

## Empowering Futures: The Effect of a Teaching Program on University Students' Knowledge and Attitude toward Preconception Care



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### ABSTRACT

**Background:** University Students' knowledge, and attitudes regarding Preconception care (PCC) are crucial to ensure a safe maternal and neonatal health outcome. **Aim:** This study aimed to evaluate the effect of a teaching program on university students' knowledge and attitudes toward PCC. **Method:** A quasi-experimental pre-test-post-test design was used. **Study subjects:** A random sample of 400 Students (140 males and 260 females) of the targeted colleges from grade 1 to grade 4 from Mansoura University participated. **Data collection tools:** Three tools were employed: Tool I: A structured interview questionnaire for sociodemographic data. Using Tools II, III to assess knowledge, and attitudes of university students toward preconception care. **Results:** University student around 21 years old improved Knowledge scores significantly, with nearly all students showing poor knowledge before the program and all demonstrating good knowledge afterward. Attitudes also showed substantial improvement, with the majority of students having poor attitudes before the program, and none having poor attitudes after program. A significant correlation was observed between knowledge and attitudes both before and after the program. **Conclusion:** The teaching program significantly improved both knowledge and attitudes toward preconception care among Mansoura students, confirming curriculum integration promotes healthier young adult behaviors. **Recommendations:** Integrate preconception care into university curricula, establish peer education platforms, and partner with healthcare professionals to deliver practical workshops and real-world applications.

**Keywords:** Attitude, knowledge, Preconception care, Teaching program, university students.

### Introduction

Healthy preconception practices are vital for improving both short- and long-term outcomes for mothers and their children. Factors such as excessive maternal weight and unhealthy lifestyle choices are associated with long-term obesity in both mother and child, reduced fertility, and adverse pregnancy outcomes. The preconception phase provides a unique opportunity to reduce risks for non-communicable diseases through epigenetic, nutritional, and environmental mechanisms (Khalaf, Ail, Hassan & Mohamed, 2022).

Preconception care (PCC) includes a wide range of preventive health services such as family planning, immunizations, management of chronic conditions, infectious disease screening, weight

control, and physical activity. These interventions aim to improve maternal and neonatal health outcomes through timely and comprehensive care (Bickmore Bickmore, Zhang, Reichert & Jule, & Jack, 2020)

Despite its recognized benefits, awareness and utilization of PCC remain limited, especially among young adults. Men's health and behaviors, such as smoking, also influence pregnancy outcomes, underscoring the need for public education and early engagement. Targeting university students can significantly improve knowledge and attitudes toward PCC. (Kolhe et al., 2024)

PCC supports both women and men throughout their reproductive years, regardless of pregnancy intention. It promotes healthier lifestyles, reduces risks of complications, and fosters better preparation for parenthood. Moreover, it helps empower women by enhancing autonomy and informed health choices (Maas et al., 2022).

Preconception care plays a significant role in national health strategies as it aligns with broader public health goals. It is often integrated into policy frameworks by healthcare professionals and decision-makers who recognize its potential to reduce maternal and infant morbidity and mortality. When embedded in health systems, PCC can support more sustainable and long-term improvements in reproductive health outcomes at the population level (Atrash & Jack, 2020a).

In Egypt, studies show poor awareness and limited practice of PCC, which increases the risk of adverse obstetric outcomes. Adolescents and university students represent a crucial group for targeted interventions. This study aims to evaluate the effect of a teaching program on PCC knowledge and attitudes among university students, while also exploring demographic associations (Aboushady, Hegazy & Abd Elnabi, 2021).

## **2.1 Significance of the Study**

Understanding and promoting preconception care (PCC) among university students is a vital public health priority, as this population represents individuals in their early reproductive years. Despite growing evidence on the importance of preconception health, awareness and practice of PCC remain low, particularly in low- and middle-income countries such as Egypt. By targeting university students and providing teaching program preconception care, this study addresses a critical gap in knowledge and aims to foster healthier lifestyle choices before conception, thereby reducing the risk of adverse maternal and neonatal outcomes. Furthermore, the study contributes to national and global goals of improving reproductive health and achieving sustainable development targets (Hill, Hall, Skouteris & Currie., 2020).

## **2.2 Aim of the Study**

To evaluate the effect of teaching program on university students' knowledge and attitudes toward preconception care.

## **2.3 Research hypotheses:**

**H1:**University Students have significantly higher mean post-test knowledge levels about PCC than mean pre-test knowledge levels.

**H2:** University students have a positive attitude post a teaching program sessions about PCC

**H3:**There is an association between the sociodemographic characteristics of the university students and their knowledge and attitude towards PCC

**H4:**University Students show a positive association between their knowledge and attitudes towards PCC

## **1. Method**

### **3.1 Study Design**

This study employed a quasi-experimental design.

### **3.2 Study setting**

The study was conducted at Mansoura University. Two colleges were chosen for conducting the study, from the theoretical sector, namely the College of Education and the College of Commerce at Mansoura University, Egypt. In contrast, two colleges were selected from the practical sector, comprising the College of Agriculture and the College of Science at Mansoura University, Egypt.

### **3.3 Subject**

400 participants (140 males and 260 females) represented study subject of the targeted colleges, students from grade 1 to grade 4 who accepted to participate in the study. Students from the medical sector, and those who refused to participate, were excluded from studying.

