

Knowledge of Malaysian University Students on Methods of Contraception, Assessed Using a Validated Instrument (Knowledge on Methods of Contraception)

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ABSTRACT

Background: Sexually active woman or couple may not be aware of the different methods of contraception and this can lead to unplanned pregnancy with psychological and social effects, and with significant impact on a woman's life. **Objective:** To develop and validate an instrument, Knowledge on Methods of Contraception (KMC) and to assess the knowledge of non-medical related university students on the methods of contraception. **Method:** The 25-item KMC (KMC-25) was initially administered to 130 non-medical related university students and retested after four weeks. Fifty pharmacy undergraduates were recruited for comparison. The validated KMC-25 was then completed by another 402 non-medical related university students. **Result:** Internal consistency of the KMC-25 was good with Cronbach's alpha = 0.78. There was significant correlation between the test-retest total scores ($p < 0.001$) and no significant difference for all the items, indicating stable reliability. Flesch Reading Ease score was 49.3 which means that the KMC-25 could be easily understood by undergraduates. The KMC-25 scores between pharmacy and non-medical related students were significantly different with median (interquartile range, IQR) of 60 (50 - 68) and 26 (12 - 40), respectively ($p < 0.001$). Out of 402 respondents, only 34 (8.4%) scored 50% and above, and were considered to have adequate knowledge on methods of contraception. Knowledge on contraception was significantly related to various characteristics of the students. **Conclusion:** The present study showed that KMC-25 is a reliable and valid instrument to assess university students' knowledge on methods of contraception. However, university students from non-medical related programs have poor knowledge and this warrants the implementation of educational programs.

INTRODUCTION

Approximately 210 million pregnancies were reported annually with an estimated 38% of unplanned pregnancies where 22% resulted in abortion [1]. A nationwide Millennium Cohort Study in the United Kingdom also revealed 33% unplanned pregnancy [2]. In recent years,

young people reach adolescence early, prefer to marry and give birth later, but are more likely to be sexually active before marriage [3]. Adolescent pregnancy has become a main concern worldwide since such pregnancies are often unplanned and unwanted. Furthermore, adolescent pregnancy can have negative impact on a woman's physical, mental, economic and social status.

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It has been estimated that 1.8 billion young people are between the age of 18 and 25 years and majority of these people are sexually active [4]. A study in Malaysia reported that 5.4% of students aged between 12 and 19 years already had sexual intercourse. Another study by the National Population and Family Board of Malaysia found that 2.2% of young adults who were 15 - 24 years old, already had sexual intercourse [6].

Malaysia is a developing country with multiracial communities. In the current era of modernization, many Malaysians still uphold a conservative and traditional view with regards to sex-related issues [7]. The education system did not have a comprehensive sexual education program. Human reproductive system was only taught in secondary schools as a science subject which was very technical until the introduction of the module, Reproductive and Social Health Education in 2006 which covered more topics on human reproduction with emphasis on the risk of premarital sex and moral values [8,9]. A survey supported by the Ministry of Health in 2015 found that 35% of Malaysian young women did not realise that they could become pregnant even if they had sex for the first time [8]. In recent years, unwanted or unplanned pregnancies in Malaysia had led to a rise in abortions and abandoned babies, with 900 cases of baby dumping being reported from 2010 to 2019 [9].

Besides the well-documented benefits of birth control to the women's health and the welfare of children, contraception is also a key factor for a better-balanced and rewarding life for both women and men [10]. Contraception, also known as family planning or birth control, empowers couples to make well informed choices and allows them the fundamental human rights to decide on the number of children they desire and to plan appropriate interpregnancy interval between their children as well as the timing of their children's birth [11]. A couple has the luxury of choosing from an array of birth control methods which are available with different mode of administration, mechanism of action, safety profiles, effectiveness, reversibility and convenience [12]. However, not every sexually active woman or couple know about the choices of contraception.

A study in Malaysia indicated that female university students had poor knowledge on reproduction and pregnancy, contraceptive uses and contraceptive methods available [7]. This study was conducted about 10 years ago and on only female university students. In addition, this previous study did not focus on knowledge of different methods of contraception. Another study found that students aged between 13 and 17 years also had inadequate knowledge about contraception, with a majority thinking that washing the vagina or having a hot shower after sexual intercourse could prevent pregnancy [13].

Studies on knowledge of contraception are still scarce in Malaysia. However, a validated instrument is required to assess such knowledge. University students in Malaysia are mainly between 19 to 24 years old which has been categorized as youths and are usually sexually active. Therefore, the present study was conducted to develop and validate a self-administered knowledge instrument, and to assess the knowledge of university students on contraception.

