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Attitude and Awareness Towards Reproductive Medicine Among Medical Students from Different Racial Background

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Abstract

Infertility cause significant decrease in populations worldwide. Little is known about the Reproductive medicine and assisted reproductive therapy is the solution for infertility in not only general populations but also among medical students. The objective of present study was to investigate attitude and awareness of medical students towards reproductive medicine in private medical college in Malaysia. This cross-sectional study was carried out in private medical college in Malaysia from March 2018 to April 2018. Sociodemographic data and attitude and awareness information were collected using a short-structured questionnaire. Odds ratios (OR) and 95% confidence intervals (CIs) were derived from Chi-square statistical test. We calculated the Cronbach's Alpha to assess internal consistency of the questionnaire. The Cronbach's alpha value was 0.678. In 233 participants, Female students are 0.71 times more aware of the reproductive medicine, but this is not significant. Among all the ethnic group, Indian has highest awareness compare to others: OR 2.44, 95% CI 1.2-4.92 [P=0.011] and among religion Hindu has highest awareness: OR 3.85, 95% CI 1.45-10.25 [P=0.005]. In attitude scores Buddhist has the highest mean attitude score of 64.04±6.61 follow by Hindu, Islam and Christian with [P<0.01]. As for ethnicity, Chinese scored the highest mean attitude score of 63.19±6.61 compared to others which scored 62.84±9.60, Indian 62±7.49, and Malay the least mean attitude score of 58.59±7.91. There is significant association between ethnicity and attitude as P-value is <0.01. In conclusion, the findings of the present study suggest that most of medical students have moderate attitude and awareness towards reproductive medicine. The ethnic backgrounds of medical students may have influence on attitude and awareness towards reproductive medicine.

Keywords

Attitude, Awareness, Reproductive Medicine, Students

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1. Introduction

Reproductive medicine is the study of the infertility, way to preserve fertility and other reproductive problems and disease. It deals with the morphology, physiology, biochemistry and pathology, puberty, menopause, physiological or pathological condition of fertility, lactation, sexual related issues, ovulation, recurrent pregnancy loss and introducing assisted reproductive technologies towards both male and female populations [1]. In multiracial country like Malaysia, much controversial ideas and debates have been done, and different races, religion and ethnicity will influence one's perception and attitude towards reproductive medicine [2]. In reproductive medicine, the methods done are assisted conception achieved by Clomiphene citrate induced ovulation or via assisted reproductive technology (ART),

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surrogacy and in vitro fertilization (IVF). Examples of ART include intra-cytoplasmic sperm injection (ICSI), cryopreservation, and intrauterine insemination (IUI) [3]. In this research, the focus components are IVF, surrogacy and sperm donation and how the medical students attitude towards this issue. [4]

Demographic and Health surveys done by WHO from 1990 to 2004 [5] for couples who are facing difficulty in conceiving globally is 8 to 12%. The organisation also says that one in four couples (20%) approximately are experiencing infertility problems, or to conceive or carry to a live birth pregnancy after one year of regular sexual relations without the use of contraceptives. [5] In 2012, a WHO study published has state that overall burden of infertility in women from 190 countries has remained similar levels and trends from 1990 to 2010 globally. [5] Malaysia is becoming an aging nation which 15% of its populations are senior citizens by the year 2030. Recent studies in 2016 states that there was a decrease in total fertility rate per women 15 – 49 ages from 2.0 babies in 2015 to 1.9 babies. Malaysia has been below average for number of babies born per woman in reproductive age group which is 2.1 babies per woman. [4-5]

The awareness and attitude towards assisted reproductive therapy is explained by few important factors including race or ethnicity, measures of socioeconomic status, gender, and risk factors of assisted reproductive therapy. Research suggests that highly religious individuals tend to hold more traditional views on marriage, and family patterns. Those with strong religious, beliefs also tend to hold more conservative, views towards genetic testing and have ethical, concerns with ART procedure. [6] Infertility is classified as the disease that needs attention as early as possible by WHO. People often undermine this problem, but infertility is one of the factors that contributing in decrease fertility rate. Reproductive medicine plays a vital role to solve the problem of infertility. However, misunderstanding regarding towards this may affect how they can handle this issue. [7]

Data of attitude of medical students towards ART plays a crucial part in formulating national health policies and it also reflects the need to provide more training opportunities to counter the decline in birth-rates. [8] According to the recent study of 1000 women from 10 Asian countries including Malaysia, reveal that there is significant knowledge gap regarding fertility, risk factors and cause of infertility and assisted reproductive treatment options. [9] General awareness about fertility across Asian countries but around 30% of women that surveyed are still less likely to seek professional help proactively. [10]

Therefore, the present study was conducted to assess medical students' attitudes and awareness towards different aspects of ART comparing with their sociodemographic background to analyse whether their different social upbringing has effect on attitude and awareness towards reproductive medicine. This will help us to identify the opinions of medical students towards infertility issue and solutions towards it.