### **3.4 Sample Size Calculation**

The statistical software application Epi-Info version 7 was used to determine the proportion of the sample. The number of participants was determined using the following formula:

$$S = Z^2 * P * \frac{(1 - P)}{M^2}$$

Where:

M = Margin of error

P = population proportion (Assumed as 50% or 0.5)

S = sample size for infinite population

Z = Z score

### **3.5 Tools of data collection:**

Three tools were used. A pre-post-tested, planned survey that was administered by the interviewer has been used to gather data. The survey was taken from a prior investigation

conducted by Demeke et al. (2024) (Demeke et al., 2024).

**Tool I: A Structure Interview Questionnaire of socio-demographic:**

The questionnaire was developed by the researchers. It was about the socio-demographic factors including (age, gender, parents' education, parents' occupation, residence, and student grade).

**Tool II: knowledge of University Students toward Preconception Care (PCC):**

This tool contained 20 items about PCC knowledge administered from a previous research (Demeke et al., 2024) and divided into 2 subsections as follows: i) Eight subitems asking about knowledge of preconception health issues distribution among students; and ii) Twelve subitems asking about students' knowledge of component of preconception care distribution before and after intervention.

**Scoring system:**

For the knowledge, each correct answer was awarded one point, while incorrect or "I don't know" responses received zero. Students scoring at or above the mean were considered to have good knowledge; those scoring below were classified as having poor knowledge (Adeyemo, & Bello, 2021) and (Fikadu, Wasihun, Yimer, & 2022).

**Part III: Attitudes of University Students toward Preconception Care (PCC):**

This tool had six questions about attitudes about PCC administered from the study by Demeke et al. (2024) on a 5-likert scale. The tool explored perceptions and beliefs about PCC and its significance in women's health, particularly for those of childbearing age. It seeks to identify the most appropriate settings—such as hospitals or clinics—for delivering PCC, and whether individuals believe that PCC positively influences pregnancy outcomes and overall women's health. Furthermore, the questions emphasize the critical nature of PCC as an essential health issue for women planning to conceive, highlighting its importance for those with significant medical conditions. Lastly, they prompt respondents to assess their own readiness and qualifications to engage with PCC, reflecting a personal commitment to this aspect of health care.

**Scoring system:**

In the context of assessing student attitudes towards PCC, a five-point Likert scale was employed to quantify the respondents' opinions. The scale featured numerical values ranging from 1 to 5, corresponding to the following response

categories: strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5).

On a scale from 0 to 30, a mean score was determined to assess the general attitude of students regarding PCC. This continuous variable was used as a metric to measure the attitudes of the respondents. Subsequently, a threshold was established by calculating the mean value of the scores. Students whose scores equaled or exceeded this mean value were categorized as having a good (positive) attitude towards PCC, while those with scores below the mean were classified as having a poor (Negative) attitude (Adeyemo & Bello, 2021).

**3.6 Validity and Reliability of the Tool:**

The study employed validated and reliable questionnaires adapted from existing literature to assess students' knowledge and attitudes toward preconception care. Content validity was confirmed by a panel of five experts from the Faculty of Nursing, Mansoura University, who reviewed the tools for clarity, relevance, and comprehensiveness. Internal consistency was supported by a Cronbach's alpha of 0.89, indicating a high level of reliability.

**3.7 Pilot study**

To make sure the research was internally consistent, a pilot study was carried out. Based on the suggestion that a reasonable sample size for a pilot study should be 10% of the study population (Notario-Pacheco et al., 2011), 40 students of the sample for the study were chosen and included in the main study sample. The reliability of the scales was assessed using Cronbach's Alpha values ( $\alpha$ ), and the SPSS software was utilized to analyze the participant questionnaires that returned (Hayes & Coutts, 2020).

**3.8 Field work**

**It consists of five phases:**

**1. Assessment Phase:**

- Conducted pre-test to evaluate baseline knowledge and attitudes toward PCC.
- Collected demographic data to identify gaps in awareness.

**Planning Phase:**

- Applied community-based, experiential learning approach.
- Delivered content through interactive lectures, presentations, and group discussions.
- Covered core PCC topics: genetic risks, nutrition, immunity, and healthy lifestyle.

- Sessions lasted 30–45 minutes, scheduled outside academic hours.

## 2. Implementation Phase:

- Two one-hour sessions over two consecutive days.
- First session focused on foundational PCC knowledge.
- Second session emphasized practical applications and behavior change.
- Post-test administered immediately after the final session.

## 3. Evaluation Phase

- A mixed-method approach was applied for program evaluation.
- Quantitative data were collected using a post-test to assess improvements in knowledge and attitude.
- Qualitative feedback was gathered through focus group discussions to explore students' perceptions of the program's relevance and effectiveness.
- The combined approach ensured a comprehensive understanding of the program's effect.

## 4. Data Collection phase

- Data were collected on pre-scheduled days to maintain consistency.
- Each group included 15–20 students.
- Sessions were adjusted to accommodate a total of 400 participants.
- Each session lasted approximately one hour.
- Active participation was encouraged through open discussions and interactive activities.

## 5. Administrative Phase

- Official approval was obtained from the university administration.
- Informed consent was collected from all participants.
- Program logistics were coordinated with university departments to ensure smooth implementation.

## 3.9 Data Analysis

Data analysis was performed using SPSS version 26 for consistency and completeness. Descriptive statistics (means, standard deviations) were used to examine continuous variables, while categorical data was analyzed using frequencies. One-way ANOVA and t-tests were employed to investigate differences between pre and post-test

variables. Correlation analysis was conducted using the Pearson's  $r$  coefficient, which ranges from -1 to +1, where 1 indicates a perfect positive correlation, 0 indicates no correlation, and -1 indicates a perfect negative correlation. A statistically significant  $p$ -value  $< 0.05$  was considered for all analyses.

