ABSTRACT

Objective This study aimed to explore the knowledge, attitude and behaviour regarding male infertility among medical students and healthcare workers in Bangladesh.

Design This was a cross-sectional study.

Setting This study covered eight divisions of Bangladesh.

Participants The participants were medical students or healthcare professionals of Bangladesh who were surveyed anonymously on their knowledge, attitude and perception regarding male infertility.

Primary outcome measures The level of knowledge, attitude and perception regarding male infertility.

Analysis The mean knowledge and attitude scores were then correlated with sociodemographic factors using χ² and two-independent sample t-tests. Finally, we performed binary logistic regression to explore predictors of good knowledge and positive attitude.

Result Among 556 participants, 49.82% did not have good male infertility knowledge, and nearly 60.79% had negative attitudes regarding male infertility. Young (23–26 years) healthcare professionals and medical students were more likely to have good knowledge than others (OR: 1.81; 95% CI 1.099 to 2.988). Surprisingly, women were more likely to have a positive attitude (OR=1.48; 95% CI 1.002 to 2.19, p=0.049) than men. Among all the professions, Bachelor of Medicine and Surgery doctors were most likely to have good knowledge and a positive attitude regarding male infertility. Good knowledge of male infertility predicted a positive attitude (OR=1.61; 95% CI 1.105 to 2.346, p=0.013) and vice versa.

Conclusion Our research found that healthcare professionals and medical students in Bangladesh had inadequate knowledge and negative attitudes regarding male infertility despite favourable opinions. This emphasises the need for interdisciplinary training programmes, standardisation of healthcare worker guidelines and curricular adjustments for medical students.
Although it was formerly thought that infertility was primarily due to a female element, it is now widely acknowledged that male factor infertility is just as essential as female factor infertility. Male infertility accounts for a considerable share of infertility, and reproductive tract infections, STDs (Sexually Transmitted Diseases), varicocele, diabetes, obesity, cystic fibrosis and hypogonadism are the major causes to be seen. Tight undergarments, keeping mobile or laptops near the genitalia, tobacco, and excessive exercise have also been proved to be responsible for decreased sperm concentration in the male population.

The prevalence of male infertility has not been accurately recognised due to patriarchal preferences in many countries. Due to a lack of understanding of the factors contributing to male infertility, some men may unknowingly engage in activities that impair their capacity to produce biological children. Certain medical conditions like cancer, genitourinary surgery, prostate surgery and cardiovascular disease can affect the fertility rate to a great extent. So, there is a need to educate health service providers about this issue and improve men’s awareness of avoiding and managing reproductive health issues.

People worldwide have many misconceptions regarding reproductive health and fertility because infertility is still a taboo subject. Understanding psychological and social problems associated with infertility would benefit from recognising ideas and attitudes towards male infertility. Uses of alternative treatments like herbal medicines, spiritual healing, homeopathy, and so on, are pretty popular in male infertility treatment. In developing countries, people tend to have more affinity towards these than other medical treatments. However, it is much more important to introduce reproductive health through the mass media and campaigns in educational institutions. Also, a complex mix of social, cultural and medical factors must be included in these awareness programmes.

Men face a difficult emotional journey after getting diagnosed with infertility disorder. According to research, infertile men have poorer self-esteem, higher anxiety and more somatic symptoms. Many studies investigated infertility-related knowledge, behaviours, perceptions and practices, but there is only a small amount of information about male infertility-related knowledge, attitude and perceptions. So, male infertility is a grave concern in our families and society. The general public seeks medical and psychological counselling and assistance from health experts about male infertility. So, this issue should be understood well by all physicians, medical students and other healthcare providers who will become doctors in the future. This study aimed to explore the knowledge, attitude and perceptions regarding male infertility among medical students and healthcare workers in Bangladesh.

**METHOD**

**Study participants and study site**

This cross-sectional study was done in Bangladesh among 556 medical students and healthcare professionals (figure 1). The research was completed in August and September 2021. The researchers employed an online survey to ensure social distancing and take appropriate precautions throughout the pandemic. The sample was selected by a quota sampling method to ensure equal representation from each of the eight divisions of Bangladesh. Participants were included upon meeting the following criteria: (1) Bangladeshi resident, (2) Healthcare professional or medical student, and (3) Providing informed consent.

**Patient and public involvement**

Patients were not involved in this study.

**Instrument and measurement**

A semistructured and self-reported questionnaire (online supplemental file) including informed consent and four categories (sociodemographic, knowledge, attitudes and perceptions) was used during data collection. The entire

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**Figure 1** STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) flow chart of study participants.
questionnaire was inputted into Google Forms without randomising items for the online distribution and was tested for usability and technical functionality. The form had 57 questions (11 items for sociodemography, 34 items for knowledge, 5 items for attitudes and 7 items for perceptions) distributed over two pages. Mandatory items were highlighted with a red asterisk, and a relevant non-response option was present. Respondents could review their answers through the back button and change their responses if necessary. The survey never displayed a second time once the user had filled it in to prevent duplicate entries.