2. Methodology

Attitude and awareness towards assisted reproductive technology (ART) among different ethnicity of Melaka-Manipal Medical College (MMMC) students were identified for this analytical cross-sectional study. Assisted reproductive technology and surrogacy has become more common and accessible in past four decades in face of infertility. It is observed that the total fertility rate in Malaysia remains below replacement level 2.1 and there is no formal record of infertility rate in Malaysia. Our research was directed to medical students of MMMC from Muar and Melaka campus in Malaysia. We conducted our research from March 2018 to April 2018, total duration of one month. MBBS students from batch 34, 35 and 36 MMMC were chosen to be part of our study. Batch 32 and 33 were not included because batch 32 graduated and batch 33 was undergoing the P2S2 exam. According to a study done on Greek medical student's knowledge and attitudes towards infertility and assisted reproductive technology, it was found that the prevalence of awareness of ART is 94%. Using a prevalence of 94%, confidence level of 97% and a margin of error of 3%, we acquired a minimum sample size (X) of 176 (Batch 34, 35 and 36 MBBS students) by using this formula: -

$$X = \frac{Z\alpha^2 p\,(1-p)}{d^2}$$

Where,

p = prevalence rate, 94%

$Z\alpha^2$ = 95% confidence level $(1.96)^2$

d = margin of error of 3%

where estimated 30 percent non-response rate were included, by using this formula: -

$$n = \frac{X}{(1-0.3)}$$

Then, we confirmed the sample size calculation by using EpiStatcalc.

Inclusion criteria are MBBS students from MMMC batch 34, 35, and 36, those students who are willing to participate by giving written inform consent, and those who are willing to know about what reproductive medicine is. Exclusion criteria are the participant who did not sign the written informed

consent, those did not completely answer the questionnaires and those want to withdraw from the study. Purposive sampling was used to select sample units.

The questionnaires consisted of 3 sections (total of 40 components) addressing a variety of issues. first section was socio-demographic, which consist of 7 components (ethnic, age, gender, religion, academic year, father's and mother's education level). Second section was awareness towards assisted reproductive technology and surrogacy, which consist of 14 components and third section was attitude towards assisted reproductive technology and surrogacy, which consist of 19 components. The questionnaire was designed based on related published studies and was validated by 6 professors from MMMC Muar and Melaka campus in Malaysia before being used. Cronbach's alpha was used to assess the reliability of questions in questionnaire. Test-retest and pilot study were not done. Questionnaires were filled by students during their break in between classes or before and after class. Students were also assured that data collected will remain confidential and solely for study purposes. We distributed a total of 301 self-administered questionnaires to selected students, and 253 were collected back. Among 253 collected questionnaires, there were 233 questionnaires filled completely and 20 questionnaires not completely answered, and thus were not included in the study. Final response rate is $\frac{233}{301} \times 100\% = 77.40\%$.

The primary outcome variables were the awareness and attitude towards assisted reproductive techniques (ART). In second and third section of the questionnaire, we included statements on several ART techniques (1: sperm donation 2. in vitro fertilization 3. surrogacy). In second section of the questionnaire, there are questions regarding awareness, opinion and knowledge component regarding assisted reproductive technology. Frequency and percentage of each question were tabulated and association with socio-demographic details were identified. In section three, attitude related questions were asked to find out attitude towards use of ART among medical students by rating of answers for this component. Each question was given 5 options: strongly disagree, disagree, neutral, agree and strongly agree. For positive statement, 5 marks was given strongly agree and 1 mark is given for those who put strongly disagree. For negative statement, 5 marks were given to strongly agree and 5 marks for strongly disagree. So, each option was given a rating and total ratings of section 3 questionnaire were 96. Rating obtained from one sample unit were put into category (0-59 is low, 60-79 is moderate and >80 is high). Four independent variables were measured in similar ways, ethnic group, race, gender and year in medical programme.

For descriptive analysis, frequency and percentage of each was tabulated. We examined how awareness and attitude of different ethnic, races, gender academic year vary by the ratings of the ART items. We collected and recorded all data using excel 2013 and analysed using Epi-info version 7. For descriptive analysis, frequency and percentage of all independent variables are tabulated. Unpaired t-test was used to find the association between gender with attitude score percentage towards Assisted reproductive technology and association between awareness and attitude towards reproductive medicine. ANOVA were used to find the association between race, ethnicity and academic year with attitude score percentage towards ART and association between awareness with knowledge and experience towards reproductive medicine. Statistical Chi-square tests were used to find out association between race, ethnicity, gender and academic year with awareness towards assisted reproductive technology (odds ratio to find the strength of association). Level of significance used was 5% thus P value <0.05 were considered as statistically significant. We obtained approval from the Ethical committee of MMMC prior to commencement of this study. All samples units had voluntarily participated in the study. Informed consent and written consent were obtained before conducting the study. Students were also assured that data collected will remain confidential and solely for study purposes.