## 3.10 Ethical Considerations

This investigation received ethical approval from the Institutional Review Board (IRB:0622) of the Faculty of Nursing, Mansoura University, Egypt. All research procedures were conducted in strict accordance with the established ethical principles and relevant regulatory guidelines. Prior to initiating the study, a member of the research team provided a comprehensive explanation of the study's objectives and methodology to each potential participant. Written informed consent was obtained from all participants, ensuring their full comprehension and voluntary participation in the research.

## 2. Results

Table (1) presented the socio-demographic characteristics of 400 students at Mansoura University. The mean age was  $21.42 \pm 1.61$  years, with 35% males and 65% females. The majority of students' parents (69.8%) had a bachelor's degree, and most parents (86%) were employed. A significant association was found between parents' education and occupation levels ( $p < 0.001$ ). Additionally, 70.8% of students lived in urban areas. Grade distribution showed most students were in Grade 1 (38.3%), Grade 3 (25%), and Grade 4 (30%), with a significant association between grade level and demographic variables ( $p < 0.001$ ).

**Table (2)** Demonstrated students' knowledge of preconception care (PCC) before and after the teaching program. Initially, knowledge was limited; 76% did not know PCC is offered to all women before pregnancy. After the program, 96.7% answered correctly. Significant improvements were also noted regarding understanding the difference between PCC and antenatal care, benefits of PCC for healthy babies, and the role of health personnel in pregnancy planning ( $p < 0.001$ ).

**Table (3)** Showed students' knowledge regarding untreated health problems and behaviors affecting maternal health before and after the program. Initially, high proportions were unaware that conditions like diabetes, epilepsy, obesity, STIs, cardiovascular diseases, and stress impact pregnancy outcomes (up to 99.7% unaware). Post-program knowledge improved significantly, with

less than 6% remaining unaware for all conditions ( $p < 0.001$ ). Similarly, awareness of harmful behaviors such as smoking, alcohol, drug use, and exposure to environmental hazards also improved markedly.

**Table (4)** Focused on students' knowledge of PCC components. Before the program, many students lacked awareness about essential PCC components such as pregnancy planning, folic acid intake (74.2% unaware), weight management, diet modification, regular exercise, and avoidance of harmful substances. After the intervention, knowledge improved significantly, with most students recognizing these components correctly ( $p < 0.001$ ).

**Table (5)** Presented total knowledge scores pre- and post-intervention. The mean total knowledge score increased significantly from  $9.42 \pm 1.98$  before the program to  $31.36 \pm 1.24$  after the program ( $\chi^2 = 720.19$ ,  $p < 0.001$ ). Prior to the intervention, 94.8% of students had poor knowledge scores, while post-intervention, 100% attained good knowledge scores.

**Table (6)** Showed attitudes toward PCC before and after the program. There was a significant positive shift; for example, 78.2% disagreed that hospitals/clinics were the best places for PCC pre-intervention, dropping to 0.3% post-intervention. Strong agreement on PCC's positive effects on pregnancy outcome and women's health increased from less than 2% to over 98%. Furthermore, 100% of students strongly agreed that

PCC is a priority for women with major illnesses after the program.

**Table (7)** showed the total attitude scores improved significantly from  $9.28 \pm 2.05$  pre-intervention to  $28.79 \pm 1.45$  post-intervention. Before the program, 79.3% had poor attitudes, whereas after the intervention, 100% had excellent attitude scores.

**Table (8)** examined the relationship between sociodemographic characteristics and knowledge scores. Parental education and occupation significantly influenced knowledge scores before and after the intervention ( $p < 0.001$ ). Urban residence was associated with higher post-intervention knowledge scores ( $p = 0.02$ ), while grade level differences were significant only before the program.

**Table (9)** Analyzed associations between sociodemographic factors and attitude scores. No significant differences were found by parents' education or occupation ( $p > 0.05$ ). Grade level was significantly associated with attitude scores both before and after the program ( $p < 0.001$ ). Residence showed no significant association with attitude scores post-teaching program.

**Table (10)** Reported a significant positive correlation between total knowledge and attitude scores before ( $r = 0.339$ ,  $p < 0.001$ ) and after ( $r = 0.160$ ,  $p = 0.001$ ) teaching program, indicating that higher knowledge was consistently associated with more positive attitudes toward PCC.

**Table (1):** Socio-demographic Characteristics Among Students

Variable	Parameter	N=400	$\chi^2$ Test	p-value
Age	Mean $\pm$ SD	21.42 $\pm$ 1.608		
	Min-max	18-26		
Gender	Male	140 (35%)	36	<0.001
	Female	260 (65%)		
Parents education	Primary	10 (2.5%)	668.82	<0.001
	Secondary	85 (21.3%)		
	Bachelor	279 (69.8%)		
	Master	12 (3%)		
	PHD	14 (3.5%)		
Parents occupation	Non-occupied	56 (14%)	207.36	<0.001
	Occupied	344 (86%)		
Residence	Rural	117 (29.3%)	68.89	<0.001
	Urban	283 (70.8%)		
Student grade	Grade 1	155 (38.3%)	90.5	<0.001
	Grade 2	25 (6.3%)		
	Grade 3	100 (25%)		
	Grade 4	120 (30%)		

X<sup>2</sup>: Chi Square Test.