Sociodemographic information
The sociodemographic section had 11 questions which included age, sex, marital status, number of children (if applicable)/diagnosed infertile by a physician, educational institution, employment, monthly family income and religion. In terms of personal information, individuals were queried about their medical history, family history of infertility and sexual exposure (history of having penetrating vaginal intercourse).

Knowledge, attitudes and perceptions
To ascertain respondents' level of knowledge, attitudes and perceptions, a total of 46 structured questions were used (34 items for knowledge, 5 items for attitudes and 7 items for perceptions). These questions were derived from a review of the prior literature.6 7 13-16

The knowledge portion had 34 questions with three response categories (ie, ‘True’, ‘False’ and ‘Don’t know’). These questions aimed to explore general knowledge (eg, a couple can be defined infertile after 1 year of unprotected sex), disease-specific knowledge (eg, sexually transmitted disease causes male infertility), drug-specific knowledge (eg, steroid causes male infertility), investigation-specific knowledge (eg, semen analysis and serum testosterone level is the primary investigation for male infertility), healthy practice-specific knowledge (eg, caffeine causes male infertility), and knowledge about the associated factor (eg, tobacco causes male infertility). The ‘Correct answer’ was assigned a value of 1, while the ‘Wrong answer/Don’t know’ was assigned a 0. The total score was calculated by adding the raw scores for all 34 questions, ranging from 0 to 34. A score more than the mean suggested ‘Good knowledge’ about male infertility. The value of Cronbach’s α for knowledge items was 0.861.

The attitude part included five statements (eg, mass media should promote educational programmes on male infertility; campaigns on reproductive health should be organised in the educational institutions) with a two-point Likert Scale (0=disagree, 1=agree). The total score was determined by adding the raw values for each of the five statements, ranging from 0 to 5, and a score greater than the mean indicating a ‘Positive attitude’ regarding male infertility. Cronbach’s α coefficient for attitudes items was 0.77.

The perceptions section included seven items assessing participants’ attitudes towards male infertility, six of which were yes/no questions (eg, general people have poor knowledge about male infertility; men feel depressed to be considered themselves as infertile, etc), and one was a scenario-based question (eg, suppose you are treating a couple for infertility, who should be investigated first?).

Survey administration
Trained research assistants contacted prospective participants via convenience and quota sampling and described the research in detail. Once the individuals were ascertained to meet the inclusion criteria and consented to voluntary participation in the study, a link to a web-based survey created by Google Forms was sent via Facebook message/email/SMS making it a closed survey. The survey was not announced or advertised anywhere else. The initial sample size was calculated using the formula N=Z²pq/d² (here, n=sample size, Z=CI, pq=variance of population, d=margin of error). Considering a 95% confidence level and 5% precision, we needed approximately 384 samples. Considering a 10% non-response rate and to ensure quality data, participants nearly twice the sample size (800) were approached. Among them, there were 588 eligible participants who agreed to participate and 556 completed the entire questionnaire (completion rate: 94.56%); incomplete questionnaires were excluded from the analysis. The number of samples from each division was calculated using the following formula: n=n x Ne/N; (here n=number of samples from each division, n=total sample, Ne=total population, Ne=population of each division).

Statistical analysis
We used Stata V.16 (StataCorp, College Station, Texas, USA) for data analysis. A histogram, a normal Q-Q plot and the Kolmogorov-Smirnov test were used to check for normality in continuous data. Arithmetic mean was used for quantitative data as a measure of centre, and SD was used as a measure of dispersion. The χ² tests and a two-independent sample t-test were used to examine the relation of the mean knowledge and attitude scores with sociodemographic characteristics. Finally, we performed binary logistic regression analysis to determine the predictors of good knowledge and positive attitude. All values of p were considered statistically significant if <0.05. Cronbach’s α was used to assess internal consistency for each knowledge and attitude scale.