3. Results

3.1. Questionnaire Validation

For questionnaire validation, Cronbach's alpha is used in assessing the reliability of the questions asked in the research. Cronbach's alpha is ranged from r = 0 – 1, with r = 0.7 or greater considered as sufficiently reliable [17]. The Cronbach's alpha value of our attitude scale was 0.678 (Table 1), which is considered as reliable. This questionnaire was validated by six experts from the ethical committee and faculty members [18]. The content validity index for items (I-CVI) and content validity index for scales (S-CVI) were calculated [19]. I-CVI standard can be relaxed when the questionnaire is validated with six or more experts but recommended no lower than 0.7 [20]. Writers have established that an S-CVI of 0.80 or higher is acceptable [21]. In our study, the mean I-CVI is 0.76, and the S-CVI calculated is 0.167 (Table 2).

Table 1. Computation of Reliability Statistics of Questionnaires Validation.

Cronbach's Alpha	N of items
0.678	18

Table 2. Questionnaire Validation on an 18-items Scale by Six Experts.

Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Number in agreement	Item CVI
1	X	X	-	X	X	X	5	0.833
2	X	X	X	X	X	X	6	1
3	-	X	-	X	-	X	3	0.500
4	X	X	X	X	-	X	5	0.833
5	-	X	-	X	X	X	4	0.667
6	X	X	X	X	X	X	6	1
7	X	X	-	X	-	X	4	0.667
8	X	X	X	X	-	X	5	0.833
9	-	X	-	X	X	X	4	0.667
10	-	X	-	X	X	X	4	0.667
11	-	X	-	X	-	X	4	0.667
12	-	X	-	X	-	X	3	0.500
13	-	X	X	X	X	X	5	0.833
14	X	X	X	X	X	X	6	1
15	-	X	-	X	X	X	4	0.667
16	X	X	X	X	-	X	5	0.833
17	-	X	-	X	X	X	4	0.667
18	X	X	-	X	X	X	5	0.833

Mean I-CVI = 0.759
S-CVI/UA = 0.167
X= Relevant/Very Important

3.2. Sociodemographic Profiles of Medical Students

A total of 233 participants participated in the study and the response rate was 77%. Table 3 shows sociodemographic characteristics of the students. Among the students, 95 were males and 138 were females. The mean age of the participants was 23.18 (SD 1.47). Muslim participants were 61 (26.18%), Buddhist 65 (27.90%), Hindu 77 (33.05%) and other religions 7 (3.00%). Majority of the participants were from 3 ethnic groups in Malaysia, Malay 56 (24.03%), Chinese 72 (30.90%), Indian 87 (37.34%) and others 18 (7.73%). 112 (48.07%) of them are third year medical students in MMMC, 93 (39.91%) fourth year and 28 (12.02%) fifth year. Father's level of education of the participants were Primary 8 (3.43%), Secondary 56 (24.03%), Diploma 32 (13.73%), Degree 92 (39.48%), Master 36 (15.45%) and PhD 9 (3.86%). Mother's level of education of the participants were Primary 8 (3.43%), Secondary 71 (30.47%), Diploma 45 (19.31%), Degree 73 (31.33%), Master 29 (12.45%) and PhD 7 (3%).

Table 3. Sociodemographic profiles of medical students (n=233).

Variables	Frequency (%)
Age (years)	
<22	16 (6.87)
22-25	208 (89.27)
>25	9 (3.86)
Mean (SD)	23.18 (1.47)
Gender	
Male	95 (40.77)
Female	138 (59.23)
Religions	
Islam	61 (26.18)
Buddhist	65 (27.90)
Christian	23 (9.87)
Hindu	77 (33.05)
Others	7 (3.00)
Ethnicity	
Malay	56 (24.03)
Chinese	72 (30.90)
Indian	87 (37.34)
Others	18 (7.73)
Academic Year	
3	112 (48.07)
4	93 (39.91)
5	28 (12.02)
Father's Education Level	
Primary	8 (3.43)
Secondary	56 (24.03)
Diploma	32 (13.73)
Degree	92 (39.48)
Master/PhD	45 (19.31)
Mother's Education Level	
Primary	8 (3.43)
Secondary	71 (30.47)
Diploma	45 (19.31)
Degree	73 (31.33)
Master/PhD	36 (15.45)

3.3. Awareness Towards Reproductive Medicine

Table 4 shows that 162 (69.53%) participants ever heard, seen or read anything about reproductive medicine prior to the study while whereas 71 (30.47%) had never heard about it. 65 (30.66%) participants claim to have excellent and good knowledge and 113 (53.30%) participants claim to have moderate knowledge about reproductive medicine, and 34 (16.04%) had poor or very low/none knowledge about it. 46 (20.54%) participants were extremely and very interested in