**Table (2):** Knowledge of Preconception Health Issues Distribution Among Students Before and After Teaching Program

Variable	Parameter	Pre	Post	$\chi^2$ Test	p-value
PCC is care given to all women before pregnancy to make them healthier	No/ I don't know	304 (76%)	13 (3.3%)	442.45	<0.001*
	Yes	96 (24%)	387 (96.7%)		
PCC is not the same as antenatal care	No/ I don't know	323 (80.7%)	12 (3%)	496.72	<0.001*
	Yes	77 (19.3%)	388 (97%)		
PCC enables healthier babies to be born	No/ I don't know	355 (89%)	8 (2%)	609.46	<0.001*
	Yes	44 (11%)	392 (98%)		
Preparation for pregnancy through PCC is best before getting pregnant	No/ I don't know	321 (80.2%)	7 (1.8%)	509.48	<0.001*
	Yes	79 (19.8%)	393 (98.2%)		
PCC ensures diseases are under control before pregnancy	No/ I don't know	335 (83.2%)	7 (1.8%)	549.47	<0.001*
	Yes	65 (16.3%)	393 (98.2%)		
PCC prevents unintended pregnancies and promotes optimal birth spacing	No/ I don't know	337 (84.2%)	0 (0%)	582.28	<0.001*
	Yes	63 (15.8%)	400 (100%)		
Is it necessary for the health personnel to have a say (advise) as to when can get pregnant?	No/ I don't know	325 (81.2%)	5 (1.3%)	528.17	<0.001*
	Yes	75 (18.8%)	395 (98.7%)		
Is it important to have a medical check-up before going on to get pregnant?	No/ I don't know	319 (79.7%)	6 (1.5%)	507.69	<0.001*
	Yes	81 (20.3%)	394 (98.5%)		

$\chi^2$ : Chi Square Test. (\*) Statistically significant at p <0.01.

**Table (3):** Knowledge of Untreated Health Problems, and Behaviors Affecting maternal Health and Pregnancy Outcome Distribution Among Students Before and after Teaching Program.

Variable	Parameter	Pre	Post	$\chi^2$ Test	p-value
Diabetes mellitus	No/ I don't know	389 (97.2%)	6 (1.5%)	733.56	<0.001*
	Yes	11 (2.8%)	394 (98.5%)		
Epilepsy	No/ I don't know	395 (98.7%)	9 (2.3%)	745.05	<0.001*
	Yes	5 (1.3%)	391 (97.7%)		
Obesity	No/ I don't know	395 (98.7%)	15 (3.7%)	722.45	<0.001*
	Yes	5 (1.3%)	385 (96.3%)		
STIs and HIV/AIDS	No/ I don't know	366 (91.5%)	16 (4%)	613.74	<0.001*
	Yes	34 (8.5%)	384 (96%)		
Cardiovascular disease	No/ I don't know	399 (99.7%)	22 (5.5%)	712.609	<0.001*
	Yes	1 (0.3%)	378 (94.5%)		
Stress and depression	No/ I don't know	389 (97.2%)	5 (1.3%)	737.44	<0.001*
	Yes	11 (2.8%)	395 (98.7%)		
Genetic disease	No/ I don't know	394 (98.5%)	13 (3.3%)	726.02	<0.001*
	Yes	6 (1.5%)	387 (96.7%)		
Cigarette smoking	No/ I don't know	293 (73.2%)	0 (0%)	462.32	<0.001*
	Yes	107 (26.8%)	400 (100%)		
Alcohol consumption	No/ I don't know	70 (17.5%)	0 (0%)	76.71	<0.001*
	Yes	330 (82.5%)	400 (100%)		
Exposure to environmental hazard	No/ I don't know	385 (96.2%)	5 (1.3%)	722.45	<0.001*
	Yes	15 (3.8%)	395 (98.7%)		
Un-prescribed drug intake	No/ I don't know	241 (60.2%)	7 (1.8%)	319.98	<0.001*
	Yes	159 (39.8%)	393 (98.2%)		
Gender based violence	No/ I don't know	293 (73.2%)	0 (0%)	462.32	<0.001*
	Yes	107 (26.8%)	400 (100%)		

$\chi^2$ : Chi Square Test. (\*) statistically significant at p<0.01.

**Table (4): Knowledge of Component of PCC Distribution Among Students Before and After Teaching Program**

Variable	Parameter	Pre	Post	$\chi^2$ Test	p-value
Pregnancy should be planned	No/ I don't know	126 (31.5%)	3 (0.8%)	139.82	<0.001*
	Yes	274 (68.5%)	397 (99.2%)		
Taking folic acid	No/ I don't know	297 (74.2%)	5 (1.3%)	453.54	<0.001*
	Yes	103 (25.8%)	395 (98.7%)		
Weight should be maintained	No/ I don't know	194 (48.5%)	11 (2.7%)	219.64	<0.001*
	Yes	206 (51.5%)	389 (97.3%)		
Diet should be modified	No/ I don't know	117 (29.2%)	0 (0%)	137.04	<0.001*
	Yes	283 (70.8%)	400 (100%)		
Regular exercise	No/ I don't know	313 (78.2%)	6 (1.5%)	491.39	<0.001*
	Yes	87 (21.8%)	394 (98.5%)		
Substance should be avoided before pregnancy	No/ I don't know	245 (61.2%)	22 (5.5%)	279.55	<0.001*
	Yes	155 (38.8%)	378 (94.5%)		
Cigarette smoking should be avoided	No/ I don't know	8 (2%)	8 (2%)	0	1
	Yes	392 (98%)	392 (98%)		
Alcohol consumption should be avoided before pregnancy	No/ I don't know	1 (0.3%)	1 (0.3%)	0	1
	Yes	399 (99.7%)	399 (99.7%)		
Illicit drugs should be avoided before pregnancy	No/ I don't know	342 (85.5%)	9 (2.2%)	562.89	<0.001
	Yes	58 (14.5%)	391 (97.8%)		
A healthy environment should be created before pregnancy	No/ I don't know	177 (44.3%)	0 (0%)	227.28	<0.001**
	Yes	223 (55.7%)	400 (100%)		
Free from stressors	No/ I don't know	301 (75.2%)	20 (5%)	410.83	<0.001*
	Yes	99 (24.8%)	380 (95%)		
TT (Tetanus Toxoid) vaccination	No/ I don't know	281 (70.2%)	15 (3.8%)	379.42	<0.001*
	Yes	119 (29.8%)	385 (96.2%)		