METHOD

The study consisted of two phases: Phase 1 was to develop and validate an instrument, Knowledge on Methods of Contraception (KMC) and Phase 2 was to determine the knowledge of university students on methods of contraception. A cross-sectional study was conducted at the various non-medical faculties of a major public university in Malaysia. Ethical approval was obtained from the Medical Ethics Committee of University Malaya Medical Centre (Medic. No: 201411-783), before commencement of the study. All respondents provided written informed consent.

Included were students who were registered as undergraduates in any of the 10 non-medical related faculties in the public university under study at the time of recruitment. Students from medical related faculties such as the Faculty of Dentistry and Faculty of Medicine, as well as Academies of Islamic Studies or Malay Studies, postgraduates, foreigners, students with cognitive problems or those who had already graduated, were excluded.

The sample size for this study was calculated based on the number of items in KMC-25 to participant ratio. Munro [14] recommended a ratio of 1 : 5 and hence, the minimum number of participants required for Phase 1 of the study should be 125. In addition, using Raosoft sample size calculator (Raosoft.com) and assuming that the proportion of students with adequate knowledge on contraception is 50% in an undergraduate student population of about 10,000 at 95% confidence level, the minimum sample size required for Phase 2 was 370.

The first version of the Knowledge on Methods of Contraception (KMC) instrument consisted of 40 items (KMC-40). It was developed based on studies in the literature [7,13,15-20]. A pilot study was conducted on 40 undergraduate students from non-medical related faculties to test the clarity and face validity of the questionnaire as well as feasibility of the study procedure, and then the questionnaire was modified accordingly. The Cronbach's alpha, corrected item-total correlation, Cronbach's alpha if item deleted, Difficulty Factor and Flesch Reading Ease were considered for the removal of any items in KMC-40.

Consequently, the KMC-40 was modified to only 25 items (KMC-25). The 25 items were classified into four categories: Questions 1 to 5 were for Natural Methods, Questions 6 to 11 for Barrier Methods, Questions 12 to 22 for Hormonal Methods and Questions 23 to 25 for Intrauterine Devices.

Phase 1: Development and validation of an instrument, Knowledge on Methods of Contraception (KMC)

A researcher was stationed in each of the non-medical faculty of the public university. Students were approached to participate in the study based on convenience sampling. The researcher approached each student and explained the aim and procedures of the study. If the student agreed to participate, he or she would sign an informed consent form and was then given a questionnaire to fill. The completed questionnaire was returned to the researcher who would ensure that the questionnaire had been filled. The researcher contacted all the respondents after three to four weeks to fill the KMC-25 again.

Phase 2: Knowledge of university students on methods of contraception

Phase 2 of the study followed similar procedure as Phase 1 except that the respondents filled the KMC-25 only once. The total number of undergraduate students registered in each non-medical faculty was obtained from the Admission and Record Section of the university. The number of respondents recruited from each faculty was based on the proportion of students in each faculty relative to the undergraduate student population in the university. A researcher was stationed in each of the non-medical faculty and approached any student to participate in the study based on convenience sampling. If the student agreed to participate, he or she would sign an informed consent form and the KMC-25 would be given for him/her to fill in by himself or herself. The researcher checked the completed questionnaire and thanked the respondent.

Data Analysis

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS), Version 22 (Armonk, NY:IBM Corp.). One mark was allocated for each correct answer in the KMC-25 while zero was given for incorrect or unsure response. This gave a minimum total score of zero and a maximum of 25. The score was then converted to a percentage by a multiplication of 4. A respondent with a total score of 50% and above was considered to have adequate knowledge on the methods of contraception while those with a score below 50% was considered to have inadequate knowledge.

Data from the KMC-25 was analyzed for internal consistency using Cronbach's alpha values, corrected item-total correlation and Cronbach's alpha if item was deleted. A Cronbach's alpha value of 0.70 to 0.95 is considered as having good internal consistency [21]. Low values of Cronbach's alpha indicate poor interrelation between items while very high values imply that the questions are very similar and there is redundancy [22]. If the Cronbach's alpha value increases substantially with the deletion of an item, then the item should be excluded to produce a more homogeneous scale. An item with its item-total correlation coefficient less than 0.2 means that it is not related to the total score and should be removed [23].

