



BMJ Open Knowledge, awareness and perception of Natural Procreative Technology (NaProTechnology) among pharmacy undergraduate students in Nigeria: a pre-post educational video intervention study

Adaobi Uchenna Mosanya ¹, Eziamaka Pauline Ezenkwele,²
Fausta Chioma Emegoakor,² Mmaduabuchi Okeh,¹ Abdulmuminu Isah ¹

To cite: Mosanya AU, Ezenkwele EP, Emegoakor FC, *et al.* Knowledge, awareness and perception of Natural Procreative Technology (NaProTechnology) among pharmacy undergraduate students in Nigeria: a pre-post educational video intervention study. *BMJ Open* 2025;**15**:e089466. doi:10.1136/bmjopen-2024-089466

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<https://doi.org/10.1136/bmjopen-2024-089466>).

Received 30 May 2024
Accepted 07 March 2025



© Author(s) (or their employer(s)) 2025. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ Group.

¹Clinical Pharmacy and Pharmacy Management, University of Nigeria Faculty of Pharmaceutical Sciences, Nsukka, Enugu, Nigeria

²Department of Obstetrics & Gynaecology, University of Nigeria Teaching Hospital, Ituku Ozalla, Enugu, Nigeria

Correspondence to

Mrs Adaobi Uchenna Mosanya;
adaobi.mosanya@unn.edu.ng

ABSTRACT

Objective The study assessed the knowledge, awareness and perception of NaProTechnology as well as the effect of an educational video intervention among pharmacy undergraduate students.

Design The study design was a pre-post educational video intervention using a cross-sectional questionnaire-based survey.

Participants and setting The study was done among undergraduate students of a school of pharmacy in South-eastern Nigeria.

Intervention and outcome measures At baseline, the knowledge, awareness and perception of the students were assessed using a 17-item questionnaire: five questions for knowledge, five questions for awareness and seven questions for perception, followed by the administration of an educational video on NaProTechnology which was prepared by one of the authors, a gynaecologist and also an expert in NaProTechnology. A post-intervention survey was done with the same pre-intervention questionnaire to assess the effect of the educational intervention. The correct (knowledge) or positive (awareness and perception) responses for each question were reported as percentages.

Results There were 410 and 350 students in the pre- and post-intervention surveys, respectively, with a relatively equal number of males and females. The majority were between 18 and 29 years old. The average proportion of the participants with correct responses on the knowledge assessment of NaProTechnology was 13.2% and 75.7% in the pre- and post-intervention surveys, respectively ($p < 0.0001$).

Conclusion An educational video intervention was effective in improving the short-term knowledge, awareness and positive perception of NaProTechnology among pharmacy students.

INTRODUCTION

Natural Procreative Technology (NaProTechnology) is a system of management of

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ One of the strengths of this study was the use of a pre-post video interventional study which facilitated the tracking of the study participants' progress with respect to knowledge, awareness and positive perception of NaProTechnology.
- ⇒ A major limitation of this study is the inability to account for confounding variables because of the absence of a control group.
- ⇒ The use of a short-term intervention (an 18 min video on NaProTechnology) may not have long-term effects with respect to the knowledge, awareness and perception of the pharmacy students.
- ⇒ Inability to determine the survey response rate, as the number of students present in the class at the time of the survey was not recorded.
- ⇒ Another limitation was a limited baseline knowledge of the participants, thereby showing a significant increase in the knowledge post-intervention.

infertility and other reproductive health issues which requires the application of a woman's observation and record of key events, such as cervical mucus secretion, throughout her menstrual cycle.¹ Some fertility biomarkers can be observed following the principles of Creighton Model FertilityCare System.² They include cervical bleeding quality, duration and quantity, cervical mucus quantity and quality, the length of the luteal phase of the menstrual cycle, etc. The Creighton Model System (CrMS) is a natural method of fertility management based on the biomarkers observed in a woman's cycle which indicate whether a woman is fertile or not.³ An important biomarker used in this system is the presence or absence of cervical mucus.⁴