$\chi^2$ : Chi Square Test. (\*) statistically significant at  $p < 0.01$ . (\*\*) highly statistically significant at  $p < 0.01$ .

**Table (5): Total Knowledge Score Among Students Before and after teaching Program**

Variable	Parameter	Pre	Post	$\chi^2$ Test	p-value
Total knowledge score	Mean $\pm$ SD	9.42 $\pm$ 1.98	31.36 $\pm$ 1.24	720.19	<0.001*
	Min-max	4-14	24-32		
	Poor	379 (94.8%)	0 (0%)		
	Good	21 (5.3%)	400 (100%)		

$\chi^2$ : Chi Square Test. (\*) statistically significant at  $p < 0.01$ .

**Table (6): Attitude Towards PCC Distribution Among Students Before and After Teaching Program.**

Variable	Parameter	Pre	Post	$\chi^2$ Test	p-value
Hospital or clinic is the best place to provide PCC	Strongly disagree	313 (78.2%)	1 (0.2%)	726.48	<0.001*
	Disagree	56 (14%)	0 (0%)		
	Neutral	17 (4.3%)	5 (1.2%)		
	Agree	4 (1%)	113 (28.3%)		
	Strongly agree	10 (2.5%)	281 (70.3%)		
PCC has a positive effect on pregnancy outcome	Strongly disagree	235 (58.7%)	1 (0.2%)	641.67	<0.001*
	Disagree	62 (15.5%)	2 (0.5%)		
	Neutral	48 (12%)	3 (0.8%)		
	Agree	18 (4.5%)	0 (0%)		
	Strongly agree	37 (9.3%)	394 (98.5%)		
PCC can improve women's health	Strongly disagree	293 (73.2%)	8 (2%)	745.55	<0.001*
	Disagree	66 (16.5%)	0 (0%)		
	Neutral	35 (8.8%)	0 (0%)		
	Agree	0 (0%)	194 (48.5%)		
	Strongly agree	6 (1.5%)	198 (49.5%)		
PCC is an important health issue for women of childbearing age	Strongly disagree	182 (45.5%)	0 (0%)	772.93	<0.001*
	Disagree	16 (4%)	5 (1.2%)		
	Neutral	202 (50.5%)	3 (0.7%)		
	Agree	0 (0%)	59 (14.8%)		
	Strongly agree	0 (0%)	333 (83.3%)		
PCC is a high priority for women with major medical illness to plan pregnancy	Strongly disagree	311 (77.7%)	0 (0%)	753.39	<0.001*
	Disagree	0 (0%)	0 (0%)		
	Neutral	77 (19.3%)	0 (0%)		
	Agree	0 (0%)	0 (0%)		
	Strongly agree	12 (3%)	400 (100%)		
student the most suitable person to plan to get PCC	Strongly disagree	378 (94.5%)	2 (0.5%)	768.22	<0.001*
	Disagree	16 (4%)	3 (0.7%)		
	Neutral	6 (1.5%)	8 (2%)		
	Agree	0 (0%)	2 (0.5%)		
	Strongly agree	0 (0%)	385 (96.3%)		

$\chi^2$ : Chi Square Test. (\*) statistically significant at  $p < 0.01$ .

**Table (7):** Total Attitude Score Among Students Before and After Teaching Program

Variable	Parameter	Pre	Post	$\chi^2$ Test	p-value
Total attitude score	Mean $\pm$ SD	9.28 $\pm$ 2.05	28.79 $\pm$ 1.45	757.17	<0.001*
	Min-max	6-16	23-30		
	Poor(negative)	389 (79.3%)	0 (0%)		
	Good(positive)	11 (2.8%)	400 (100%)		

$\chi^2$ : Chi Square Test. (\*) statistically significant at  $p < 0.01$ .

**Table (8):** Association Between the Socio-Demographic Traits and Total Knowledge Score Among Students Before and After Teaching Program.

Variable	Parameter	Pre Mean $\pm$ SD	Post Mean $\pm$ SD	p-value
Parents education	Primary	9.1 $\pm$ 3.03	31.6 $\pm$ 0.51	<0.001*
	Secondary	9.18 $\pm$ 2.48	31.06 $\pm$ 1.77	
	Bachelor	9.48 $\pm$ 1.79	31.42 $\pm$ 1.08	
	Master	9.33 $\pm$ 1.07	31.58 $\pm$ 0.79	
	PhD	10.14 $\pm$ 1.79	31.57 $\pm$ 0.51	
p-value		0.455	0.142	
Parents' occupation	Non-employed	8.89 $\pm$ 1.39	31.79 $\pm$ 0.41	<0.001*
	Employed	9.51 $\pm$ 2.04	31.29 $\pm$ 1.31	
p-value		0.031*	0.006*	
Residence	Rural	9.31 $\pm$ 1.84	31.14 $\pm$ 1.65	<0.001*
	Urban	9.47 $\pm$ 2.03	31.45 $\pm$ 1.01	
p-value		0.45	0.02*	
Student grade	Grade 1	9.49 $\pm$ 1.93	31.35 $\pm$ 1.03	<0.001*
	Grade 2	8.88 $\pm$ 2.55	31.48 $\pm$ 0.82	
	Grade 3	8.92 $\pm$ 2	31.45 $\pm$ 1.09	
	Grade 4	9.87 $\pm$ 1.78	31.27 $\pm$ 1.62	
p-value		0.002*	0.69	

$\chi^2$ : Chi Square Test. (\*) statistically significant at  $p < 0.01$ .