Stable reliability was determined by comparing the scores obtained from two separate administrations of the KMC-25. Spearman's correlation coefficient (ρ) was used to determine the strength of the relationship between the total knowledge score of the respondents in the test-retest. According to the rule of thumb, Spearman's ρ is interpreted as followed: negligible correlation (0 to 0.3), low correlation (0.3 to 0.5), moderate correlation (0.5 to 0.7), high correlation (0.7 to 0.9) and very high correlation (0.9 to 1.0) [24]. In addition, McNemar Test was used to compare the answer to each item in the KMC-25 between the two tests results.

Flesch Reading Ease Calculator (<http://www.readabilityformulas.com/free-readability-formula-tests.php>) was used to ensure that the KMC-25 could be read and understood easily. The higher the number means the easier it is to read the text. A score between 0 and 30 is considered as easily understood by college graduates, while a score between 40 and 50 by 9th to 10th graders (around 14 to 15 years old students), a score between 60 and 70 by 8th and 9th graders (around 13 to 14 years old), and between 90 to 100 can be easily understood by 5th graders (around 10 years old).

Difficulty factor determines whether the question is too easy or too difficult to answer. It is calculated by using the number of respondents who answered a particular question correctly divided by the total number of respondents. An item with value less than 0.2 means it is too difficult while those more than 0.8 is too easy [25].

Discriminant validity was conducted by comparing the knowledge scores of KMC-25 between non-medical students and final year pharmacy students who should have better knowledge due to the inclusion of topics on contraception in their pharmacy curriculum. Comparison was done using Mann-Whitney U test. A p-value of less than 0.05 was considered as statistically significant.

Possible predictors of knowledge on contraceptive methods were analyzed using univariate and multivariate Poisson regression under the Generalized Linear Model function in SPSS.

RESULT

Phase 1: Development and validation of an instrument, KMC

The content validity of the KMC-25 was conducted by four experienced pharmacists and a clinician. A total of 130 respondents from non-medical faculties participated in this phase of the study.

The Cronbach's alpha of the final KMC-25 was 0.78. Five items had a corrected item-total correlation of less than 0.2 and none of the items produced an increase in Cronbach's alpha value of more than 0.01 if it was deleted. (Table I.)

Only 68 respondents participated in the retest. The McNemar test showed no significant difference between the first and second test (test-retest) for each item of the KMC-25, except for item 4. (Table I.) In addition, Spearman's correlation coefficient showed that there was a high positive correlation between the total scores of the KMC-25 for the test and retest results (Spearman's rho = 0.868; $p < 0.001$).

Flesch Reading Ease score for KMC-25 was 49.3 and graded as Level 10 which indicated that the KMC-25 could be easily understood by students aged 14 to 15 years. This means that KMC-25 can be even more easily understood by university students. Of the 25 items in the KMC-25, 11 (44%) items had difficulty factor less than 0.2 but none was more than 0.8. (Table I.)

Fifty final year pharmacy students were recruited in this study to test the discriminant validity of KMC-25 instrument. Significant difference was found between the total KMC-25 scores of final year pharmacy students and non-medical related students, with $p < 0.001$. (Table II.)

Phase 2: Knowledge of university students on methods of contraception

Characteristics of Respondents

Out of 412 students who were approached by the researcher and who met the inclusion criteria, 10 declined to participate as they were rushing to class. Therefore, the response rate of this study was 97.6%. Characteristics of 402 respondents in Phase 2 of the study are presented in Table III. Occupation of family members which was considered as medically related included

nurses (19), doctors (10), pharmacists (4), medical assistants (2), dental surgery assistants (1), physiotherapists (1), and dietitians (1).

Knowledge Scores of Respondents

Out of 402 respondents, only 34 (8.5%) scored 50% and above, and were considered to have adequate knowledge on methods of contraception. The total KMC-25 score ranged from 0 to 80%, with one respondent scoring 80% while 27 respondents (6.7%) did not answer any of the questions correctly. The mean (SD) knowledge score of the respondents was 25 (16.8)%. Nine possible predictors of contraceptive knowledge were analyzed as shown in Table III. Multivariate Poisson regression analysis identified seven of the independent variables to be significantly associated with the knowledge on methods of contraception. The incidence rate ratio (IRR) of each predictor is as shown in Table III. The group with the lowest mean total knowledge score in each independent variable was used as the reference.

The percentage of respondents who answered each item in KMC-25 correctly is as shown in Table IV.

Sources of Information on Methods of Contraception

The respondents obtained information on methods of contraception from various sources (Figure I). The respondents were allowed to select more than one source of information and hence, the percentages in Figure I added up to more than 100%. A couple of respondents obtained information of contraception from drama and movie (one respondent) or fiction and novel (one respondent).

