominantly female participants (70.6%; n=339) with only 29.4% (n=141) male. Eighty three percent (n=400) of participants were born in Ireland as illustrated in Table 1.

Table 1: Sample characteristics by participating group

	<i>Clinic Attendees N (%)</i>	<i>Students N (%)</i>	<i>Total N (%)</i>
<i>Total</i>	178	302	480
<i>Age in years</i>			
<25	1 (0.6)	213 (70.5)	214 (44.9)
25-29	33 (18.8)	45 (15)	78(16.3)
30-34	96 (54.9)	19 (6.3)	115(24.1)
35-39	42 (24)	11 (3.6)	53(11.1)
≥40	3 (1.7)	14 (4.6)	17 (3.6)
<i>Gender</i>			
Male	54 (38.3)	87 (61.7)	141 (29.4)
Female	123 (36.3)	216 (63.7)	339 (70.6)
<i>Country of birth</i>			
Ireland	152 (85.9)	248 (81.6)	400 (83.1)
United Kingdom	14 (7.9)	18 (5.9)	32 (6.7)
Other	11 (6.2)	38 (12.5)	49 (10.2)
<i>Education</i>			

<i>Non-degree qualification</i>	2 (1.1)	105 (34.9)	107 (22.4)
<i>Undergraduate degree</i>	66 (37.5)	134 (44.5)	200 (41.9)
<i>Postgraduate degree</i>	108 (61.4)	62 (20.6)	170 (35.7)

Employment status

<i>Paid employment</i>	162 (91.5)	75 (24.7)	237 (49.2)
<i>Full-time student</i>	2 (1.1)	221 (72.7)	223 (46.4)
<i>Other</i>	13 (7.4)	8 (2.6)	21 (4.4)

Relationship Status

<i>Married</i>	58 (33)	18 (5.9)	76 (15.9)
<i>In a relationship</i>	75 (42.6)	142 (46.9)	217(45.3)
<i>Single</i>	43 (24.4)	143 (47.2)	186(38.8)

Perceptions on level of fertility knowledge

Fifty-two percent (n=252) felt they had some level of fertility knowledge while 58% (n=278) felt they were knowledgeable on ART. Students considered themselves slightly more knowledgeable than those attending clinics in both fertility knowledge (mean 2.39 vs 2.19) and knowledge of ART (mean 2.06 vs 1.81).

Fertility Knowledge: Clinic participants vs Students

Findings on fertility knowledge analysed according to each group of participants are detailed in Table 2. A statistically significant higher number of students incorrectly believed that a woman's overall health and fitness level is a better indicator of her current fertility status than her age (53%) vs (40.2%); p=.016), using assisted reproductive technologies allows most women to have a baby with their own eggs at any age (22.3%) vs (18.2%); p=0.020) and with fertility treatments a woman in her 40s has at least a 50% chance of having a baby using her own eggs (23.7%) vs (21.4%); p=0.026).

Table 2: Fertility Awareness Survey (FAS) knowledge item distribution.

FAS Knowledge Item	Clinic Attendees					Students				Total	
	True False	Disagree (n)	Unsure (n)	Agree (n)	%	Disagree (n)	Unsure (n)	Agree (n)	%	p-value	%
A woman's overall health and fitness level is a better indicator of her current fertility status than her age	F	58	15	49	47.5	67	34	114	31.2	0.016*	37.1
There is a marked decrease in a woman's ability to become pregnant around 37 years of age	T	17	9	151	85.3	20	16	266	88.1	0.802	87.1
The age of a man is an important factor affecting a couple's fertility	T	60	22	95	53.7	128	43	130	43.2	0.053	47.1
Prior to a woman reaching menopause, the assisted reproductive technologies (e.g., In-Vitro Fertilization known as IVF) can help most women to have a baby using their own eggs	F	15	48	114	8.5	35	47	220	11.6	0.902	10.4
A woman's eggs are as old as she is	T	55	34	88	49.7	110	36	157	51.8	0.773	51
A man's age is related to an increased risk of birth defects	T	79	45	52	29.5	137	81	85	28.1	0.924	28.6
Taking birth control pills for more than 5 years negatively affects a woman's fertility	F	91	40	45	51.7	155	76	71	51.3	0.790	51.5
Using assisted reproductive technologies allow most women to have a baby with their own eggs at any age	F	113	31	32	64.2	160	74	67	53.2	0.020*	57.2