**Table (9):** Association Between the Socio-demographic Traits and Total Attitude Score Among Students Before and after Teaching Program

Variable	Parameter	Pre Mean $\pm$ SD	Post Mean $\pm$ SD	p-value
Parents education	Primary	9.30 $\pm$ 2.71	28.7 $\pm$ 0.94	<0.001*
	Secondary	9.08 $\pm$ 1.82	1.44 $\pm$ 0.15	
	Bachelor	9.31 $\pm$ 2.1	1.48 $\pm$ 0.08	
	Master	9.58 $\pm$ 2.23	28.08 $\pm$ 1.67	
	PhD	9.57 $\pm$ 2.02	28.79 $\pm$ 1.02	
p-value		0.847	0.49	
Parents' occupation	Non-employed	9.25 $\pm$ 1.63	28.59 $\pm$ 1.30	<0.001*
	Employed	9.28 $\pm$ 2.12	28.82 $\pm$ 1.47	
p-value		0.906	0.26	
Residence	Rural	9.15 $\pm$ 2.06	28.96 $\pm$ 1.01	<0.001*
	Urban	9.34 $\pm$ 2.05	28.72 $\pm$ 1.6	
p-value		0.4	0.14	
Student grade	Grade 1	9.57 $\pm$ 2.16	28.74 $\pm$ 1.37	<0.001*
	Grade 2	9.8 $\pm$ 1.58	26.4 $\pm$ 1.8	
	Grade 3	8.72 $\pm$ 2.07	29.35 $\pm$ 1.24	
	Grade 4	9.26 $\pm$ 1.9	28.88 $\pm$ 1.12	
p-value		0.006	<0.001	

$\chi^2$ : Chi Square Test. (\*) statistically significant at  $p < 0.01$ .



**Table (10):** Correlation Between Knowledge and Attitude Scores Before and After Teaching Program Among Students

Item		Total knowledge score
Total attitude score pre teaching program	r-value	0.339*
	p-value	<0.001*
Total attitude score post teaching program	r-value	0.160*
	p-value	0.001*

(\*) statistically significant at  $p < 0.01$ .

### 3. Discussion

Optimal preparation for pregnancy, childbirth, and healthy offspring necessitates a comprehensive understanding of PCC. Nonetheless, a lot of university students have false assumptions about their knowledge of PCC. It is crucial to give learners access to educational resources and information that are both standardized and helpful in order to close this knowledge gap (Khalaf et al., 2022). Multimedia resources and specially designed instructional materials are necessary for effective PCC instruction in order to help students comprehend this important subject (Ukoha & Dube, 2019). The present investigation sought to determine whether there was a relationship between the targeted population's knowledge and attitude level of PCC, in addition to the way a teaching program influenced undergraduate students' views and understandings about PCC and the socioeconomic background of the university students and their knowledge and attitude towards PCC.

Instead, focusing on a single demographic or program structure as in other studies, the quasi-experimental study design used a novel strategy that encompassed a broad sample of students from several faculties. To guarantee thorough treatment of the subject, the current study specifically combined a number of academic and practical fields. The current method is further distinguished by the fact that the educational program was created with particular interventions that were adapted to meet the requirements of Mansoura University students while taking into consideration community demands and local health data.

Similar research routinely shows this trend (Charafeddine et al., 2014 & van Voorst, Plasschaert, Jong-Potjer, Steegers & Denktas, 2016), probably due to the fact that women are typically more involved in issues pertaining to reproductive health. Further confirming this pattern by Ukoha, & Dube (2019) who discovered that women made up the majority of their responses (83.3%). With 35% of the respondents being men and 65% being women, the gender distribution in this study is consistent with the outcomes of Khalaf

et al. (2022) who also stated that there were more female participants.

In terms of parental careers and education, 70.8% of the parents of the pupils in this survey lived in cities, 86% were working, and 69.8% had bachelor's degrees. These results somewhat agree with those of Khalaf et al. (2022), who discovered that fewer than 25% of their subjects were from rural regions. The greater urban presence in the current study may be a sign of improved availability to educational resources in metropolitan regions. Ukoha and Dube (2019), on the other hand, noted that there were disparities in the socioeconomic circumstances of various populations, with a greater percentage of housewives (78.1%) and lower parental education.

The present study's findings demonstrated a considerable improvement in knowledge scores after implementing the educational program. Other studies, such as those by (Braspenningx, Haagdoorns, Blaumeiser, Jacquemyn, & Mortier (2013), Charafeddine et al. (2014), DeJoy (2014), Coll et al. (2016), Krishnan, Joseph, & Maheswari (2016), Ojukwu, Patel, Stephenson, Howden, & Shawe, (2016), Bortolus et al. (2017), Priani, Afyanti, & Kurniawati (2019), In addition, Khalaf et al. (2022) who support the current findings by pointing out that university students and young adults generally don't know enough about PCC activities. This reaffirms the necessity of focused educational initiatives to close the knowledge gap.