Ethics
All participants provided informed consent. The 1964 Declaration of Helsinki and later modifications and comparable ethical standards were followed wherever feasible. Data collection was voluntary, and no incentives were offered to participants. Data were only accessible to the authors and were not disclosed anywhere. All the reporting was done according to the Checklist for Reporting Results of Internet E-Surveys guidelines.17

Iktidar MA, et al. BMJ Open 2022;12:e062251. doi:10.1136/bmjopen-2022-062251
RESULTS

Sociodemographic characteristics

Among the 556 participants, the majority (41.1%) were between 23 years and 26 years of age, whereas the age of the participants ranged between 19 years to 59 years, with women representing 59.89% of the respondents. Of the participants 78.6% were Muslims and 70.86% of the study participants were unmarried. Approximately 14.21% of participants had children, 10.07% of the participants were married but not planning for children currently, 2.16% were trying to conceive, 10.07% were not planning for children and 1.44% were suffering from infertility (men 75%, women 25%). Among the respondents, 75.36% were from government institutions, 21.94% were from private institutions and 2.7% were in the autonomous category. Of the participants 37.77% were doctors, whereas nurses made up 10.61%, students were 44.24% and others were 7.37%. About 71.22% of the participants had never been sexually exposed, but 28.78% gave a history of sexual exposure. The study found that 91.73% of participants had no family history of infertility, while 8.27% had a family history of infertility. Of the participants 10.25% reported obesity as a comorbidity, 7.37% reported hypertension, 5.22% reported diabetes, 3.06% reported a history of mumps, 3.06% reported a history of genitourinary infection, 1.62% reported autoimmune diseases, 1.26% reported a history of tuberculosis and 76.44% reported no personal history of diseases. In terms of household income, details of the participants have been mentioned in Table 1.

In this section, the maximum possible score for each respondent was 34, whereas the respondent's mean score was 19.48±6.04. The overall prevalence of good knowledge was 50.18%. The highest overall prevalence of good knowledge was regarding investigation-related information (83.09%), whereas the lowest overall prevalence was in the disease-related section (38.74%). More than half of the men (56.5%) showed good knowledge, although for women was 45.05%. Concerning different subgroups, 74.03% of MBBS (Bachelor of Medicine and Surgery) doctors showed good knowledge; on the other hand, only 28.81% of nurses showed good knowledge. Among the other subgroups, 57.14% BDS (Bachelor of Dental Surgery) Doctors, 42.02% MBBS Students, 41.38% BDS Students, and 31.71% other healthcare staff had overall good knowledge (Table 2).

Attitude towards male infertility

The overall total possible score for attitude for each respondent was 5, but the mean score of the respondents was 4.17±0.88. Surprisingly only 39.21% had a positive attitude towards male infertility. The most positive attitude was that ‘Mass media should promote educational programmes on male infertility’, where around 96% of respondents had a positive attitude. On the other hand, only 46% of the respondents had a positive attitude regarding the treatment cost of male infertility (Table 3).

Predictors of knowledge and attitude towards male infertility

Table 1 presents the bivariate analysis of potential factors associated with the knowledge and attitude towards male infertility. Two independent sample t-tests revealed that age, gender, income, profession and children status were significantly associated with both knowledge and attitude. Participants with sexual exposure had higher overall mean knowledge (19.3±0.49) and attitude (4.18±0.07) scores than those non-exposed. In addition, sexual exposure was significantly associated with knowledge level (p=0.009) but not with attitude (p=0.92). Family history of infertility was also significantly associated with both knowledge and attitude. In the case of comorbidities, obesity was significantly associated with knowledge of male infertility. On the other hand, hypertension and a history of genitourinary infection were significantly associated with attitudes towards male infertility.

Table 2 reveals that men have significantly better knowledge than women in general, drug-related and associated factors-related knowledge items. MBBS doctors had significantly better knowledge than all other professions in all the knowledge domains except associated factors-related knowledge, and they were significantly better than BDS doctors in general, disease-related and drug-related items.

Table 4 depicts the binary logistic regression model for good knowledge. Participants aged between 23 years and 26 years had 80% more knowledge than participants whose age was less than 23 years (OR: 1.81; 95% CI 1.099 to 2.988). In addition, participants from private institutions have 9% more knowledge about male infertility than those from government institutions (OR: 1.099; 95% CI 0.69 to 1.755). MBBS doctors had the most knowledge among all the professions. Compared with them, BDS doctors, MBBS students, BDS students, nurses and other health professionals had 51%, 65%, 66%, 83% and 74% less knowledge about male infertility. Furthermore, participants with a positive attitude towards male infertility had around 60% more knowledge than participants with negative attitudes (OR: 1.59; 95% CI 1.082 to 2.342).

In terms of attitude, Table 5 shows that women had a 48% more positive attitude towards male infertility than men, with a 95% CI (OR=1.48; 95% CI 1.02 to 2.19, p=0.049). In addition, BDS doctors, MBBS students, BDS students, nurses and other health professionals had 44%, 60%, 72%, 73% and 91% less positive attitudes towards male infertility than MBBS doctors. Moreover, participants with good knowledge about male infertility had 61% more positive attitudes than participants who had poor knowledge (OR=1.61; 95% CI 1.105 to 2.346, p=0.013).