NaProTechnology with more than 45 years of history⁵ has diverse applications in the different aspects of a woman's health, especially in her reproductive life. It began in 1976 with the studies done by Thomas W. Hilgers who later established an institute for the study of Human Reproduction in 1985. He wrote a book entitled 'The Medical and Surgical Practice of NaProTechnology' in 2004.³ Although there is no study specifically highlighting the history of NaProTechnology in Nigeria, there is evidence in the published literature of its existence in Nigeria as far back as 2014.^{6,7} Some of the gynaecological illnesses that can be treated using NaProTechnology are infertility, recurrent miscarriages, premenstrual syndrome, polycystic ovarian disease, menstrual irregularity, hormonal imbalances, ovarian cysts and post-partum depression.¹ It is a model of health management with advantages because it forms the basis for the timing of specific diagnostic tests as well as for the therapy and its monitoring.⁸ Through this method, couples are empowered to become active and informed participants in their management.⁹ This is quite different from assisted reproductive technology (ART) which is only aimed at achieving conception thereby leaving the couple still infertile afterwards because the root cause(s) of infertility were not treated.¹⁰

A NaProTechnologist is a medical doctor who has been trained to use the CrMS recordings to carry out a diagnostic evaluation and create a treatment regimen for each patient. The patient's CrMS chart is evaluated by the NaProTechnologist on a regular basis to monitor treatment response. They also provide effective surgical gynaecological care with the aim of restoring the reproductive system. The FertilityCare Practitioner (FCP) teaches women how to chart their menstrual cycle according to the CrMS. Moreover, pharmacists are also trained to become Creighton Model System Pharmacy Consultants as well as FCPs.¹¹ The Creighton Model System Pharmacy Consultants are expected to be knowledgeable in the science of NaProTechnology with respect to pharmacological treatments, including bioidentical hormones and nonhormonal treatments.³ They compound the bioidentical hormones which are used in treating patients. Drugs like vitamin B₆, clomiphene citrate and low-dose naltrexone have also been found very useful in NaProTechnology treatment.

Nigeria has been experiencing a decline in total fertility rate in the last two decades, particularly among the inhabitants of the predominantly Christian southern region.¹² There is a significantly high incidence of infertility in Nigeria as evidenced in recent studies. The range of infertility incidence is from 18.2% to 32% while secondary infertility is its most prevalent variant.^{13–15} Infertility has many negative impacts on the psychological and social well-being of Nigerian women. It particularly leads to frustration, low self-esteem, stigma, social withdrawal, pressure from in-laws, emotional stress, depression, etc.^{16,17} In a study among 75 women evaluated in Lagos, Nigeria, 70.6% of them were diagnosed with polycystic

ovary syndrome (PCOS)¹⁸ while another study with a particular focus on infertile women reported prevalence of PCOS between 16.9% (National Institutes of Health (NIH) criteria), 27.6% (Rotterdam criteria) and 20.7% (Androgen Excess Society (AES) criteria).¹⁹ The prevalence of recurrent miscarriage among women in Nigeria varies according to the criteria applied during the diagnosis. The study by Eleje and colleagues reported a range from 15.34% (American Society for Reproductive Medicine/ European Society for Human Reproduction and Embryology (ASRM/ESHRE) criteria) to 5.29% (World Health Organization/ Royal College of Obstetricians and Gynecologists (WHO/RCOG) criteria).²⁰

In Africa, Nigeria comes second after the Democratic Republic of Congo in the number of Catholicism adherents (Angerbrandt, 2018).²¹ In Nigeria, there is a significant population of Catholics, more than 27 million in number.²² NaProTechnology is one of the accepted methods used in managing infertility among Catholics because it respects bioethical principles.^{5,23,24}

For the above reasons, it is of great importance to increase among healthcare professionals, knowledge, awareness and positive perception of NaProTechnology. Also, since there is no published study among pharmacists, it is even more urgent to do so among these members of the healthcare system, particularly during their preparatory stage in the University. NaProTechnology has been taught in different universities and has been met with a high level of enthusiasm among students of health-related disciplines.^{25–27} For instance, NaProTechnology is taught as part of an elective multidisciplinary course about sexuality and human reproduction included in gynaecology for fourth-year medical students since 1997.²⁵ Although there are no data on the practice of NaProTechnology in Nigeria, there is a directory of practitioners which can be assessed online.²⁸

Over the years, studies have been done regarding fertility knowledge among university students^{26,27,29} and partnered women,³⁰ and knowledge about infertility.³¹ There is sparse literature reporting the assessment of the effect of a video intervention on knowledge, awareness and perception of NaProTechnology, a method of infertility management. In addition, because of the role that pharmacists play in NaProTechnology, it is pertinent to carry out this study among pharmacy undergraduate students. Therefore, the purpose of this study was to assess the knowledge, awareness and perception of NaProTechnology as well as the effect of an educational video intervention among pharmacy undergraduate students of the University of Nigeria, Nsukka.