Reproductive medicine and 129 (57.59%) showed moderate interest in it, the rest 49 (21.88%) participants show little or no interest. 125 (53.65%).123 (52.79%) of participant will use all possessions of ART If they fail to conceive rather than adopt children (25.32%) and remain childless (5.15%), 39 (16.74%) remain unsure. Majority 125 (53.65%) participant appraise reproductive medicine as having clear advantages and rather advantages, while 101 (43.35%) participant remain neutral, only 7 (3.00%) appraise it to have clear disadvantages or rather disadvantages. 229 (98.28%) participants are aware that sperms/oocytes donation is possible and 78 (33.48%) participant is willing to donate their sperms/oocytes mostly because they want to help infertility couple and small amount donate for the purpose of earning money and precaution to use it back when infertile. 82 (35.19%) Participants are not willing to donate as 46 (40.00%) of them think it is against religious belief, 41 (35.65%) are concern about psychological and emotional effects, 17 (14.78%) think its morally wrong, 10 (8.70%) are afraid of possible adverse effects on future fertility and only 1 (0.87%) is being screened for sexually transmitted infections/contacting HIV infection. 100 (43.10%) participants would not donate to homosexual couple while 68 (29.31%) remain unsure. 128 (55.17%) participants will consider product of conception as owns child from donated sperm/oocyte. 219 (93.99%) have not exposed to surrogacy among Family and Friends. 117 (50.21%) do not prefer surrogacy in future, only 21 (9.01%) would prefer it while 95 (40.77%) remain unsure. Of all participants, 109 (46.78%) prefer Adoption, 27 (11.59%) prefer Surrogacy and 34 (14.59%) would consider both, while 63 (27.04%) prefer neither.

Table 4. Awareness towards reproductive medicine.

Awareness towards reproductive Medicine	Frequency (%)
Have you ever heard, seen or read anything about reproductive medicine prior to this study?	
Yes	162 (69.53)
No	71 (30.47)
How would you describe your knowledge about reproductive medicine?	
Excellent / good	65 (30.66)
Moderate	113 (53.30)
Poor/ very low or none	34 (16.04)
How much are you interested in Reproductive Medicine?	
Extremely /very	46 (20.54)
Moderate	129 (57.59)
Little / none	49 (21.88)
If you and your partner desire children and were not able to have children the natural way, what would you do?	
Use all possessions of ART such as IVF, surrogacy	123 (52.79)
Adopt children	59 (25.32)
Remain childless	12 (5.15)
Unsure	39 (16.74)
How would Appraise reproductive medicine as a whole?	
Clear advantages / rather advantages	125 (53.65)
Neutral / undecided	101 (43.35)
Rather disadvantage / clear disadvantages	7 (3.00)
Are you aware that we can donate our sperms/oocytes?	
Yes	229 (98.28)
No	4 (1.72)
Are you willing to donate your sperms/oocytes for infertile couples?	
Yes	78 (33.48)
No	82 (35.19)
Unsure	73 (31.33)
*if answer yes, please proceed to next question, if answer no, please skip next question.	
What is the purpose of you donating your sperms/oocytes?	
Help of infertility couples	91 (73.39)
Can be used back when I'm old/infertile	12 (9.68)
To earn money	12 (9.68)
Just for fun/trial	9 (7.26)
If no, why?	
Against religious belief	46 (40.00)
Morally wrong	17 (14.78)
Possible adverse effect on future fertility	10 (8.70)
Being screened for sexually transmitted infections/contacting HIV infection	1 (0.87)
Psychological and emotional effects	41 (35.65)
Are you willing to donate to homosexual couples?	
Yes	64 (27.59)
No	100 (43.10)
Unsure	68 (29.31)
Do you consider the product of conception as your child from donated sperm/oocyte?	
Yes	128 (55.17)

Awareness towards reproductive Medicine	Frequency (%)
No	104 (44.83%)
Do your family and Friends have any experience with surrogacy?	
Yes	14 (6.01%)
No	219 (93.99%)
Would you prefer surrogacy in future?	
Yes	21 (9.01%)
No	117 (50.21%)
Unsure	95 (40.77%)
Do you prefer surrogacy or adoption?	
Surrogacy	27 (11.59%)
Adoption	109 (46.78%)
Both	34 (14.59%)
Neither	63 (27.04%)

3.4. Attitude of Medical Student Towards Reproductive Medicine

Table 5 shows, total attitude was calculated for each sample and tabulated into three groups, which are low, moderate and high. Most of the medical students have moderate attitude towards reproductive medicine (62.66%). Some of them are in low attitude group (36.48%) and only small number of medical students are in high attitude group (0.86%).