DISCUSSION

Internal consistency estimates of Cronbach's alpha are highly dependent on item variances and their intercorrelations [26]. In the present study, the KMC-25 has achieved good internal consistency since its Cronbach's alpha was in the range of 0.70 to 0.95. The Cronbach's alpha of KMC-25 did not change much if any of the items was omitted. Therefore, the 25 items were retained even though five of the items had corrected item-total correlation of less than 0.2. This allows for item variability so that the knowledge of different methods of contraception could be assessed.

Response to all the items did not show any significant difference between the test and retest. In addition, the total scores of the test-retest showed a high Spearman's rho of more than 0.8 which implies a high positive correlation between the two tests. Therefore, the KMC-25 has achieved stable reliability which means that the questions are clear enough for

Table I. Reliability and Difficulty Factor of KMC-25 (N = 130)

| No | Item ^d | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted | Difficulty Factor | McNemar Test, n = 68 p value |
|-----|---|----------------------------------|----------------------------------|-------------------|------------------------------|
| 1. | Natural methods are 100% effective in preventing pregnancy. | 0.354 | 0.770 | 0.48 | 0.302 |
| 2. | A woman will not get pregnant if her partner does not ejaculate during sexual intercourse. | 0.278 | 0.774 | 0.24 | 0.267 |
| 3. | All women can detect a small rise in their body temperature to prevent pregnancy. | 0.178 ^a | 0.779 | 0.19 ^b | 1.000 |
| 4. | Washing the vagina immediately after having sex can prevent pregnancy. | 0.378 | 0.768 | 0.47 | 0.002** |
| 5. | A woman can detect her fertile period by looking at the texture of her cervical mucous. | 0.338 | 0.771 | 0.23 | 0.804 |
| 6. | All barrier methods can protect against sexually transmitted diseases (STDs). | 0.450 | 0.764 | 0.30 | 0.581 |
| 7. | Condoms can break if the tip is not pinched to remove air bubbles. | 0.248 | 0.776 | 0.30 | 0.332 |
| 8. | Spermicide will increase the efficiency of a condom. | 0.164 ^a | 0.779 | 0.10 ^b | 0.508 |
| 9. | All barrier methods, including condoms can be reused. | 0.431 | 0.765 | 0.67 | 0.607 |
| 10. | Diaphragms and cervical caps are designed to be used with spermicides. | 0.153 ^a | 0.779 | 0.09 ^b | 0.549 |
| 11. | Diaphragms and cervical caps form a barrier to prevent sperm from entering into the uterus. | 0.484 | 0.761 | 0.53 | 0.210 |
| 12. | Oral birth control pills do not work unless they are taken around the same time every day. | 0.212 | 0.777 | 0.18 ^b | 0.118 |
| 13. | Oral birth control pills are available everywhere including grocery shops and supermarkets. | 0.231 | 0.778 | 0.38 | 0.093 |
| 14. | A woman who has been taking birth control pills for several years will never get pregnant even if she stops using the pill. | 0.302 | 0.773 | 0.42 | 1.000 |
| 15. | Birth control pills with only one type of hormone (progestin) decrease the risk of breast cancer. | 0.183 ^a | 0.778 | 0.08 ^b | 0.581 |
| 16. | Birth control pills with high content of progestin (female hormone) have lower risk of ovarian cancer than those with low content of progestin. | 0.154 ^a | 0.779 | 0.05 ^b | 1.000 |
| 17. | Combined birth control pills are more likely to increase body weight than those with progestin only. | 0.209 | 0.777 | 0.12 ^b | 0.754 |
| 18. | All types of birth control pills are effective in preventing pregnancy if taken immediately after sexual intercourse. | 0.394 | 0.767 | 0.39 | 0.167 |
| 19. | Emergency birth control pills should be used continuously to prevent pregnancy. | 0.224 | 0.777 | 0.20 | 0.824 |
| 20. | Implants contain similar hormones as birth control pills. | 0.346 | 0.771 | 0.10 ^b | 1.000 |
| 21. | Implants are preferred to birth control pills because the problem of missing pills will not occur. | 0.479 | 0.763 | 0.19 ^b | 0.189 |
| 22. | Injections are preferred compared to implants as skin allergies do not occur. | 0.264 | 0.775 | 0.16 ^b | 1.000 |
| 23. | Intrauterine device (IUD) will prevent pregnancy permanently. | 0.399 | 0.768 | 0.20 | 0.791 |
| 24. | IUD can be inserted by the woman herself just before any sexual activity. | 0.289 | 0.774 | 0.18 ^b | 0.057 |
| 25. | IUD can cause abnormal bleeding and pain. | 0.478 | 0.763 | 0.23 | 0.581 |
| | Total score (Spearman's Correlation Coefficient) | | | | < 0.001** (0.868) |