Perception regarding male infertility

Among participants 93.71% perceived ‘general people have poor knowledge about male infertility’ and 75.72% think ‘Uses of complementary medicine (herbal, spiritual healing, homeopathy etc.) are popular in male infertility treatment’. Concurrently, 89.39% believe that men are...
### Table 1  Baseline characteristics of study participants and their knowledge and attitude scores (n=556)

| Variable                              | N     | %    | Knowledge Score (mean±SD=19.48±6.04) | Attitude Score (mean±SD=4.17±0.88) |
|---------------------------------------|-------|------|-------------------------------------|-----------------------------------|
|                                       |       |      | Mean ±SD P value                   | Mean ±SD P value                   |
| Age, in years (mean±SD=26.31±6.87 years) | <0.001| 0.002|                                   |                                   |
| <23                                   | 157   | 28.81| 16.37 ±5.44 0.002                  | 4.08 ±0.80 0.80                   |
| 23–26                                 | 224   | 41.1 | 19.15 ±5.84 0.002                  | 4.32 ±0.80 0.80                   |
| ≥27                                   | 164   | 30.09| 18.67 ±6.87 0.002                  | 4.01 ±1.02 0.80                   |
| Gender                                |       |      |                                     |                                   |
| Male                                  | 223   | 40.11| 19.27 ±0.43 0.001                  | 4.03 ±0.07 0.002                  |
| Female                                | 333   | 59.89| 17.53 ±0.32 0.001                  | 4.26 ±0.04 0.001                  |
| Income, in BDT (mean±SD=68,247±93,054 BDT) |       |      |                                     |                                   |
| <31000                                | 165   | 29.68| 16.68 ±5.9 0.001                   | 3.98 ±1.01 0.008                  |
| 31000–50 000                          | 92    | 16.55| 18.64 ±5.74 0.001                  | 4.17 ±0.96 0.008                  |
| 51000–67 000                          | 163   | 29.32| 18.68 ±6.45 0.001                  | 4.25 ±0.82 0.001                  |
| ≥68000                                | 136   | 24.46| 19.28 ±5.98 0.001                  | 4.30 ±0.66 0.001                  |
| Religion                              |       |      |                                     |                                   |
| Islam                                 | 437   | 78.6 | 18.45 ±6.1 0.18                    | 4.21 ±0.85 0.15                   |
| Hindu                                 | 102   | 18.35| 17.58 ±6.38 0.18                   | 4.05 ±0.98 0.18                   |
| Buddhism                              | 17    | 3.06 | 16.29 ±5.27 0.18                   | 3.94 ±0.97 0.18                   |
| Institution                           |       |      |                                     |                                   |
| Government                            | 419   | 75.36| 18.18 ±6.27 0.17                   | 4.20 ±0.85 0.37                   |
| Private                               | 122   | 21.94| 18.71 ±5.81 0.09                   | 4.09 ±0.94 0.37                   |
| Other                                 | 15    | 2.7  | 15.6 ±4.24 0.09                    | 4.00 ±1.07 0.37                   |
| Profession                            |       |      |                                     |                                   |
| Doctor                                | 210   | 37.77| 20.83 ±6.42 <0.001                 | 4.42 ±0.80 <0.001                 |
| Student                               | 246   | 44.24| 16.88 ±5.64 0.84                   | 4.10 ±0.84 0.84                   |
| First year                            | 18    | 3.24 | 15.83 ±4.37 0.33                   | 4.33 ±0.65 0.33                   |
| Second year                           | 64    | 11.51| 17.73 ±5.58 0.06                   | 4.06 ±0.77 0.06                   |
| Third year                            | 66    | 11.87| 18.12 ±5.20 0.05                   | 4.05 ±0.81 0.05                   |
| Fourth year                           | 44    | 7.91 | 18.66 ±5.09 0.04                   | 4.16 ±0.82 0.04                   |
| Fifth year                            | 54    | 9.71 | 20.12 ±6.04 0.04                   | 4.22 ±0.89 0.04                   |
| Nurse                                 | 59    | 10.61| 15.71 ±4.64 0.33                   | 4.03 ±0.83 0.33                   |
| Other                                 | 41    | 7.37 | 16.56 ±4.63 0.34                   | 3.49 ±1.08 0.34                   |
| Marital status                        |       |      |                                     |                                   |
| Married                               | 157   | 28.24| 18.7 ±6.51 0.20                   | 4.18 ±0.91 0.20                   |
| Unmarried                             | 394   | 70.86| 17.99 ±5.97 0.86                   | 4.17 ±0.86 0.86                   |
| Other                                 | 5     | 0.9  | 21.8 ±6.22 1.41                    | 4.00 ±1.41 1.41                   |
| Children status                       |       |      |                                     |                                   |
| Have children                         | 79    | 14.21| 17.63 ±6.39 0.08                   | 4.00 ±1.01 0.08                   |
| Trying to conceive                    | 12    | 2.16 | 18.04 ±5.99 0.85                   | 4.18 ±0.85 0.85                   |
| Not planning                          | 56    | 10.07| 21.36 ±5.43 0.85                   | 4.00 ±0.85 0.85                   |
| Suffering from infertility            | 8     | 1.44 | 19.93 ±6.83 0.50                   | 4.57 ±0.50 0.50                   |
| Not applicable                        | 401   | 72.12| 17.5 ±3.93 0.08                   | 2.63 ±0.92 0.08                   |
| Sexual exposure                       |       |      |                                     |                                   |
| No                                    | 396   | 71.22| 17.8 ±0.31 0.08                   | 4.17 ±0.04 0.08                   |
| Yes                                   | 160   | 28.78| 19.3 ±0.49 0.07                   | 4.18 ±0.07 0.07                   |