MATERIALS AND METHODS

Study design

A cross-sectional survey and an interventional study were conducted among pharmacy students at the University of Nigeria, Nsukka, Enugu state, in May 2021. The study was conducted in two phases. The first phase was a baseline

survey assessing the knowledge, awareness and perception of the students regarding NaProTechnology. Then, an 18 min video on NaProTechnology was prepared by a gynaecologist, one of the authors, who is also an expert in NaProTechnology. It consisted of the meaning of NaProTechnology, how NaProTechnology uses Creighton Model FertilityCare system, and how it is used in the treatment of infertility and other gynaecological disorders. The video is available on request.

Study setting

The Faculty of Pharmaceutical Sciences began as a Department in the Faculty of Science in 1967. It was later raised to the status of a Faculty in 1980. At the time of the study, the faculty was running a 5-year B.Pharm programme. The student population from the second year to the fifth year in 2021 was 1531.

Participants

All pharmacy students from the second year to the fifth year at the University of Nigeria, Nsukka, were eligible to participate in the study. All the students who were present at the time of the pre-intervention questionnaire distribution were invited to participate in the survey. Also, the investigators with the help of the class representatives invited those who participated in the pre-intervention survey to watch the educational video on NaProTechnology which was posted on their WhatsApp platform. Therefore, convenient sampling, a nonprobability method of sampling, was used. A brief introduction was given about the investigator, and their verbal consents were received individually before participation.

Sample size

A sample size of 308 was calculated using the Raosoft sample size calculator.³² The margin of error was set at 5% within a 95% CI.

Variables

The correct responses for each knowledge question both in the pre- and post-intervention survey were reported as percentages. For example, the correct response to the question 'What is the full name of NaProTech?' is Natural Procreative Technology. Likewise, the positive responses to the awareness and perception questions were reported as percentages.

Data sources

A 17-item questionnaire was used as the data collection tool. It was structured into four sections: the first section consisted of questions related to the sociodemographic characteristics of the respondents. The second section comprised five knowledge questions, four of which were open-ended. The third section comprised five awareness questions. The final section included seven questions about their perception of NaProTechnology. All the response options from the second to the final section were dichotomous (yes or no) except four knowledge questions which were open-ended. For more details, see online supplemental file 1. The questionnaire was

content- and face-validated by two experts in Clinical Pharmacy and a consultant gynaecologist. From the feedback received after the validation, corrections were also made to the questionnaire. The updated version of the questionnaire was piloted among 20 students who were excluded from participating in the final survey. The reliability test was done, and a Cronbach's alpha of 0.94 was obtained. The survey was done in two phases: the pre-intervention phase and the post-intervention phase. After the first phase, the video containing the information about NaProTechnology was posted on the WhatsApp platform of each of the classes. This means of communication was chosen because it was impossible to get all the students who participated in the pre-intervention to assemble again since their responses were anonymous and no personal identifying data such as name or contact number were collected. There were daily reminders from the investigator for the students to watch the videos. This lasted for 1 week. Then, the post-intervention survey was done by asking those who had filled out the pre-intervention questionnaire and watched the video to fill out the post-intervention questionnaire.

Statistical methods

The data were coded, entered into an Excel spreadsheet, cleaned, exported to and analysed using SPSS V.25. There was no thematic analysis for the responses to the four open-ended knowledge questions. Rather, each response was checked against the correct answers. Incorrect responses were coded 0, while correct responses were coded 1. For instance, the correct response to the first knowledge question 'What is the full name of NaProTechnology' is Natural Procreative Technology. The statistical significance for all the inferential analyses was taken at $p < 0.05$.

ETHICS

The study was carried out according to the World Medical Association Declaration of Helsinki's principles of research ethics.³³ Therefore, before beginning the study, ethical clearance was sought and received from the Ethics Research Committee of the Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka, on 15 July 2020 (FPSRE/UNN/20/0007). In addition, an introduction to the study was given to each prospective participant, and their verbal informed consent was freely granted before they entered into the research. Every measure was put in place to protect the privacy of the respondents and the confidentiality of their personal data throughout the data collection and thereafter. It was also made known to the respondents that they were free to withdraw anytime from the study.

Patient and public involvement

There was no patient nor public involvement in this study.