^aValue < 0.2; ^bDifficulty factor < 0.2;

**p-value < 0.01

Table II. Comparison between total knowledge scores of final year pharmacy students and non-medical students

| Types of students | Mann-Whitney U test | | | Chi square test | | χ^2 (p value) |
|------------------------------|---------------------|-----------|-------------------|---|---|--------------------|
| | Median (IQR) scores | Mean rank | Z value (p value) | Inadequate knowledge (< 50) Frequency (%) | Adequate knowledge (> 50) Frequency (%) | |
| Pharmacy students | 60 (50 - 68) | 144.62 | -8.657 (< 0.001) | 12 (24%) | 38 (76%) | 79.768 (< 0.001) |
| Non-medical related students | 26 (12 - 40) | 69.68 | | 119 (91.5%) | 11 (8.5%) | |

IQR: Interquartile range

Table III. Characteristics of respondents and possible predictors of contraceptive knowledge (N = 402)

| Characteristics | Frequency (%) | Total Knowledge Scores | | Univariate Poisson Regression | | Multivariate Poisson Regression | |
|-------------------------------------|---------------|------------------------|--------------|-------------------------------|---------|---------------------------------|-----------|
| | | Mean (SD) | Median (IQR) | Crude IRR (95% CI) | P value | Adjusted IRR (95% CI) | P value |
| Gender | | | | | < 0.001 | | 0.005** |
| Male | 126 (31.3%) | 28.95 (18.1) | 28 (0 - 80) | 1.248 (1.198; 1.300) | | 1.072 (1.022; 1.126) | |
| Female | 276 (68.7%) | 23.20 (15.9) | 22 (0 - 76) | 1 | | 1 | |
| Ethnicity | | | | | < 0.001 | | 0.081 |
| Malay | 177 (44.0%) | 20.75 (15.3) | 20 (0 - 76) | 1.089 (1.001; 1.183) | | 1.225 (0.838; 1.789) | |
| Chinese | 175 (43.5%) | 30.15 (16.9) | 32 (0 - 80) | 1.582 (1.458; 1.716) | | 1.268 (1.029; 1.563) | |
| Indian | 34 (8.5%) | 19.06 (16.2) | 16 (0 - 64) | 1 | | 1 | |
| Others ^a | 16 (4.0%) | 28.50 (17.5) | 34 (0 - 52) | NA | | NA | |
| Religion | | | | | < 0.001 | | 0.18 |
| Muslim | 181 (45.0%) | 20.84 (15.3) | 20 (0 - 76) | 1.145 (1.045; 1.254) | | 0.860 (0.582; 1.272) | |
| Buddhist | 136 (33.8%) | 29.68 (17.2) | 28 (0 - 80) | 1.630 (1.489; 1.785) | | 1.120 (0.891; 1.409) | |
| Christian | 46 (11.4%) | 30.17 (16.2) | 32 (0 - 56) | 1.657 (1.499; 1.832) | | 1.211 (0.973; 1.507) | |
| Hindu | 29 (7.2%) | 18.21 (16.5) | 16 (0 - 64) | 1 | | 1 | |
| Others ^b | 10 (2.5%) | 32.80 (16.5) | 30 (8 - 68) | NA | | NA | |
| Marital status | | | | | < 0.001 | | < 0.001** |