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depressed about their infertility. Approximately 94.96% believe that infertile men endure a challenging emotional journey. Only 7.19% of the participants took part in male infertility training. About 84% disagreed with the notion that ‘prescription of complementary medicine is beneficial in the treatment of male infertility’. During infertility treatment, 14.57% believed ‘male should be investigated first’, 8.63% thought ‘female should be investigated first’ and 76.8% considered ‘both male and female should be investigated first’ (table 6).

**DISCUSSION**

This study explored the knowledge, attitude and beliefs of medical students and healthcare professionals in Bangladesh regarding male infertility. The key findings were that nearly half of the study population did not have good male infertility knowledge, and nearly two-thirds had negative attitudes regarding male infertility. Young (23–26 years) healthcare professionals and medical students were more likely to have good knowledge. Surprisingly, women were more likely to have a positive attitude than men. Among all the professions, MBBS doctors were most likely to have good knowledge and a positive attitude regarding male infertility. Good knowledge of male infertility predicted a positive attitude and vice versa.

This study clearly highlighted the lack of awareness concerning male infertility as barely half of the population in our study possessed good overall knowledge. Knowledge is also significantly lower among women compared with men. This lack of understanding explains why infertility is associated with such a negative connotation in our society.18 Our finding is consistent with a global poll of nearly 17,500 women from 10 countries conducted during the World Fertility Awareness Month.19 The lack of awareness was further reinforced when it was discovered that just half (56.76%) of the participants recognized how infertility is diagnosed after at least 1 year of regular unprotected sex. This may influence the couple’s decision to seek treatment, which should not be premature or postponed.20 Most of our participants were aware of the age at which male fertility begins to diminish, which corroborated the findings of Hammarberg et al.21 Despite advances in microsurgery and genetics that have transformed the diagnosis and treatment of male infertility, there are still many unanswered questions, as properly identified by most of our participants (79.96%).13

Several factors have been associated with male infertility, including various diseases (eg, STD, etc), treatment modalities (eg, steroids, etc), and lifestyle habits (eg, smoking, alcohol consumption, etc).14 15 22 While it is unnecessary for non-physicians to be aware of all possible causes, it is necessary for them to be aware of acquired and potentially preventable causes of infertility, such as sexually transmitted illnesses. In contrast to Ali et al, most of our participants did not have a good knowledge of disease-related and iatrogenic causes of male infertility.23 However, most of them correctly identified STDs, psychosocial disorders, genitourinary infections, obesity and autoimmune diseases to be the causes of male infertility.

Nearly three-fourths of our participants accurately identified the negative consequences of cigarette smoking and alcohol consumption on male fertility. These findings agree with data from previous studies.25 24 This higher prevalence of awareness regarding tobacco and alcohol

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**Table 1** Continued

| Variable                        | N | %   | Knowledge Score (mean±SD=19.48±6.04) | Attitude Score (mean±SD=4.17±0.88) |
|---------------------------------|---|-----|--------------------------------------|-------------------------------------|
|                                 |   |     | Mean ±SD | P value | Mean ±SD | P value |
| Family history of infertility   |   |     |          |         |          |         |
| No                              | 510 | 91.73 | 18.39 ±0.28 | 0.036 | 4.19 ±0.04 | 0.06 |
| Yes                             | 46  | 8.27 | 16.41 ±0.73 | 0.009 | 3.93 ±0.13 | 0.04 |
| Comorbidity                     |   |     |          |         |          |         |
| Obesity                         | 57  | 10.25 | 19.54 ±0.7 | 0.09 | 4.11 ±0.13 | 0.56 |
| Hypertension                    | 41  | 7.37 | 19.1 ±0.9 | 0.35 | 3.90 ±0.16 | 0.04 |
| Diabetes                        | 29  | 5.22 | 19.45 ±1.11 | 0.27 | 4.14 ±0.13 | 0.84 |
| Mumps                           | 17  | 3.06 | 19.29 ±1.26 | 0.47 | 4.24 ±0.14 | 0.75 |
| Genitourinary infection         | 17  | 3.06 | 17.12 ±1 | 0.45 | 3.65 ±0.21 | 0.01 |
| Autoimmune disease              | 9   | 1.62 | 20.11 ±1.39 | 0.35 | 3.89 ±0.42 | 0.34 |
| Tuberculosis                    | 7   | 1.26 | 20.86 ±2.76 | 0.25 | 4.29 ±0.42 | 0.72 |
| Asthma                          | 5   | 0.9 | 16.2 ±3.67 | 0.46 | 3.80 ±0.49 | 0.35 |
| No comorbidity                  | 425 | 76.44 | 18.14 ±0.31 | 0.58 | 4.20 ±0.04 | 0.13 |