RESULTS

Only 410 students consented to participate in the study (table 1). Moreover, in the post-intervention phase, 350

Table 1 Sociodemographic characteristics of the respondents

Independent variables	Pre-intervention (n=410)	Post-intervention (n=350)
Sex		
Female	207 (50.5)	178 (50.9)
Male	203 (49.5)	172 (49.1)
Age (in years)		
Less than 18	1 (0.2)	1 (0.3)
18–24	281 (68.5)	235 (67.1)
25–29	120 (29.2)	108 (30.9)
30–35	6 (1.5)	5 (1.4)
Above 35	2 (0.5)	1 (0.3)
Marital status		
Married	17 (4.1)	14 (4.0)
Single	390 (95.1)	334 (95.4)
Others	3 (0.7)	2 (0.6)
Year of study		
Second year	73 (17.8)	66 (18.9)
Third year	181 (44.1)	152 (43.4)
Fourth year	64 (15.6)	47 (13.4)
Fifth year	92 (22.4)	85 (24.3)

students (table 1) returned for the data collection. The sociodemographic data were presented as frequencies and percentages.

The majority of the students (n=410) who participated in the pre-intervention survey were between 18 and 29 years old. Less than 5% were married, while the highest proportion of the respondents were in their third year of study.

The percentage of the respondents who gave correct answers to the knowledge questions before and after the educational intervention is shown in table 2. The difference in the proportion of those who answered the questions correctly at baseline and those after the intervention was statistically significant.

The frequency and percentages of the positive responses to the awareness questions in the pre- and post-intervention surveys are presented in table 3. The

proportion of those who gave positive answers to the awareness questions was higher than those of the knowledge questions. The question that had the highest positive responses in both the pre- and post-intervention phases was ‘Are pharmacists involved in NaProTechnology?’, and the percentages were 27.6% and 84.6%, respectively.

The positive responses to the perception questions are presented in table 4. The question ‘Are there religious barriers that may impede the nationwide deployment of the service?’ received the lowest number of responses in the affirmative (29.3%) during the pre-intervention survey. While in the post-intervention phase, the question ‘Would the knowledge gained be useful to you in your future career as a pharmacist?’ had the highest number of positive responses (91.4%). There was also a statistically significant difference between the pre- and post-intervention responses.

DISCUSSION

Principal findings

The knowledge, awareness and positive perception of NaProTechnology among the pharmacy students prior to intervention were poor but improved markedly afterwards.

The modal age group of the participants was between 18 and 29 years. The brief video intervention showed a significant difference in their level of knowledge, awareness and perception between the pre- and post-intervention periods. However, the percentages of the students with good knowledge, good awareness and positive perception were not 100%.

Is NaProTechnology harmful to human life? This question had the highest correct response rate of the knowledge section of the survey during the pre-intervention phase.

While in the post-intervention phase, the question ‘What is it used for?’ received the highest percentage of correct answers.

‘Are pharmacists involved in NaProTechnology?’ was the awareness question with the highest number of positive responses for both the pre- and post-intervention phases.

There was a high percentage of positive responses in the pre-intervention survey for the perception question:

Table 2 Frequency and percentage of correct responses to the knowledge questions

Knowledge questions	Pre-intervention (n=410)	Post-intervention (n=350)	P value
What is the full name of NaProTechnology?	57 (13.9)	284 (81.1)	<0.0001
What is NaProTechnology used for?	45 (11.0)	285 (81.4)	<0.0001
Who can use NaProTechnology?	45 (11.0)	262 (74.9)	<0.0001
Is NaProTechnology harmful to human life?	82 (20.0)	268 (76.6)	<0.0001
Can NaProTechnology be used in children?	41 (10.0)	225 (64.3)	<0.0001
Average proportion of participants who supplied correct responses	54 (13.2)	265 (75.7)	<0.0001

Table 3 Frequency and percentage of positive responses to the awareness questions

Awareness questions	Pre-intervention (n=410)	Post-intervention (n=350)	P value
1. Have you ever heard of NaProTechnology?	50 (12.2)	278 (79.4)	<0.0001
2. Are there experts in NaProTechnology in Nigeria?	91 (22.2)	236 (67.4)	<0.0001
3. Does NaProTechnology adopt individualised care?	102 (24.9)	280 (80.0)	<0.0001
4. Are pharmacists involved in NaProTechnology?	113 (27.6)	296 (84.6)	<0.0001
Average proportion of participants who supplied positive responses	93 (22.7)	276 (78.9)	<0.0001

‘Are there religious barriers that impede the nationwide depolyment of the service?’ which meant there was a low positive perception. However, in the post-intervention survey, there was a marked increase in the positive perception of NaProTechnology having no religious barrier that would impede its nationwide deployment.