| Married | 3 (0.7%) | 38.67 (16.2) | 39 (24 - 56) | 1.553 (1.293; 1.865) | | 1.957 (1.593; 2.403) | |
| Single | 399 (99.3%) | 24.90 (16.8) | 24 (0 - 80) | 1 | | 1 | |
| Secondary education | | | | | < 0.001 | | < 0.001** |
| Rural Area ^c | 12 (3.0 %) | 30.00 (16.9) | 30 (8 - 52) | 1.207 (1.087; 1.341) | | 1.301 (1.166; 1.452) | |
| Urban Area | 390 (97.0%) | 24.85 (16.8) | 24 (0 - 80) | 1 | | 1 | |
| Stream in Secondary School | | | | | < 0.001 | | 0.001** |
| Science | 329 (81.8%) | 26.08 (16.7) | 24 (0 - 80) | 1.293 (1.224; 1.367) | | 1.135 (1.057; 1.220) | |
| Art | 73 (18.2%) | 20.16 (16.6) | 16 (0 - 60) | 1 | | 1 | |
| Occupation of Family Members | | | | | < 0.001 | | 0.009** |
| Non-medical Related | 367 (91.3%) | 25.34 (17.0) | 24 (0 - 80) | 1.179 (1.095; 1.270) | | 1.119 (1.029; 1.218) | |
| Medical Related | 35 (8.7%) | 21.48 (14.5) | 24 (0 - 56) | 1 | | 1 | |
| Current Year of Study | | | | | < 0.001 | | < 0.001** |
| Year 1 | 167 (41.5%) | 22.75 (15.6) | 20 (0 - 64) | 1.007 (0.954; 1.064) | | 1.133 (1.062; 1.209) | |
| Year 2 | 103 (25.6) | 26.87 (16.4) | 28 (0 - 76) | 1.190 (1.122; 1.261) | | 1.182 (1.105; 1.264) | |
| Year 4 | 47 (1.7) | 33.28 (19.3) | 32 (8 - 76) | 1.473 (1.378; 1.575) | | 1.208 (1.117; 1.307) | |
| Year 3 | 85 (21.1) | 22.59 (16.6) | 20 (0 - 80) | 1 | | 1 | |
| Faculty of Study | | | | | < 0.001 | | < 0.001** |
| Law | 23 (5.7) | 29.04 (17.7) | 28 (4 - 76) | 1.683 (1.522; 1.861) | | 1.373 (1.224; 1.539) | |
| Science | 99 (24.6) | 27.27 (15.5) | 28 (0 - 68) | 1.581 (1.465; 1.706) | | 1.359 (1.239; 1.490) | |
| Education | 22 (5.5) | 23.27 (16.0) | 24 (0 - 52) | 1.349 (1.210; 1.504) | | 1.392 (1.224; 1.583) | |
| Engineering | 66 (16.4) | 33.82 (19.3) | 32 (4 - 80) | 1.960 (1.813; 2.119) | | 1.635; 1.476; 1.810) | |
| Built Environment | 30 (7.5) | 20.53 (14.3) | 20 (0 - 48) | 1.190 (1.074; 1.319) | | 1.090 (0.969; 1.225) | |
| Languages & Linguistics | 24 (6.0) | 20.67 (17.8) | 20 (0 - 64) | 1.198 (1.073; 1.337) | | 1.070 (0.944; 1.212) | |
| Business & Accountancy | 42 (10.4) | 23.33 (16.9) | 22 (0 - 60) | 1.352 (1.235; 1.481) | | 1.253 (1.132; 1.385) | |
| Economics & Administration | 26 (6.5) | 23.54 (14.7) | 20 (8 - 56) | 1.364 (1.230; 1.512) | | 1.149 (1.028; 1.283) | |
| Computer Science & IT | 19 (4.7) | 18.74 (12.7) | 16 (0 - 40) | 1.086 (0.960; 1.228) | | 0.965 (0.840; 1.109) | |
| Arts and Social Science | 51 (12.7) | 17.25 (13.4) | 16 (0 - 44) | 1 | | 1 | |