Knowledge about male infertility. BDT, Bangladeshi taka (Currency).
Table 2  Correct knowledge regarding male infertility in gender and profession subgroups (n=556)

| Knowledge items* | Overall (n=556) | Gender | Profession |
|------------------|-----------------|--------|------------|
|                  | N   | %    | N     | %    | N   | %   | N   | %   | N   | %   | N   | %   | N   | %   | N   | %   |
| General (0–3)    |     |      |       |      |     |      |     |      |     |      |     |      |     |      |     |      |
| k1               |     |      |       |      |     |      |     |      |     |      |     |      |     |      |     |      |
|                 |     |      |       |      |     |      |     |      |     |      |     |      |     |      |     |      |
|                 |     |      |       |      |     |      |     |      |     |      |     |      |     |      |     |      |
| Disease-related  |     |      |       |      |     |      |     |      |     |      |     |      |     |      |     |      |
| kdr1             |     |      |       |      |     |      |     |      |     |      |     |      |     |      |     |      |
|                 |     |      |       |      |     |      |     |      |     |      |     |      |     |      |     |      |
|                 |     |      |       |      |     |      |     |      |     |      |     |      |     |      |     |      |
| Investigation related (0–1) |     |      |       |      |     |      |     |      |     |      |     |      |     |      |     |      |
|                 |     |      |       |      |     |      |     |      |     |      |     |      |     |      |     |      |
|                 |     |      |       |      |     |      |     |      |     |      |     |      |     |      |     |      |