For the post-intervention survey of the pharmacy students’ perception, the question ‘Would the knowledge gained be useful to you in your future career as a pharmacist?’ emerged as the most correctly answered; even though before the intervention, the percentage of correct responses was low.

Discussion of the key findings and meaning of the study

The fact that there was poor knowledge of NaProTechnology among the students prior to the educational intervention is understandable since NaProTechnology is a relatively new system of therapy and has not yet been included in the curriculum. It was developed in the 1980s in the United States by Hilgers and his collaborators.¹ This is expected to have observed a modal age bracket between 18 and 29 years because it seems to be the prevailing age bracket of undergraduate students in Nigeria.^{34 35}

The brief educational video intervention showed a significant difference in their level of knowledge, awareness and perception. However, the percentages of the students with good knowledge, good awareness and positive perception were not 100%. This may have been a result of low level of engagement by some students. Learning outcomes have been shown to be related to the level of engagement

and learning goals.³⁶ Also, prior experience of the participants with video-based learning influences their level of engagement³⁷ which may have imparted their level of information retention. Another challenge may be as a result of an imbalance between the context and details of the video. According to Kizilcec and colleagues, having the presenter’s face can improve the visual attention of the participants but may not have a positive impact on recall.³⁸ Perhaps, this may have happened with this study because even though the presenter’s face was visible, some of the study participants may not have retained much of the information acquired from the video presentation. On the other hand, despite its demerits, video-based education has some advantages such as improved learner’s engagement and motivation. One of the advantages is that it helps the instructor to demonstrate with visual aids complex subjects which are common in the sciences thereby improving the learning outcomes.³⁹

From the study, it was observed that the majority of the participants knew that NaProTechnology is not harmful to life. This may have resulted from the intuition that NaProTechnology is safe for humans. In any case, NaProTechnology and the Creighton Model FertilityCare System have been shown to be useful and harmless. In fact, couples have preferred it to ART such as in vitro fertilisation (IVF) because of its advantages over the latter.⁴⁰ While in the post-intervention phase, the question ‘What is it used for?’ received the highest percentage of correct answers.

Table 4 Frequency and percentages: positive perception of NaProTechnology

Perception question	Pre-intervention (n=410)	Post intervention (n=350)	P value
1. Would the knowledge gained be useful to you in your future career as a pharmacist?	155 (37.8)	320 (91.4)	<0.0001
2. If in need of NaProTechnology would you opt for it?	138 (33.7)	308 (88.0)	<0.0001
3. Would you be willing to pay for the services if in need of it?	147 (35.9)	311 (88.9)	<0.0001
4. Would you recommend it for family and friends in need of it?	138 (33.7)	306 (87.4)	<0.0001
5. Would you recommend it to clients in need of it in the future?	132 (32.2)	304 (86.9)	<0.0001
6. Should it be deployed nationwide?	142 (34.6)	300 (85.7)	<0.0001
7. Are there religious barriers that may impede the nationwide deployment of the service?	120 (29.3)	257 (73.4)	<0.0001
Average proportion of participants who supplied positive responses	139 (34.9)	301 (86)	<0.0001

'Are pharmacists involved in NaProTechnology?' was the awareness question with the highest number of positive responses for both the pre- and post-intervention phases. Pharmacists are indispensable for the success of NaProTechnology. In fact, there is a great demand for the natural form of progesterone, a hormone that has found its usefulness in the prevention of preterm delivery.⁴¹ Pharmacists are needed to ensure that this naturally occurring hormone is commercially available in safe, accurate and sterile forms.^{42 43}

There was a high percentage of positive responses to the perception question: 'Are there religious barriers that impede the nationwide depolyment of the service?' in the pre-intervention phase. However, in reality, there are no religious barriers to the nationwide deployment of the service. The technology has been found to be ethically sound in line with the fundamental human right to life and respect for human dignity. NaProTechnology does not entertain abortion of fetuses because there is less likelihood of multiple pregnancies or need for hyperstimulation of the ovaries which carries with it a high risk of maternal death.⁴⁴ Also, it is not saddled with the prospect of freezing embryos or discarding some as does happen with IVF since NaProTechnology treatment encourages in vivo fertilisation after treating the underlying cause(s) of infertility.