However, Ukoha and Dube (2019) discovered that their participants already knew something about PCC, indicating that the effect of educational interventions can differ based on starting awareness degrees.

Following the intervention, this study also found that students' attitudes about PCC significantly improved, which is in line with results by Krishnan et al. (2016), & Khalaf et al. (2022). The positive relationship between attitude and knowledge implies that students' attitudes regarding PCC improved as they learnt more (Khalaf et al., 2022).

This finding is supported by DeJoy (2014), and Priani et al. (2019) who discovered that educational initiatives result in changes in attitudes towards healthier behaviors in addition to increasing knowledge. The current study's correlation ( $p < 0.001$ ) is in line with the pattern noted in related research, such as that of Alkhatib, & Agraib, & Hourani, & Hasan, (2024). who discovered that among women of reproductive age, PCC knowledge, attitude, and practice were positively correlated (Alkhatib et al., 2024).

The study by Abayneh et al. (2022) among Ethiopian obstetricians also emphasizes the significance of attitudes and knowledge in PCC practices. Even though almost half of the providers knew a lot, over half practiced poorly, showing that knowledge is inadequate on its own without accompanying behavioral changes. This echoes findings from Nepali, & Sapkota (2017) who, despite having a reasonable level of understanding, additionally identified poor practice among pregnant women (42%). According to this research, in order to bring about long-lasting change, behavior-focused therapies must be combined with gains in knowledge and attitude. On the other hand, the findings from Ukoha and Dube, (2019) imply a different dynamic in which participants' opinions were less affected by the educational session because they already knew something (Ukoha & Dube, 2019). This discrepancy may be explained by differences in the sociocultural backgrounds of the research participants, which may have an impact on PCC baseline knowledge and attitudes.

Comparable to the outcomes reported by Sainafat, Ikhlasiah, Mat, & Hassan (2020), who stated that reducing maternal and newborn mortality in university students through PCC initiatives, the findings of the current study highlight the substantial influence that contextually relevant, well-structured educational interventions can have on knowledge and attitudes towards PCC (Sainafat et al., 2020), who reported that PCC interventions in university students could reduce maternal and infant mortality. These results' consistency with other studies demonstrates the significance of PCC education as an essential component of reproductive health initiatives.

#### **4. Conclusion**

The results of this study suggest that the educational program had a significant effect on the knowledge and attitude of Mansoura University students regarding PCC. The students who participated in the program showed a significant increase in their knowledge scores and a positive

correlation between knowledge and attitude towards PCC. The findings of this study highlight the importance of incorporating PCC education into university curricula to promote healthy behaviors among

The findings demonstrate that the educational program produced significant improvements in both knowledge and attitudes toward preconception care among students at Mansoura University. Before the intervention, participants exhibited limited awareness and relatively unfavorable attitudes toward PCC. Following the program, scores for both domains rose markedly, and a strong positive correlation between knowledge and attitude was observed, indicating that enhanced understanding is associated with more constructive perceptions. These results support the integration of preconception care education into university curricula as a strategic means to foster healthier behaviors in young adults.

#### **5. Recommendation**

Enhancing integration of preconception care teaching into university curricula by ensuring all students receive foundational knowledge on the topic. Additionally, establishing peer education programs by training selected students as peer educators can facilitate the dissemination of information and foster discussions on preconception care among their peers. Moreover, creating a supportive learning environment by organizing regular workshops and seminars led by healthcare professionals can provide students with practical insights and real-life applications of preconception care principles with Collaborating of local clinics and hospitals to offer students opportunities for hands-on learning experiences as bridge the gap between theoretical knowledge and practical application

#### **6. Limitation**

The current study is limited by its reliance on self-reported data, which may introduce bias and affect the reliability of the findings. Additionally, The small sample size limits the generalizability of the results. Future research should explore long-term behavioral outcomes, use objective tools to assess knowledge and attitudes, and include larger, more diverse student populations. Enhancing the educational content with interactive strategies like role-playing and group discussions is also recommended to improve engagement and retention.

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## 8. Competing interests

The authors attest that they have no financial relationships that they disagree with.