The total cost of one cycle of In-Vitro Fertilisation (IVF) is under 6000euro	T	71	60	46	26	132	106	65	21.5	0.194	23.1
There is a progressive decrease in a woman's ability to become pregnant after the age of 35	T	15	10	152	85.9	13	22	267	88.4	0.774	87.5
The rates of miscarriage are significantly higher for women in their 40s than for women in their 30s, even for physically fit women in excellent health	T	13	15	149	84.2	19	32	252	83.2	0.332	71
Egg freezing before the age of 35 can significantly prolong a woman's fertility	T	33	42	102	57.6	41	70	192	63.4	0.534	61.3
Most couples have to go through IVF more than once to have a baby	T	18	38	120	68.2	49	49	203	67.4	0.151	67.7
Most Irish fertility clinics will not provide treatment to women over the age of 45	T	21	80	76	42.9	39	147	115	38.2	0.270	40
At most fertility clinics in Ireland there are no age restrictions on when a woman can receive treatment	F	94	63	20	53.1	138	129	33	46	0.099	48.6
In vitro fertilization (IVF) success rates differ depending on a woman's age	T	13	25	138	78.4	15	46	240	79.7	0.865	79.2
By freezing her eggs, a woman has at least a 50% chance of having a baby	T	69	70	37	21	82	148	72	23.8	0.009*	22.8
Sexually transmitted infections such as Chlamydia and Gonorrhoea are high risk factors for infertility	T	17	27	133	75.1	21	35	246	81.5	0.094	79.1
Women over 35 years are more likely to have a baby with chromosomal abnormalities such as	T	20	22	135	76.3	26	35	241	79.8	0.075	78.5

Downs Syndrome compared with younger mothers											
Irrespective of their age, women who use in vitro fertilization have a better chance of becoming pregnant than women who do not use IVF	F	78	56	43	44.1	142	90	70	47	0.788	45.9
When using in vitro fertilization (IVF) there are no associated risks for a woman	F	137	29	11	77.4	224	65	13	74.2	0.594	75.4
When using in vitro fertilization (IVF) there are no associated risks for a child	F	97	52	28	54.8	165	94	42	54.8	0.759	54.8
The majority of fertility problems are female- related	F	100	38	39	56.5	188	68	45	62.5	0.167	60.3
With fertility treatments a woman in her 40s has at least a 50% chance of having a baby using her own eggs	F	72	67	38	40.7	83	146	71	27.7	0.026*	32.5
A woman's weight affects her fertility	T	19	18	140	79.1	22	39	239	79.7	0.811	79.5
The upper age limit for a man to be treated at most Irish fertility clinics is 55 years of age	F	28	97	50	16	26	169	104	8.7	0.078	11.4
There is a significant decline in the quality of a man's sperm before the age of 50	T	59	44	74	41.8	103	89	108	36	0.308	38.2
Smoking cigarettes or marijuana can reduce the quality of a man's sperm	T	9	10	158	89.3	13	20	267	89	0.599	89.1
Children born to fathers over the age of 45 have higher rates of learning disabilities, autism, schizophrenia and some forms of cancer	T	69	53	54	30.7	90	131	79	26.3	0.662	27.9

Note:

% = Percentage of correct answers

**= Statistically significant using 95% confidence interval*

Lifestyle Factors

The majority correctly reported that lifestyle factors influence fertility. Over 95% believed smoking (n=468) and alcohol (n=454) negatively impact ability to conceive. Over 92% believed weight (n=439) and diet (n=446) impact fertility whilst 61% (n=290) felt fertility supplements work.

Chi square tests indicated ($p>0.05$) there was no statistically significant difference between this knowledge in both groups analysed.

Knowledge of Male Fertility

Only 29% (n=137) correctly believe that a man's age is related to an increased risk of birth defects and 28% (n=133) correctly reported that children born to fathers over the age of 45 have higher rates of learning disabilities, autism, schizophrenia, and some forms of cancer. There were no statistically significant differences in the level of knowledge or answers for these questions among students or clinic attendees as highlighted in Table 2.

There were no statistically significant differences in knowledge level between groups.