Table 5. Attitude of Medical Student towards Reproductive Medicine.

Attitude Group	Attitude Group (%)
Low	85 (36.48)
Moderate	146 (62.66)
High	2 (0.86)
Total score Mean (SD)	59.15 (7.37)

Table 6. Attitude of Medical Student towards Reproductive Medicine (n=233).

Research Questions	Attitude Frequency (%)				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree
Involuntarily childless couples should use all possibilities of reproductive medicine for having biological children.	5 (2.15)	32 (13.73)	96 (41.20)	72 (30.90)	28 (12.02)
Application of new techniques of reproductive medicine presents grave ethical conflicts.	9 (3.86)	33 (14.16)	116 (49.79)	66 (28.33)	9 (3.86)
Parents should disclose the assisted reproductive therapy conception method to their children.	5 (2.15)	46 (19.74)	109 (46.78)	54 (23.18)	19 (8.15)
IVF should be available to all couples.	7 (3.00)	34 (14.59)	76 (32.62)	91 (39.06)	25 (10.73)
IVF should be available to married couples only.	14 (6.01)	60 (25.75)	79 (33.91)	55 (23.61)	25 (10.73)
IVF should be available to Heterosexual couples.	11 (4.74)	29 (12.50)	77 (33.19)	78 (33.62)	37 (15.95)
IVF should be available to Homosexual couples.	26 (11.16)	51 (21.89)	83 (35.62)	49 (21.03)	24 (10.30)
IVF should be available to single mothers.	16 (6.87)	40 (17.17)	86 (36.91)	66 (28.33)	25 (10.73)
I believe that IVF is better option than adoption.	14 (6.01)	60 (25.75)	96 (41.20)	42 (18.03)	21 (9.01)
I believe IVF is ethical.	5 (2.15)	32 (13.73)	86 (36.91)	88 (37.77)	22 (9.44)
I think sperms/oocytes donor should be paid.	11 (4.72)	33 (14.16)	98 (42.06)	70 (30.040	21 (9.01)
I will donate my sperm/oocyte for money.	54 (23.18)	60 (25.75)	73 (31.33)	33 (14.16)	13 (5.58)
I will accept my partner donating sperm/oocyte.	47 (20.17)	54 (23.18)	80 (34.33)	41 (17.60)	11 (4.72)
Surrogacy is a suitable method of assisted reproductive therapy.	24 (1.030)	51 (21.89)	93 (39.91)	58 (24.89)	7 (3.00)
Surrogacy should be a last resort in assisted reproductive therapy.	16 (6.87)	41 (17.60)	88 (37.77)	72 (30.90)	16 (6.87)
I think surrogate mother may transform into an instrument for reproduction.	31 (13.30)	48 (20.60)	89 (38.20)	55 (23.61)	10 (4.29)
Use of surrogacy is praiseworthy.	23 (9.87)	57 (23.18)	111 (47.64)	34 (14.59)	11 (4.72)
Surrogate mother should receive payment.	11 (4.72)	38 (16.31)	85 (36.48)	70 (30.04)	29 (12.45)

Willingness to become a surrogate or allow your partner to become surrogate.	Unwilling	Unsure	Willing
Surrogate for relative/friend	106 (45.49)	98 (42.06)	29 (12.45)
Surrogate for strangers	120 (51.50)	99 (42.49)	14 (6.01)

3.5. Association Between Gender, Ethnicity, Religion, Academic Year with Awareness Towards Reproductive Medicine Among Medical Students

Table 7 shows, associations between gender, ethnicity, religion, academic year with awareness towards reproductive medicine. Table shows that 62 (65.26%) male students and 100 (72.46%) female students are aware of reproductive medicine. And males are 0.71 times less likely to aware of reproductive medicine than female but there is no significant association between gender and awareness (p value 0.24).

Among all ethnicity, Chinese is considered as reference group as 44 (61.11%) Chinese students were aware of the topic. Malay students are 1.14 times more aware of reproductive medicine compare to Chinese students but there is no significant association (p value 0.71). Indian students are 2.44 times more likely to be aware of reproductive medicine than Chinese students and there is a significant association (p value 0.01). Other ethnic groups are 1.65 times more likely to be aware of reproductive medicine than Chinese students but there is no significant association between them (p value 0.38).

Religion-wised, Christian students are the reference group as 11 (47.83%) of them were aware of reproductive medicine. Muslim students are 2.07 times more aware of reproductive medicine compare to Christian students and there is no significant association between them (p value 0.14). Buddhist students are 2.28 times more aware of reproductive medicine than Christian students and there is no significant association (p value 0.09). Hindu students have the highest awareness of 60 (77.92%) students and 3.85 times more aware compare to Christian and there is significant association between them (p value 0.005). Students with other religions have significant awareness towards reproductive medicine as well (p value 0.01).