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| Knowledge items* | Overall (n=556) | Gender | Profession | Student | Nurse (n=59) | Other (n=41) |
|------------------|----------------|--------|-----------|----------|--------------|--------------|
|                  | N   | %    | N   | %    | N   | %    | N   | %    | N   | %    | N   | %    | N   | %    |
| Healthy practice related (0–4) |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| ki1              | 462 | 83.09| 177 | 79.37| 285 | 85.59| 142 | 92.21| 50  | 89.29| 160 | 85.11| 48  | 82.76| 42  | 71.19| 20  | 48.78|
|                 | (2.57±0.69) | (2.57±0.70) | (2.57±0.69) | (2.70±0.53)* | (2.76±0.57)* | (2.50±0.72)* | (2.64±0.74)* | (2.44±0.81)* | (2.27±0.83)* |
| kinf1            | 498 | 89.57| 197 | 88.34| 301 | 90.39| 147 | 95.45| 55  | 98.21| 167 | 88.83| 50  | 86.21| 48  | 81.36| 31  | 75.61|
|                 | (3.75±1.29) | (4.05±1.25)* | (3.56±1.28)* | (4.13±1.22) | (4.05±1.06)* | (3.61±1.31)* | (3.64±1.0)* | (3.32±1.41)* | (3.36±1.0)* |
| kinf2            | 394 | 70.86| 162 | 72.65| 232 | 69.67| 124 | 80.52| 46  | 82.14| 123 | 65.43| 39  | 67.24| 39  | 66.1 | 23  | 56.1 |
| kinf3            | 461 | 82.91| 180 | 80.72| 281 | 84.38| 142 | 92.21| 50  | 89.29| 157 | 83.51| 47  | 81.03| 41  | 69.49| 24  | 58.54|
| kinf4            | 79  | 14.21| 43  | 19.28| 43  | 12.91| 4   | 2.6  | 4   | 7.14 | 23  | 12.23| 17  | 29.31| 16  | 27.12| 15  | 36.59|
| Associated factors related (0–6) |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| ko1              | 422 | 75.9 | 181 | 81.17| 241 | 72.37| 127 | 82.47| 42  | 75  | 138 | 73.4 | 46  | 79.31| 40  | 67.8 | 29  | 70.73|
|                 | (3.51±1.29) | (4.05±1.25)* | (3.56±1.28)* | (4.13±1.22) | (4.05±1.06)* | (3.61±1.31)* | (3.64±1.0)* | (3.32±1.41)* | (3.36±1.0)* |
| ko2              | 424 | 76.26| 170 | 76.23| 254 | 76.28| 125 | 81.17| 49  | 87.5 | 141 | 75   | 46  | 79.31| 42  | 71.19| 21  | 51.22|
| ko3              | 333 | 59.89| 119 | 53.36| 135 | 40.54| 93  | 60.39| 24  | 42.86| 80  | 42.55| 27  | 46.55| 18  | 30.51| 12  | 29.27|
| ko4              | 295 | 53.06| 147 | 65.92| 186 | 55.86| 104 | 67.53| 37  | 66.07| 100 | 53.19| 39  | 67.24| 31  | 52.54| 22  | 53.66|
| ko5              | 295 | 53.06| 130 | 58.3 | 165 | 49.55| 84  | 54.55| 31  | 55.36| 96  | 51.06| 26  | 44.83| 31  | 52.54| 27  | 65.85|
| ko6              | 361 | 64.93| 157 | 70.4 | 204 | 61.26| 104 | 67.53| 44  | 78.57| 125 | 66.49| 27  | 46.55| 34  | 57.63| 27  | 65.85|
| Good knowledge summary (≥mean) |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |
| General          | 392 | 70.89| 170 | 76.92| 222 | 66.87| 127 | 82.47| 35  | 62.50| 125 | 67.57| 38  | 65.52| 36  | 61.02| 31  | 75.61|
| Disease related  | 215 | 38.74| 91  | 40.99| 124 | 37.24| 97  | 63.40| 15  | 26.79| 60  | 31.91| 20  | 34.48| 13  | 22.03| 10  | 24.39|
| Iatrogenic       | 263 | 47.30| 113 | 50.6 | 150 | 45.05| 111 | 72.08| 31  | 55.36| 71  | 37.77| 18  | 31.03| 16  | 27.12| 16  | 39.02|
| Investigation related | 462 | 83.09| 177 | 79.37| 285 | 85.59| 142 | 92.21| 50  | 89.29| 160 | 85.11| 48  | 82.76| 42  | 71.19| 20  | 48.78|
| Healthy practice related | 353 | 63.49| 140 | 62.78| 213 | 63.96| 113 | 73.38| 41  | 73.21| 113 | 60.11| 41  | 70.69| 30  | 50.85| 15  | 36.59|
| Associated factors related | 352 | 63.31| 161 | 72.20| 191 | 57.36| 117 | 75.97| 40  | 71.43| 116 | 61.70| 33  | 56.90| 27  | 45.76| 19  | 46.34|
| Overall          | 279 | 50.18| 126 | 56.5 | 153 | 45.95| 114 | 74.03| 32  | 57.14| 79  | 42.02| 24  | 41.38| 17  | 28.81| 13  | 31.71|

Table 2  Continued
may be due to extensive campaigning by the Government of Bangladesh and also associated with social stigma.\textsuperscript{23–26}

People worldwide have accumulated a plethora of myths about reproductive health and fertility. We found several misunderstandings regarding male infertility in our study, such as keeping mobile near genitalia (46.94%), masturbation (46.94%), wearing tight underwear (40.11%), length of penis (35.07%) and excessive exercise (17.09%). These beliefs are consistent with studies from Pakistan and Saudi Arabia.\textsuperscript{23,27}

The age of the participants was a significant predictor of good knowledge; individuals from 23 years to 26 years of age had the maximum likelihood (adjusted OR=1.812, p=0.02) of having good knowledge regarding male infertility. Hammarberg \textit{et al}. came to a similar conclusion from their study on the Australian population of reproductive age.\textsuperscript{21}

Female participants in the study showed poor overall knowledge levels compared with men. The majority of the women were medical students and nurses, whereas most male participants were doctors. Hence, it can explain the differences in knowledge between these two gender groups. Furthermore, women in our study were 48.3% more prone to positive attitudes towards male infertility than men (adjusted OR=1.483, p=0.049). Infertile women are often subjected to more societal pressure than men, which may explain why women have a more positive attitude towards infertility than men.\textsuperscript{28}

According to study results, 28.78% of participants reported sexual exposure, although more than 70% are older than 23 years. This finding correlates to the marital status (married 28.24%; divorced/separated/widowed 0.9%) since premarital sexual intercourse is uncommon in Bangladesh due to religious and cultural norms.