The positive points mentioned above in favour of NaProTechnology led to its endorsement as a method for Catholic couples and physicians who are guided by ethical moral principles that respect human dignity, the unity of marriage and the right of a child to be born as a fruit of the love of the parents through their conjugal acts. These principles serve as the north pole in making decisions related to the diagnosis and treatment of infertility or sterility. NaProTechnology also has social, medical and economic values. NaProTechnology has a threefold success rate in managing infertile couples more than what is obtainable using ART and 10 times less prevalence of multiple pregnancies when compared with IVF. On the other hand, assisted reproductive technology (ART) including IVF brings with it a violation of the rights of individuals to know their biological origins and subsequent struggles with identity issues. In addition, IVF poses serious risks of medical complications for the women as well as their offsprings which could be life-threatening. Finally, ART is very expensive and usually is not covered by health insurance policies making it very exorbitant for the majority of infertile couples. For instance, the cost of treating infertility using NaProTechnology is about \$322 per cycle, while for IVF, the cost is up to \$1000.⁴⁵ Also, there are costs associated with the management of the complications that arise as a result of the procedures used by ARTs. This cost implication is particularly even more critical in a country like Nigeria where a great number live below the poverty line.²⁴

The brief educational video intervention led to a significant change in intention of using the knowledge gained in their future career practice as pharmacists. A comparable change in behaviour has been observed in previous studies such as that after an educational intervention in fertility

awareness-based methods (FABMs) for women's health among medical students. At the end of the online elective course, a significant proportion of the students were willing to offer FABMs to their future patients as a treatment option in the management of PCOS and premenstrual syndrome and for avoiding conception during the postpartum period.²⁷

Strengths and weaknesses of the study

The strength of this study was the use of a video intervention to increase the knowledge, awareness and positive perception of NaProTechnology, an emerging area addressing women's health in Nigeria. However, a noteworthy limitation of the study is the use of a short-term intervention (an 18min video on NaProTechnology) which may not have long-term effects with respect to the knowledge, awareness and perception of the pharmacy students. Also, there was a limited baseline knowledge of the participants thereby showing a significant increase in the knowledge post-intervention. The final limitation is the inability to determine the survey response rate, as the number of students present in the class at the time of the survey was not recorded.

Possible implications for clinicians and policymakers

There was a significant increase in the number of participants who thought that the knowledge about NaProTechnology gained during the educational intervention would be useful in their future careers as pharmacists. It shows clearly that the students perceived a possible career path for them in NaProTechnology and would likely avail themselves of opportunities for training. Such an anticipated behaviour is similar to the study by Danis *et al* who looked at the impact of a lecture on FABMs and their clinical applications among third-year medical students.²⁶ This study was not designed to equip the participants to provide NaProTechnology services immediately after graduation. Rather, it was to create awareness among them and to anticipate their interest in getting proper NaProTechnology training in the future. This also could inform pharmacy education curriculum developers for possible inclusion of NaProTechnology in the courses related to the management of infertility and other gynaecological disorders. Inclusion in the curriculum could help increase the awareness of NaProTechnology among the broader community of pharmacy healthcare providers.

Unanswered questions and future research

It is not clear whether this study may produce a change in behaviour with potential public health implications. In other words, a single video intervention may not encourage more pharmacists to get trained in NaProTechnology and subsequently offer services in the future. Nevertheless, the study would have at least raised the awareness of the participants regarding the existence of and applications of NaProTechnology.

Conclusions

There was a general poor knowledge and awareness in addition to a low positive perception of NaProTechnology among the surveyed students before the video intervention. However, the parameters of knowledge,

awareness and positive perception improved remarkably after the video intervention which is an indication of a positive effect. The difference between the proportion of those who had good knowledge, good awareness and positive perception in the pre-intervention phase and the post-intervention phase was significant. There was a relatively higher awareness that pharmacists are needed in the delivery of NaProTechnology services.

Intervention video availability

The 18 min educational video on NaProTechnology used for the intervention is available from the second author.

Contributors AUM: Contributed substantially to the design of the study, formulation of the research questions, data analysis and finally the drafting of the final version of the article. This author is the guarantor. EPE: Designing the study, writing the article, revised the draft critically, approved the final version and prepared the video on NaProTechnology. FCE: Contributed to the conceptualisation of the study, drafting and revision of the final version of the article. MO: Participated substantially in the design and execution of the study, data collection and in writing the article. AI: Contributed actively from the conception of the study until its completion as well as in the data analysis and manuscript write-up.