Among comparison between academic year and awareness, students that are studying in Year 3 is consider as reference group. Compare to Year 3, 66 (70.97%) of year 4 students are 1.15 times more aware of reproductive medicine but there are no significant association (p value 0.63). Amongst Year 5 students, 20 (71.43%) of them are 1.18 time more aware compare to Year 3 students but there is no significant association as well (p value 0.72). Overall, there is no significant association between Academic year and Awareness towards reproductive medicine.

Table 7. Association between Gender, Ethnicity, Religion, Academic year with Awareness toward reproductive medicine among medical students.

Variables	Awareness		X^2	OR (95%CI)	P value
	Yes	No			
Gender					
Male	62 (65.26%)	33 (34.74%)	1.38	0.71 (0.40-1.25)	0.241
Female	100 (72.46%)	38 (27.54%)			
Ethnicity					
Chinese	44 (61.11%)	28 (38.89%)		*Reference*	
Malay	36 (64.29%)	20 (35.71%)	0.14	1.14 (0.55-2.36)	0.712
Indian	69 (79.31%)	18 (20.69%)	6.34	2.44 (1.2-4.92)	0.011*
Others	13 (72.22%)	5 (27.78%)	0.76	1.65 (0.53-5.14)	0.381
Religion					
Christian	11 (47.83%)	12 (52.17%)		*Reference*	
Islam	40 (65.57%)	21 (34.43%)	2.2	2.07 (0.78-5.50)	0.137
Buddhist	44 (67.69%)	21 (32.31%)	2.8	2.28 (0.87-6.02)	0.091
Hindu	60 (77.92%)	17 (22.08%)	7.79	3.85 (1.45-10.25)	0.005*
Others	7 (100.00%)	0 (0.00%)	6.08	-	0.013*
Academic Year					
3	76 (67.86%)	36 (32.14%)		*Reference*	
4	66 (70.97%)	27 (29.03%)	0.23	1.15 (0.63-2.1)	0.631
5	20 (71.43%)	8 (28.57%)	0.13	1.18 (0.48-2.94)	0.715

*Significant; OR (95%CI) = Odds ratio (95% confidence interval), X^2 = chi square

3.6. Association Between Awareness, Knowledge, Experience with Attitude Score

Table 8 shows association between awareness, knowledge, experience with attitude score percentage. Association between awareness and attitude score was calculated using unpaired t-test. The mean of students that are aware of reproductive medicine is 62.21 and those not aware of is

60.24. T value is (-1.82) which means there is no association between awareness and knowledge and this is not significant because P value is 0.07.

Association between knowledge and Attitude score is compared using ANOVA, with level of significant is 0.05. The students with poor knowledge has highest mean among the three, Poor knowledge (77.73), followed by good knowledge (63.41) and moderate knowledge (59.59), and there is no significant association as the P value is 0.09.

Similarly, association between appraise reproductive medicine attitude score, is calculated by using ANOVA test. The students that agree with reproductive medicine has more advantage has the highest mean 65.62, followed by disadvantage (58.33) and neutral (45.44). And there is no significant association between them as P value is 0.07.

Students with any family experience of assisted reproductive therapy is compared to attitude percentage score by using unpair-t test with level of significant 0.05. the mean value of those had experienced is 61.81 and those did not is 58.48. and t test value is 1.58 and there is no significant association between them because P value is 0.11.

Tables 8. Association Between Awareness, Knowledge, Experience with Attitude score.

Variables	Attitude score Mean (SD)	t (df)/ F (df1, df2)	P value
Awareness			
Yes	62.21 (8.01)	-1.82 (231)	0.070[a]
No	60.24 (6.68)		
Knowledge			
Good	63.41 (7.26)		
Moderate	59.59 (7.71)	2.41 (2,209)	0.090[b]
Poor	77.73 (8.81)		
Appraise reproductive medicine			
Clear advantage	65.62 (8.01)		
Neutral	45.44 (6.74)	2.65 (2,230)	0.071[b]
Disadvantage	58.33 (11.93)		
Experience			
Yes	61.81 (7.71)	1.58 (231)	0.114[a]
No	58.48 (6.61)		