Costs of IVF

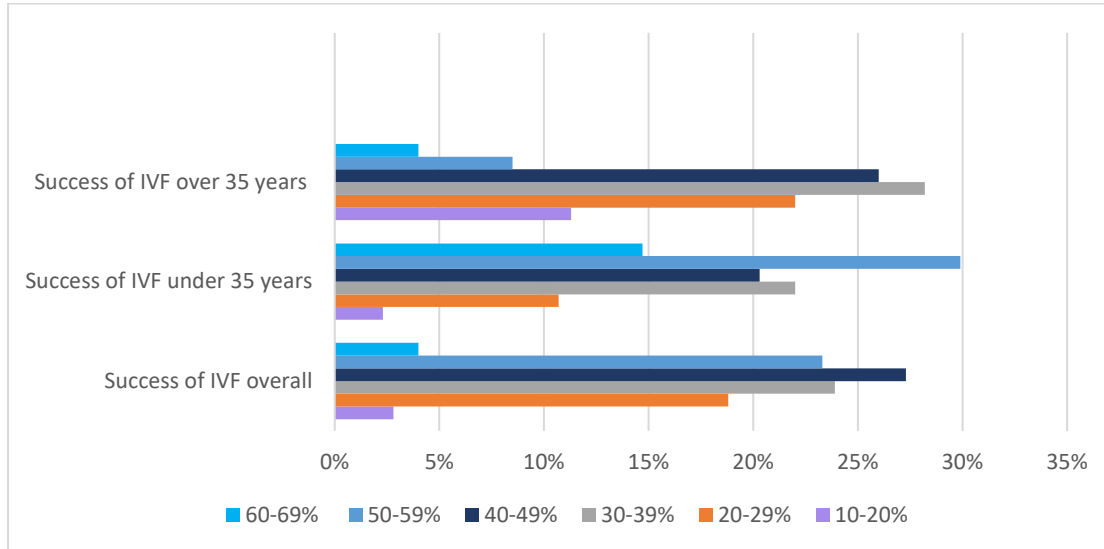
Only 23% (n=111) correctly estimated the total cost of one cycle of In-Vitro Fertilisation (IVF) is under 6000 euro.

Success rates and when to seek treatment

Perception of IVF success is illustrated in Figure 1. Seventy five percent (n=360) of respondents thought IVF is between 30 and 60% effective.

Figure 1:

Perception of IVF Success



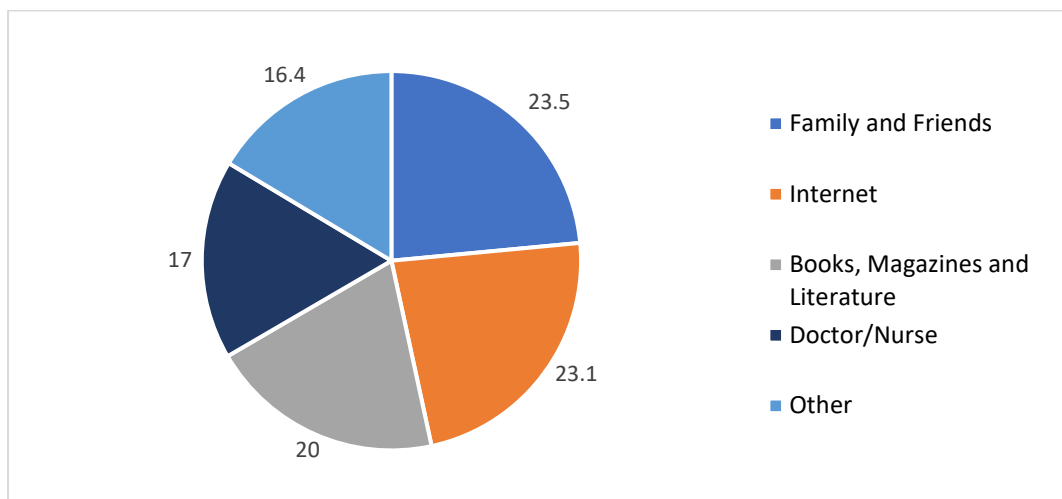
A total of 48% (n=228) correctly believed assistance should be sought after one year of trying to conceive below 35 years and 40% (n=189) correctly understood assistance should be sought after 6 months of trying to conceive above 35 years.

Knowledge sources

Only 17% of participants reported that their preference would be to seek information from a health professional as shown in Figure 2.

Figure 2:

Information Sources



Knowledge among students: comparison according to course

A two sample T-test analysed knowledge of students from the college of medicine & health (CMH) in comparison to the remaining participants from the student group. A statistically significant difference was found between these two groups of students in relation to knowledge that IVF success rates differ depending on a woman's age (CMH Mean=2.09(SD 0.799) vs Other students Mean=1.82(SD 0.815); $p=0.009$) and knowledge that most couples have to go through IVF more than once to have a baby (CMH Mean=2.56(SD 1.246) vs Other students Mean=2.23(SD 1.017); $p=0.030$). A lower mean represents a greater disagreement with the statements.

Conversely, these students had less awareness of male related fertility factors as a higher proportion incorrectly thought that the majority of fertility problems are female related (Other students Mean=3.47(SD 1.045) vs CMH Mean=3.82(SD 1.011); $p=0.008$).

Discussion

Overall, there was a high level of knowledge of factors influencing fertility but a low level of knowledge of consequences of delayed childbearing, costs of ART treatments, their success in overcoming the consequences of age-related fertility decline and the impact of male fertility on fecundity.