Others^a : include Buginese, Dusun, Punjabi, Bumiputera Sabah, Sikh, Bidayuh, Kadazan, Bajau, Lundayeh. and Eurasian. These were excluded from Kruskal–Wallis Test due to too small sample size in the study.

Others^b : include Catholic, Atheist, Sikhism, Free thinker and Taoism.

Area^c : Rural area refers to area with population between 1 000 and 10 000.

SD = Standard deviation; IQR = Interquartile range; IRR = Incidence rate ratio; CI = Confidence interval; NA = Not applicable (excluded from the analysis)

**p < 0.01

Table IV. Percentage of Correct Answers on each item in KMC-25 (N = 402)

| No. | Items | Correct answer Frequency (%) | Total score for each category (%) |
|-----|---|------------------------------|-----------------------------------|
| 1. | Natural methods are 100% effective in preventing pregnancy. | 178 (44.3) | Natural Method 31.20 |
| 2. | A woman will not get pregnant if her partner does not ejaculate during sexual intercourse. | 81 (20.1) | |
| 3. | All women can detect a small rise in their body temperature to prevent pregnancy. | 79 (19.7) | |
| 4. | Washing the vagina immediately after having sex can prevent pregnancy. | 210 (52.2) | |
| 5. | A woman can detect her fertile period by looking at the texture of her cervical mucous. | 80 (19.9) | |
| 6. | All barrier methods can protect against sexually transmitted diseases (STDs). | 114 (28.4) | Barrier Method 31.33 |
| 7. | Condoms can break if the tip is not pinched to remove air bubbles. | 121 (30.1) | |
| 8. | Spermicide will increase the efficiency of a condom. | 33 (8.2) | |
| 9. | All barrier methods, including condoms can be reused. | 260 (64.7) | |
| 10. | Diaphragms and cervical caps are designed to be used with spermicides. | 42 (10.4) | |
| 11. | Diaphragms and cervical caps form a barrier to prevent sperm from entering into the uterus. | 185 (46.0) | |
| 12. | Oral birth control pills do not work unless they are taken around the same time every day. | 96 (23.9) | Hormonal Method 20.45 |
| 13. | Oral birth control pills are available everywhere including grocery shops and supermarkets. | 136 (33.8) | |
| 14. | A woman who has been taking birth control pills for several years will never get pregnant even if she stops using the pill. | 159 (39.6) | |
| 15. | Birth control pills with only one type of hormone (progestin) decrease the risk of breast cancer. | 39 (9.7) | |
| 16. | Birth control pills with high content of progestin (female hormone) have lower risk of ovarian cancer than those with low content of progestin. | 35 (8.7) | |
| 17. | Combined birth control pills are more likely to increase body weight than those with progestin only. | 59 (14.7) | |
| 18. | All types of birth control pills are effective in preventing pregnancy if taken immediately after sexual intercourse. | 141 (35.1) | |
| 19. | Emergency birth control pills should be used continuously to prevent pregnancy. | 70 (17.4) | |
| 20. | Implants contain similar hormones as birth control pills. | 48 (11.9) | |
| 21. | Implants are preferred to birth control pills because the problem of missing pills will not occur. | 55 (13.7) | |
| 22. | Injections are preferred compared to implants as skin allergies do not occur. | 67 (16.7) | IUD 18.67 |
| 23. | Intrauterine device (IUD) will prevent pregnancy permanently. | 75 (18.7) | |
| 24. | IUD can be inserted by the woman herself just before any sexual activity. | 72 (17.9) | |
| 25. | IUD can cause abnormal bleeding and pain. | 80 (19.9) | |

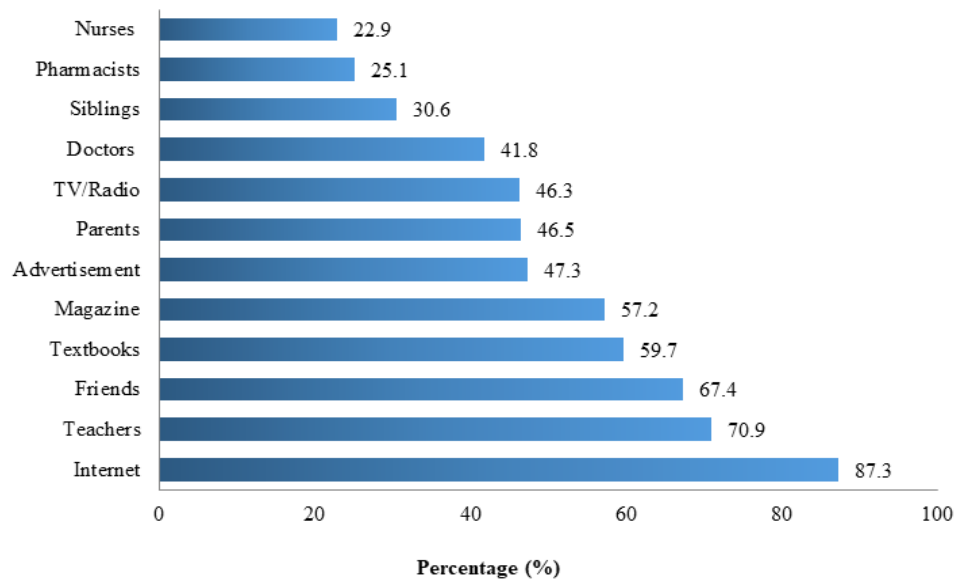


Figure I. Sources of Information (N = 402)

the respondents to interpret them the same way in both tests.

Flesch Reading Ease score for KMC-25 was 49.3 which means that the target population which were university students should be able to read and understand the statements in the KMC-25 easily. Therefore, if a respondent gave an incorrect answer, it was not because he or she had difficulty to comprehend the meaning of the statement but more because he or she did not have sufficient knowledge to answer it correct.