[a]Independent t-test; [b]ANOVA

3.7. Association Between Gender, Religion, Ethnicity and Academic Year with Attitude Towards Reproductive Medicine

Table 9 shows the association between gender with attitude towards reproductive medicine using unpaired t-test and association between religion, ethnicity, and academic year with attitude towards reproductive medicine using ANOVA test. Result shows that the mean attitude score in male is 61.75±7.88, slightly higher than female of score 61.52±7.88. t-value found is -0.23, which falls within acceptance region of normal distribution, ±1.950. P-value is 0.82, and thus there is no association between gender and attitude. Association between religion, ethnicity and academic year with attitude towards reproductive medicine. In religion, it shows that others have the highest mean attitude score of 66.96±8.52, followed by Buddhist with mean score of 64.04±6.61, then Hindu 62.55±6.62 and Islam 58.52±7.84, Christian scored the least which is 58.20±9.32. There is significant association between religion and attitude as the p-value is <0.01. As for ethnicity, Chinese scored the highest mean attitude score of 63.19±6.61 compared to others which scored 62.84±9.60, Indian 62±7.49, and Malay the least mean attitude score of 58.59±7.91. There is significant association between ethnicity and attitude as P-value is <0.01. Academic year also plays a role in deciding the attitude of students towards reproductive medicine as the P-value is less than 0.01, again suggesting that there is significant association between academic year and attitude towards reproductive medicine. It shows that year 5 students have highest attitude score of 66.52±4.75, followed by year 3 students of score of 61.15±7.54, and year 4 students scoring the least of 60.70±8.06.

Table 9. Association between gender, religion, ethnicity and academic year with attitude towards reproductive medicine.

Variables	Attitude score Mean (SD)	t (df)/ F (df1, df2)	P-value
Gender			
Female	61.52 (7.88)	-0.23 (231)	0.818[a]
Male	61.75 (7.40)		
Religion			
Islam	58.52 (7.84)		
Buddhist	64.04 (6.61)		
Christian	58.20 (9.32)	7.04 (4,228)	<0.001[b]*
Hindu	62.55 (6.62)		
Others	66.96 (8.52)		
Ethnicity			
Malay	58.59 (7.91)		
Chinese	63.19 (6.61)	4.31 (3,229)	0.006[b]*
Indian	62.00 (7.49)		
others	62.84 (9.60)		
Academic year			
3	61.15 (7.54)		
4	60.70 (8.06)	6.92 (2,230)	0.009[b]*
5	66.52 (4.75)		

*Significant; [a]Independent t-test; [b]ANOVA

4. Discussion

The study was designed to investigate the association between gender, religion, ethnicity, and academic year with awareness towards reproductive medicine, association between gender, religion, ethnicity and academic year with attitude towards reproductive medicine, association between

awareness and attitude towards reproductive medicine and association between knowledge and experience with attitude towards reproductive medicine. Reproductive Medicine are not easily available, and the ART services are heavily privatized and has limited access due to high cost.

We studied the association between gender, religion, ethnicity and academic year with awareness towards reproductive medicine. More female students (72.46%) are aware of reproductive medicine compared to male students (65.26%). One of the reasons could be because women were more aware of the age-related drop affecting female fertility than men were. [22] Another study on fertility awareness also suggest that despite women and men's similar personal intentions for having child, women consider having children as being an important aspect in their life than men did. [23-24] Many couples plan to have their first child beyond age 30 and both male and female are aware of decrease in fecundity as they age and thus are more aware of reproductive medicine. [25] However, there is no association between gender and awareness.

In terms of ethnic, more Indians (79.31) are aware of reproductive medicine, followed by others (72.22%), Malay (64.29%) and then Chinese 44 (61.11%). Only Indian shows significant association with awareness mainly because most Indian in Malaysia are Hindu, and Hindu is a liberal religion which accepts reproductive medicine. [26] More of other religion (100%) is aware of reproductive medicine, followed by Hindu (77.912%), Buddhist (67.69%), Islam (65.57%), lastly is Christian (47.83). Assisted reproduction is accepted in nearly all its forms by Judaism, Hinduism and Buddhism, although most Orthodox Jews refuse third party involvement, however Roman Catholicism is yet to accept this assisted technique, while Protestants, Anglicans, Coptic Christians and Sunni Muslims accept most of its forms, which do not involve gamete or embryo donation. [27] Hindu is a liberal religion which accepts reproductive medicine, but it is better if the oocyte and sperm used come from a married couple. Hinduism also accepts sperm donation, but the donor must be a close relative of the infertile husband. Hindu is also practicing adoption, and abortion is not prohibited. [28] Only Hindu and other ethnicity shows significant association with awareness. Moreover, most of the students are aware that sperms or oocyte donations are possible and are willing to donate to help infertility couple while the others think that as they think it is against religious belief and will have psychological and emotional effect after the donation. However, participants would not donate to homosexual couple as homosexual couple is not recognized and ethically unacceptable in Malaysia as according to Penal Code (Consolidated version 1998) 187 Section 377B Punishment for committing carnal intercourse against the order of nature. [28] "Whoever voluntarily commits carnal intercourse against the order of nature shall be punished with imprisonment for a term which may extend to twenty years and shall also be liable to whipping." Students prefer adoption than surrogacy as surrogacy are expensive and immoral.