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 not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by the Ethics Research Committee of the Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka, on 15 July 2020 (FPSRE/UNN/20/0007). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Adaobi Uchenna Mosanya <http://orcid.org/0000-0002-8442-4358>

Abdulmuminu Isah <http://orcid.org/0000-0002-1349-6434>

REFERENCES

- Tham E, Schliep K, Stanford J. Natural procreative technology for infertility and recurrent miscarriage: outcomes in a Canadian family practice. *Can Fam Physician* 2012;58:e267–74.
- Stanford JB, Parnell TA, Boyle PC. Outcomes from treatment of infertility with natural procreative technology in an Irish general practice. *J Am Board Fam Med* 2008;21:375–84.
- Hilgers TW. *The medical & surgical practice of NaProTECHNOLOGY*. Pope Paul VI Institute Press, 2004.
- Fehring RJ. Accuracy of the peak day of cervical mucus as a biological marker of fertility. *Contraception* 2002;66:231–5.
- Vaquero JF, Marcos H, Mena MV, et al. How to face infertility from a medical perspective, respecting the human person and married love? NaProTechnology's help in these processes. *Medicina y Ética* 2023;34:194–241.
- Achebe F. Evaluation of effects of artemether + lufefantrine (artemisinin-based combination therapy) on women's reproductive cycle using Creighton Model Fertilitycare System and NaProTECHNOLOGY. *Niger J Gen Pract* 2017;15:31.
- Achebe F. System and NaProTECHNOLOGY. *Niger J Gen Pract* 2019;17:51.
- Hilgers TW. The Identification of Postovulation Infertility with the Measurement of Early Luteal Phase (Peak Day +3) Progesterone Production. *Linacre Q* 2020;87:78–84.
- Camacho A. *The effect of NaProTECHNOLOGY on marital interaction in couples with infertility*. University of Connecticut, 2018.
- Keefe CE, Mirkes R, Yeung P. The Evaluation and Treatment of Cervical Factor Infertility a Medical-Moral Analysis. *Linacre Q* 2012;79:409–25.
- Pope Paul VI Institute. Straight Talk on women's health and fertility, 2011. Available: <http://www.drhilgers.com/tag/naprotechnology/>
- Stonawski M, Potančoková M, Cantele M, et al. The changing religious composition of Nigeria: causes and implications of demographic divergence. *J Mod Afr Stud* 2016;54:361–87.
- Odeigah LO, Owolabi BO, Obalolu IA, et al. Epidemiology and sociodemographic predictors of infertility among women in ilorin, north-central nigeria: a 5-year retrospective longitudinal study. *In Review* [Preprint] 2024.
- Odunvbun WO, Oziga DV, Oyeye LO, et al. Pattern of infertility among infertile couple in a secondary health facility in Delta State, South South Nigeria. *Trop J Obstet Gynaecol* 2018;35:244.
- Orij PC, Kiridi EK, Ubom AE, et al. Pattern of infertility among infertile couples in a tertiary health institution in Bayelsa State, South-South Nigeria. *Int J Sci Rep* 2022;8:136.
- Naab F, Lawali Y, Donkor ES. "My mother in-law forced my husband to divorce me": Experiences of women with infertility in Zamfara State of Nigeria. *PLoS One* 2019;14:e0225149.
- Olowokere AE, Olowookere JO, Komolafe AO, et al. Psychological and Social Effects of Infertility on Women: A Mixed Method Research. *Gynecol Reprod Health* 2022.
- Balogun M, Coker O, Samuel T, et al. PMON245 Clinical Phenotypes of Polycystic Ovary Syndrome (PCOS) in Nigerian Women: Preliminary Results of the Nigeria PCOS Epidemiology & Phenotype (Nigeria-Pep) Study. *J Endocrine Soc* 2022;6:A696.
- Akpata CB, Uadia PO, Okonofua FE. Prevalence of Polycystic Ovary Syndrome in Nigerian Women with Infertility: A Prospective Study of the Three Assessment Criteria. *OJOG* 2018;08:1109–20.
- Eleje GU, Ugwu EO, Igbodike EP, et al. Prevalence and associated factors of recurrent pregnancy loss in Nigeria according to different national and international criteria (ASRM/ESHRE vs. WHO/RCOG). *Front Reprod Health* 2023;5:1049711.
- Angerbrandt H. *History: reviews of new books*. In: *Religion and the Making of Nigeria*. 46. . NC: Duke University Press, 2018: 336. Available: <https://doi.org/10.1080/03612759.2018.1412770>
- Ezenweke E, Kanu I. The Church and National Development: Towards a Philosophy of Collaboration. *Afr Res Rev* 2012;6:102–12.
- Chazan B, Šeman EI, Walley S. MaterCare International in Mission. *Linacre Q* 2021;88:372–80.
- Gallo P, Tham J. How NaProTechnology compares with Assisted Reproductive Technology. *Medicina y Ética* 2022;33:205–38.
- Burgo CLD, Irala JD. Teaching about fertility and natural family planning in the university setting. *SVEIKATOS MOKSLAI* 2011;21:21–3.
- Danis PG, Kurz SA, Covert LM. Medical Students' Knowledge of Fertility Awareness-Based Methods of Family Planning. *Front Med* 2017;4.
- Duane M, Waechter L, May M, et al. Fertility Awareness-Based Methods for Family Planning and Women's Health: Impact of an Online Elective. *Fam Med* 2024;56:414–21.
- FertilityCare Centres of Africa (FCCA). Practitioners in Nigeria. FertilityCare Centres of Africa (FCCA) | Practitioners in Nigeria, 2024. Available: <https://www.naprofcca.org/>
- Conceição C, Pedro J, Martins MV. Effectiveness of a video intervention on fertility knowledge among university students: a randomised pre-test/post-test study. *Eur J Contracept Reprod Health Care* 2017;22:107–13.
- Pedro J, Fernandes J, Barros A, et al. Effectiveness of a video-based education on fertility awareness: a randomized controlled trial with partnered women. *Hum Fertil (Camb)* 2022;25:522–33.