It is reassuring that respondents show good knowledge of factors influencing fertility especially lifestyle factors. However there is evidence of poor understanding of delayed childbearing consequences, cost of ART, success rates and male factor infertility, supporting research conducted internationally^{1,12,13,14,15,16}

In line with beliefs in this study, particularly among students, research on aging and infertility further portrayed young people's misconceptions regarding widespread belief in the infallibility of reproductive technology¹⁷. However, the Human Fertilisation and Embryology Authority (HFEA) reports currently women who use their own frozen eggs for treatment have a success rate of 18% for livebirth, a figure significantly less than the 26% success rate of IVF overall¹⁸.

Perhaps, the abstract concept of ART may lead to unrealistic expectations. Also, the role of celebrities and the media in glorifying ART as outlined by Daniluk et al. (2012) creates further "false" confidence. Research shows young people want to first complete their education, find a suitable partner, and progress their career before childbirth^{14,15,16}.

A 2011 review stated age does impact reproduction, sexual function, sperm parameters and fertility¹⁹. There was a reduced level of knowledge on factors influencing male fertility as demonstrated in Table 2 in particular with regard to the impact of a man's age on fertility. This is consistent with Daniluk's findings; less than half of women studied knew male partner age is an important factor in a woman's chances of conceiving (42.8%)¹.

The comparison of students dependent on their course indicates even within those related to health, there is inadequate knowledge. Students from the College of Medicine and Health reported less knowledge of male fertility than others. In one US study investigating Obstetrics and Gynaecology trainees' knowledge nearly half overestimated the age at which female fertility markedly declines and three-quarters overestimated ART success²⁰.

Strengths include the broad knowledge assessment of an Irish population. Both males and females with and without children were included. The FAS initially used by Daniluk et al. only investigated childless women¹. Our research obtained a broader view of delayed child-bearing and ART attitudes among an Irish population.

The predominant age groups assessed fall into the target category for education and interventions, another strength. While there was an over-representation of younger participants, with the predominant age bracket (44.9% of participants) being under 25, these are the target group for intervention and education.

The second most common age group was 30-34 years, with 24.1% (n=115) of participants. This group encapsulates both those most likely to conceive, considering the average age of mothers in Ireland in 2020 was 33.1 years²¹, and those who would be more likely to consider ART. This provides a good balance to the study entailing significant comparisons and variety of knowledge to be analysed.

Limitations include the potential gender bias associated with a predominantly female population, intrinsic to the sample type recruited. Additionally, there was a bias toward higher socioeconomic status as over 90% of participants were either in paid employment or full-time education. Evidence suggests women, more educated individuals, individuals struggling to conceive, and those who planned their pregnancies have greater fertility awareness levels²², indicating that results from this population may constitute a heightened representation of actual knowledge amongst the Irish population.

However, it is the more educated, working population that tend to delay childbearing and are overrepresented amongst ART cohorts. This is supported by recent CSO statistics. Just under one in five mothers (18%) stated their occupation as homemaker²⁴. This authenticates the need to provide targeted information.

Furthermore, email-based recruitment of participants may present a limitation as this can lead to self-selection bias as elucidated by Yu et al. (2016). Results may not be an absolutely accurate representation of the population as non-responders are not accounted for ¹⁹.

This study exposes targets for focused research and further education. Research involving a younger cohort could be inclusive of those who don't attend third level education and of more diverse socioeconomic groups. To suggest that all individuals have the same educational needs regarding fertility and ART would be inaccurate and unfair.

Additionally, assessment of knowledge of qualified healthcare professionals in Ireland, particularly GPs as they are often a first point of care, could provide enhanced insight. This study illustrates the lack of utilisation of doctors and nurses as information sources regarding fertility.

Public health campaigns are also a frequent measure to educate the nation on impacts of their actions on their health. Should the same emphasis be put on the fertility preservation as smoking cessation? The obstacle to this is public criticism for placing increasing pressure on young women to have children before they are ready, but we must certainly be considering new outlets for widespread dispersion of information.

In conclusion, this study provides insight into knowledge and awareness of fertility in an Irish population. While it is reassuring that many have a significant level of knowledge, there are evident gaps be addressed. These include the differing views of the impact age can have on fertility and subsequent ART with many overestimating their fecundity. Identifying these areas allows for adequate measures to address and tackle the lack of knowledge, enabling informed decision-making and timely intervention if necessary. Additionally, our findings provide a knowledge base for improved fertility services to be introduced.

Declarations of Conflicts of Interest:

None declared.

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Abbreviations

ART: Assisted Reproductive Technologies

IVF: In Vitro Fertilisation

CUMH: Cork University Maternity Hospital

CREC: Clinical Research Ethics Committee

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