A study showed that medical students have more knowledge about assisted reproductive technology when compared to students doing psychology degree. But there is no significant association between age and course type. [28] In this study, more Year 5 students (71.43%) are aware of reproductive medicine, followed by Year 4 students (70.97%) and lastly Year 3 students (67.86%). However, there is no significant association between academic year and awareness towards reproductive medicine.

In regards of association between gender, religion, ethnicity and academic year with attitude towards reproductive medicine, our study revealed that 62.66% students have moderate attitude score percentage towards reproductive medicine, 36.48% students have low attitude score percentage and to our surprise only 0.86% students have high attitude score percentage. Some carries a positive attitude as they think it's human nature to have their own child and they want someone to care of them when they get old. Women were more likely to believe that they would undergo IVF treatment in case of fertility problems and they are more aware of the risk factors is using ART, while men were more likely to think that they would abstain from having children. This shows that female has more positive attitude towards ART, but adoption was considered an equally possible option by both. [29] Or in other word, both has positive attitude towards ART and adoption [30]. In our study, male has slightly better attitude level (61.75%) than female (61.52%). However, there's no significant association between gender and attitude.

Other religion (66.96%) has the highest attitude score among all religion, followed by Buddhist (64.04%), Hindu (62.55%), Islam (58.52%) and Christian having the least percentage of 58.20% positive attitude level towards reproductive medicine. There is significant association between religion and attitude. Chinese scored the highest of 63.19% compared to others (62.84%), Indian (62.00%) and Malay (58.59%). Chinese influenced by Confucius teachings are family oriented and do not demand exclusive adherence, thus has more positive attitude towards the use of ART. Same goes to Malay, they put a lot of emphasis on the importance of marriage, family formation and procreation. There is significant association between ethnicity and attitude towards reproductive medicine. Year 5 students scored highest (62.84%) in attitude section, followed by Year 3 students (61.15%) and lastly Year 4

students (60.70%). There is significant association between academic year with attitude.

Association between Awareness, knowledge and experience with attitude score. This study shows that those who are aware of reproductive medicine scored 62.21% in attitude section, slightly higher than those who are not aware of reproductive medicine with score of 60.24%. there is no significant association between awareness and attitude. Student believe surrogacy is suitable method of assisted reproductive therapy and should be a last resort in assisted reproductive therapy. Surrogacy involves inseminating the surrogate with the husband's sperm as wife cannot carry a child throughout the pregnancy. However, is has been commercialized nowadays in which surrogates receive payment for producing a child beyond expenses they incur just like selling the organs. Hence student believe surrogate mother may transform into an instrument for reproduction and should receive payment for it. Students are unwilling to become a surrogate nor allow their partner to become surrogate for relative, friend no strangers. Whenever donor eggs/sperm or a surrogate are used, the question of bonding can affect all parties involved. Surprisingly, students with poor knowledge and experience with reproductive medicine have better attitude towards reproductive medicine (77.73%) compared to those with moderate and good knowledge and experience with reproductive medicine. There is no significant association between knowledge and experience with attitude towards reproductive medicine. Exposure to surrogacy among Family and Friends are very limited as Reproductive Medicine are not well developed and has no official policies are planned to govern the field.

4.1. Limitations

Though there are limitations in our study, response rate was high as 77%. Secondly, there was no validated questionnaire available for our study, however we adopted and modified the previous questionnaires. The modified questionnaire was validated by six experts. Thirdly, we used questionnaires to survey the opinion of students, there were many did not complete answering the surveys. Fourthly, the range of the age of our subjects is from 20 to 30 years old. Majority of the medical students recruited in the study were from Year 3, and there was small sample size from Year 5 students because they were preparing for their end year professional exam. We conducted study in only one private medical college which may not be representative of other medical schools around the country. Therefore, our results cannot be generalised. Besides, students of the same age group from other disciplines may have different levels of awareness and attitude towards reproductive medicine, which need further investigations.

4.2. Recommendation

In this study we could only focus on a small portion of reproductive medicine such as assisted reproductive therapy (IVF, sperm donation, surrogacy, etc.). It is thus recommended to find out the other portions of reproductive medicine such as. In future research, larger sample size is recommended to use to find out the association of attitude and awareness towards reproductive medicine among the general population of Malaysia.

5. Conclusion

In conclusion, this study gives evidence that most of the medical students in the study have moderate attitude and knowledge towards reproductive medicine as a whole. Most of them appraised reproductive medicine to be clear advantageous. This study also helps to identify the importance of medical student's awareness towards reproductive medicine and presence of high demand for training opportunities in the field of reproductive medicine in the face of rapid decline in national fertility rate. The outcome of this study is a national issue of concern as lack of awareness and negative attitude towards reproductive medicine can have an effect on country's populations. Our study seeks to help medical students to aware of this affair as a small contribution to society.

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