- 31 Thomson AA, Brown M, Zhang S, *et al.* Evaluating Acquisition of Knowledge about Infertility Using a Whiteboard Video. *J Obstet Gynaecol Can* 2016;38:646–50.
- 32 Raosoft, Inc. Sample Size Calculator by Raosoft. 2004. Available: <http://www.raosoft.com/samplesize.html>
- 33 The World Medical Association Inc. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *J Am Med Assoc* 2013;310:2191–4.
- 34 Aluh DO, Chukwuobasi T, Mosanya AU. A cross-sectional survey of social media anxiety among students of university of Nigeria. *J Mental Health Hum Behav* 2019;24:51.
- 35 Uleanya C. Exploring Undergraduates' Perception on Assessments and Feedbacks at Selected Nigerian and South African Rural Universities. *Ujer* 2021;9:836–43.
- 36 Seo K, Dodson S, Harandi NM, *et al.* Active learning with online video: The impact of learning context on engagement. *Comput Educ* 2021;165:104132.
- 37 Giannakos M, Jaccheri L, Krogstie J. How Video Usage Styles Affect Student Engagement? Implications for Video-Based Learning Environments. 2015.
- 38 Kizilcec RF, Papadopoulos K, Sritanyaratana L. Showing face in video instruction: effects on information retention, visual attention, and affect. in: proceedings of the sigchi conference on human factors in computing systems. 2014:2095–102.
- 39 Yanti F. Video-Based Learning as a Modern Distance Learning Method for Biology. *J Dig Learning and Dist Edu* 2024;3:108–112.
- 40 Flores RL. Infertility in The Philippines and Natural Procreative (Napro) Technology: A Commentary. *Scholars Academic J Biosci* 2016;4:328–31.
- 41 Yadav G, Gupta S, Singh P, *et al.* The role of vaginal progesterone in established pre-term labor: A randomized controlled trial. *J Family Med Prim Care* 2022;11:7042–7.
- 42 Reed-Kane D, Kirschbaum K. Prevention of preterm delivery with compounded 17a-hydroxyprogesterone caproate. *Int J Pharm Compd* 2006;10:165–71.
- 43 Weber C. Agents of change. *The Catholic World Report* 2005;15:38–47.
- 44 Vélez JR. An Ethical Comparison between In-Vitro Fertilization and NaProTechnology. *Linacre Q* 2012;79:57–72.
- 45 Cerven C. *Exploration of the effectiveness of NaProTechnology in women's healthcare. Undergraduate research and creative practice.* Grand Valley State University, 2020. Available: https://www.fertilitycare.be/images/documenten/Exploration_of_the_Effectiveness_of_NaProTechnology_in_Womens_He.pdf