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## 10. 12. References

- Abayneh, H., Wakgari, N., Ganfure, G., & Bulto, G. A. (2022). Knowledge, attitude, and practice of preconception care and associated factors among obstetric care providers working in public health facilities of West Shoa Zone, Ethiopia: A cross-sectional study. *Plos one*, 17(8), e0272316.
- Aboushady, M. R., Hegazy, A. E.-k., & M Ebrahim Abd Elnabi, M. (2021). Knowledge, Believes and Behaviors toward Preconception Care among Women at Childbearing period: Suggested Plan of Action. *Egyptian Journal of Health Care*, 12(1), 1463-1474.
- Adeyemo, A. A., & Bello, O. O. (2021). Preconception care: What women know, think and do. *African Journal of Medical and Health Sciences*, 20(2), 18-26.
- Alkhatib, B., Agraib, L. M., Hourani, H. A., & Hasan, H. (2024). Assessing the Provision of Preconception Care Knowledge, Attitudes, and Practice Among Jordanian Women of Reproductive Age. *SAGE Open*, 14(2), 21582440241245221.
- Atrash, H., & Jack, B. (2020a). Preconception care to improve pregnancy outcomes: clinical practice guidelines. *Journal of Human Growth and Development*, 30(3), 407-416.
- Atrash, H., & Jack, B. (2020b). Preconception care to improve pregnancy outcomes: the science. *Journal of Human Growth and Development*, 30(3), 355-362.
- Bickmore, T., Zhang, Z., Reichert, M., Julce, C., & Jack, B. (2020). Promotion of preconception care among adolescents and young adults by conversational agent. *Journal of Adolescent Health*, 67(2), S45-S51.
- Bortolus, R., Oprandi, N. C., Rech Morassutti, F., Marchetto, L., Filippini, F., Agricola, E., Tozzi, A. E., Castellani, C., Lalatta, F., & Rusticali, B. (2017). Why women do not ask for information on preconception health? A qualitative study. *BMC pregnancy and childbirth*, 17, 1-11.
- Braspenningx, S., Haagdoorens, M., Blaumeiser, B., Jacquemyn, Y., & Mortier, G. (2013). Preconceptional care: a systematic review of the current situation and recommendations for the future. *Facts, views & vision in ObGyn*, 5(1), 13.
- Charafeddine, L., El Rafei, R., Azizi, S., Sinno, D., Alamiddine, K., Howson, C. P., Walani, S. R., Ammar, W., Nassar, A., & Yunis, K. (2014). Improving awareness of preconception health among adolescents: experience of a school-based intervention in Lebanon. *BMC Public Health*, 14, 1-9.
- Coll, A. S., Potter, J. E., Chakhtoura, N., Alcaide, M. L., Cook, R., & Jones, D. L. (2016). Providers' perspectives on preconception counseling and safer conception for HIV-infected women. *AIDS care*, 28(4), 513-518.
- DeJoy, S. B. (2014). Pilot test of a preconception and midwifery care promotion program for college women. *Journal of Midwifery & Women's Health*, 59(5), 523-527.
- Demeke, M., Yetwale, F., Mulaw, Z., Yehualashet, D., Gashaw, A., & Agegn Mengistie, B. (2024). Knowledge and attitude towards preconception care and associated factors among women of reproductive age with chronic disease in Amhara region referral hospitals, Ethiopia, 2022. *BMC Women's Health*, 24(1), 184.
- Fikadu, K., Wasihun, B., & Yimer, O. (2022). Knowledge of pre-conception health and planned pregnancy among married women in Jinka town, southern Ethiopia and factors influencing knowledge. *Plos one*, 17(5), e0268012.
- Hayes, A. F., & Coutts, J. J. (2020). Use omega rather than Cronbach's alpha for estimating reliability. But.... *Communication Methods and Measures*, 14(1), 1-24.
- Hill, B., Hall, J., Skouteris, H., & Currie, S. (2020). Defining preconception: exploring the concept of a preconception population. *BMC pregnancy and childbirth*, 20, 1-11.

- Khalaf, F. R., Ail, R. R., Hassan, M., & Mohamed, A. A. (2022). Effect of Educational Program on Knowledge and Attitude of Adolescent Nursing Students About preconception Care at Assiut City. *Assiut Scientific Nursing Journal*, 10(28.), 91-101.
- Kolhe, R. S., Aggarwal, R., Raut, A. V., Maliye, C., Gupta, S. S., Garg, B. S., & Poonam, C. P.-c. H. G. S. K. S. R. M. A. J. A. K. D. A. K. A. S. (2024). Optimizing Health Before Pregnancy: Evaluating the Feasibility of Community-Based Preconception Care Package in Rural Central India. *Global Implementation Research and Applications*, 4(1), 24-39.
- Krishnan, G. G., Joseph, J., & Maheswari, B. (2016). Effect of structured West program on knowledge and attitude regarding preconception care among adolescent girls. *IJAR*, 2(4), 435-439.
- Maas, V., Poels, M., Ista, E., Menge, L., Vanden Auweele, K., de Bie, R., de Smit, D., van Vliet-Lachotzki, E., Franx, A., & Koster, M. (2022). The effect of a locally tailored intervention on the uptake of preconception care in the Netherlands: a stepped-wedge cluster randomized trial (APROPOS-II study). *BMC Public Health*, 22(1), 1997.
- Nepali, G., & Sapkota, S. D. (2017). Knowledge and practice regarding preconception care among antenatal mothers. *International Journal of Perceptions in Public Health*, 1(4), 224-227.
- Notario-Pacheco, B., Solera-Martínez, M., Serrano-Parra, M. D., Bartolomé-Gutiérrez, R., García-Campayo, J., & Martínez-Vizcaino, V. (2011). Reliability and validity of the Spanish version of the 10-item Connor-Davidson Resilience Scale (10-item CD-RISC) in young adults. *Health and quality of life outcomes*, 9, 1-6.
- Ojukwu, O., Patel, D., Stephenson, J., Howden, B., & Shawe, J. (2016). General practitioners' knowledge, attitudes and views of providing preconception care: a qualitative investigation. *Upsala journal of medical sciences*, 121(4), 256-263.
- Priani, I. F., Afyanti, Y., & Kurniawati, W. (2019). Preparing pregnancy through preconception education training. *Enfermeria Clinica*, 29, 304-309.
- Sainafat, A., Ikhlasih, M., Mat, S. B., & Hassan, H. C. (2020). Preconception care in adolescents. *Enfermeria Clinica*, 30, 73-76.
- Ukoha, W. C., & Dube, M. (2019). Primary health care nursing students' knowledge of and attitude towards the provision of preconception care in KwaZulu-Natal. *African journal of primary health care & family medicine*, 11(1), 1-8.
- van Voorst, S., Plasschaert, S., de Jong-Potjer, L., Steegers, E., & Denktas, S. (2016). Current practice of preconception care by primary caregivers in the Netherlands. *The European Journal of Contraception & Reproductive Health Care*, 21(3), 251-258.