Of the 25 items in the KMC-25, 11 (44%) were considered as difficult to answer but no item was too easy. Although this KMC-25 contains some difficult questions, these questions are deemed essential for someone to practice correct contraception and hence, these items were retained in the instrument.

The total knowledge score of final year pharmacy students was significantly higher ($p < 0.001$) than that of non-medical related students with a median (IQR) of 60 (50 - 68)% and 26 (12 - 40)%, respectively. In addition, the proportion of pharmacy students with adequate knowledge on methods of contraception was significantly higher than that of non-medical related students [76% versus 8.5%, $p < 0.001$]. This is as expected and indicates that the KMC-25 can differentiate people with different knowledge level on the methods of contraception.

Phase 2 of the study also found that only 8.5 % of the university students from non-medical related faculties have adequate knowledge on the methods of contraception. Other studies reported similar findings [7,19,27,28]. However, adolescents in Southern Africa and Ghana had higher knowledge on contraceptive issues [29,30].

The present study showed that university students with significantly better knowledge on methods of contraception are males (compared to females), already married (relative to those still single), had their secondary education in rural area (relative to urban), from Science stream (relative to Arts stream), with family members in non-medical related occupations (compared to medical related occupations), and in Year 4 of their degree program (compared to Year 3). In addition, students from Engineering or other degree programs (except from Computer Science and Information Technology) had significantly better knowledge than those from Arts and Social Science.

Male students are probably more inquisitive and hence, tend to know more about contraceptive methods compared to female students. Naturally, students who are already married, from Science stream in schools and studying in Science related programs will be more knowledgeable about contraception than those who are still single, from Arts stream in schools and

studying in Arts related degree programs. Students from Science stream and Science related degree programs are probably exposed to more in-depth science education which is related to reproduction. However, students from secondary schools in rural areas and those with family members who have non-medical related occupations were shown to have higher knowledge than those from urban schools and with family members who have medical related occupations. These are unexpected and currently there is no logical explanation.

In the present study, the respondents scored the highest point in Barrier Method, followed by Natural Method, Hormonal Method and IUD. In addition, of the items in the KMC-25, the highest proportion of respondents (64.7%) knew that condoms cannot be reused. Similarly, another study in Malaysia, and other studies in Nigeria and in Ghana, reported that the most common contraceptive method known was the condom [7,27,29]. On the contrary, a study in Turkey showed that all the participants knew about contraceptive pills which were easily available and commonly used [31]. The reason for this difference may be because condoms are easily available in Malaysia whereas, contraceptive pills are controlled medications and can only be obtained from licensed health care providers.

Majority of the respondents (80%) believed that a woman would not get pregnant if her partner did not have ejaculation during sexual intercourse. A similar study in Malaysia reported 61.8% of their respondents with the same belief [7]. This lack of understanding can lead to unintended pregnancy. Less than 20% of the respondents could answer the questions on hormonal method and intrauterine devices (IUDs) correctly probably because these questions were more technical. A Nigeria study stated that injectable hormonal contraceptives and intrauterine devices were mostly available only at designated family planning clinics [32]. Similar availability occurs in Malaysia and hence, respondents had less exposure to these two methods of contraception. Respondents had poor awareness and knowledge on the insertion of IUD as well as the relationship between birth control pills and breast or ovarian cancer. Majority of the respondents (more than 80%) thought that IUD can be inserted by women themselves instead of by health care professionals.

Most of the respondents obtained information on methods of contraception from the internet (87.3%), followed by from their teachers or friends. However, a previous study in Malaysia found magazines (22.4%) and internet (20.4%) were the most common sources of information for contraception [7]. This difference is attributed to the advance in technology and the increased use of internet by most university students. Less than 42% of the respondents in the present study seek a doctor's

advice, and even lesser (25%) asked information from a pharmacist. This shows that most of the respondents prefer to seek information on contraception from other sources than from health care providers and hence, is an area of concern as there is a high possibility of incorrect information.

The limitation of the present study is that it was conducted in only one university although it is a major university in Malaysia and hence, the findings may not be representative of all university students in Malaysia. Multiple site studies should be conducted in future to obtain better representation of the target population.

CONCLUSION

The present study shows that KMC-25 is a reliable and valid instrument to assess university students' knowledge on methods of contraception. University students from non-medical related programs have poor knowledge on the methods of contraception. This warrants the implementation of reproductive and sexual educational programs to improve their knowledge level and to prevent or minimize unplanned or unwanted pregnancy.

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CONFLICT OF INTEREST

This study has no conflict of interest. This research did not receive any specific grant from funding agencies in public, commercial or not-for-profit sectors.

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