MBBS doctors had a significantly higher prevalence of good knowledge and positive attitude compared with all other healthcare professionals and medical students; their medical background and training may explain this. Zhang \textit{et al}. report similar positive attitudes but limited knowledge among oncology physicians in China.\textsuperscript{29}

Of our study participants 93.71% perceive the general population to have poor knowledge about male infertility, which corresponds to our current study’s findings. This poor knowledge may be attributed to only 7.19% receiving training on male infertility. When asked who should be investigated first in the case of an infertile couple, the majority (76.8%) of the participants responded: ‘both’, which is consistent with the findings from Saudi Arabia but contrasts with findings from Latin America.\textsuperscript{27,30} Nearly all of the study participants perceive that men diagnosed with male infertility face a difficult emotional journey and often feel depressed about their situation, which is in line with the current evidence.\textsuperscript{31} Although the majority do not support complementary medicine (homeopathy, spiritual healing, etc) for the treatment of male infertility, most of them admit these treatment modalities are popular in treating male infertility. This shows how common it is for people to think that all illnesses cannot be cured.
Table 3  Attitude regarding male infertility results in gender and profession subgroups (n=556)

| Item | Overall (n=556) | Male (n=223) | Female (n=333) | Doctor MBBS (n=154) BDS (n=56) | Student MBBS (n=188) BDS (n=58) | Nurse (n=59) | Other (n=41) |
|------|----------------|--------------|---------------|-------------------------------|--------------------------------|--------------|--------------|
|      | N | % | N | % | N | % | N | % | N | % | N | % | N | % |
| a1   | 499 | 89.75 | 195 | 87.44 | 304 | 91.29 | 145 | 94.16 | 54 | 96.43 | 172 | 91.49 | 47 | 81.03 | 49 | 83.05 | 32 | 78.05 |
| a2   | 532 | 95.68 | 206 | 92.38 | 326 | 97.9 | 148 | 96.1 | 56 | 100 | 180 | 95.74 | 56 | 96.55 | 57 | 96.61 | 35 | 85.37 |
| a3   | 523 | 94.06 | 201 | 90.13 | 322 | 96.7 | 145 | 94.16 | 56 | 100 | 179 | 95.21 | 56 | 96.55 | 56 | 94.92 | 31 | 75.61 |
| a4   | 506 | 91.01 | 194 | 87 | 312 | 93.69 | 140 | 90.91 | 54 | 96.43 | 171 | 90.96 | 51 | 87.93 | 55 | 93.22 | 35 | 85.37 |
| a5   | 258 | 46.4 | 103 | 46.19 | 155 | 46.55 | 103 | 66.88 | 28 | 50 | 75 | 39.89 | 21 | 36.21 | 21 | 35.59 | 10 | 24.39 |

Summary

| Attitude                  | Overall (n=556) | Male (n=223) | Female (n=333) | Doctor MBBS (n=154) BDS (n=56) | Student MBBS (n=188) BDS (n=58) | Nurse (n=59) | Other (n=41) |
|---------------------------|----------------|--------------|---------------|-------------------------------|--------------------------------|--------------|--------------|
| Negative attitude (<mean) | 338 | 60.79 | 142 | 63.68 | 196 | 58.86 | 64 | 41.56 | 31 | 55.36 | 121 | 64.36 | 42 | 72.41 | 43 | 72.88 | 37 | 90.24 |
| Positive attitude (>mean) | 218 | 39.21 | 81 | 36.32 | 137 | 41.14 | 90 | 58.44 | 25 | 44.64 | 67 | 35.64 | 16 | 27.59 | 16 | 27.12 | 4 | 9.76 |

a1, Infertility is only a problem of females; a2, Mass media should promote educational programs on male infertility; a3, Campaigns on Reproductive Health should be organized in the educational institutions; a4, Men feel ashamed to be considered themselves as infertile; a5, Treatment for male infertility is always costly.
by medical science, and this belief is congruent with the evidence from Pakistan.\(^{23}\)

**Limitations**

Owing to our study’s cross-sectional design, we cannot infer causality for the associations that we have reported in this article. We, therefore, sought to control for the potential effect of confounders by reporting adjusted ORs using multiple regression models. The number of participants in our study may be a limitation, although it is larger than that of similar studies.\(^{21,23,24}\) Furthermore, selection bias is always a potential drawback in non-random studies. We employed a quota sampling technique to ensure representative samples from all over the country. There is also a need for qualitative research to understand the in-depth individual knowledge, attitude and perception which will influence the development of relevant training modules and precipitation of necessary curriculum changes.

**CONCLUSION**

Aside from these caveats, the findings of our current study suggest that healthcare professionals and medical students of Bangladesh have overall inadequate knowledge and a negative attitude towards male infertility. However, it is essential to have sufficient knowledge and a positive attitude to ensure a comprehensive healthcare service for people with male infertility. This points to the necessity for multidisciplinary training programmes, the formulation of a standard guideline for healthcare workers and necessary curriculum changes for medical students.
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Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Consent obtained directly from patient(s)

Ethics approval This study involves human participants and was approved by the Institutional Review Board, North South University (#2021/OR-2001). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available. Data are available upon reasonable request to the corresponding author.

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