Nano Teaching Sessions for University Students regarding Prevention of Helicobacter Pylori Infection

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Abstract:

Backdrop: Helicobacter pylori infection is the top prevalent chronic infection globally. Nano teaching sessions can be an efficient method concerning prevention of helicobacter pylori infection among university students by increasing awareness and promoting healthy practices. **Aim:** This study aimed to evaluate the effect of nano teaching sessions for university students regarding prevention of helicobacter pylori infection. **Study design:** A quasi-experimental design was adopted. **Setting:** This research was implemented at three of Non-Medical Faculties affiliated to Benha University, Egypt where selected randomly. **Sample:** Simple random sample of 379 university students were involved. **Tools for data collection:** Two tools were implemented. **I:** An interview questionnaire that involved socio-demographic characteristics of the university students, medical history, knowledge and reported practices of university students for prevention of helicobacter pylori infection. **II:** Attitude scale about prevention of helicobacter pylori infection. **Results:** 7.9% of studied students had good knowledge concerning prevention of H. Pylori infection pre nano teaching sessions implementation which enhanced to 71.2% post nano teaching sessions implementation, 19.3% of the studied students had satisfactory reported practices relating to prevention of H. Pylori infection pre implementation of nano teaching sessions which raised to 89.7% post nano teaching sessions implementation, and 23.7% of studied students had positive attitude regards prevention of H. Pylori infection pre nano teaching sessions implementation which raised to 87.9% post nano teaching sessions implementation. **Conclusion:** Nano training sessions were successful in raising university students' knowledge, enhancing their practices, and positively altering their attitude about preventing helicobacter pylori infections. **Recommendations:** Continuing nano teaching sessions regarding prevention of helicobacter pylori infection for university students to enhance their knowledge, practices and attitude.

Keywords: Nano teaching sessions, Prevention of helicobacter pylori infection, University students.

Introduction

Helicobacter Pylori (H. Pylori) infection is a significant human infection caused by germ negative bacteria which is found in the atmosphere of the digestive system in around 4.4 billion individuals, about half of the globe's population and usually hurts the gastric mucosa **(Bekta et al., 2025).**

Helicobacter pylori infection affects about 80–91 percent of individuals living in developing nations and 11–25 percent of those in developed nations. Globally, several factors such as education, awareness, location, age, living circumstances, socioeconomic level and hygiene influence the incidence of H. pylori infection. H. pylori infection can spread either directly between individuals or indirectly through an infected person's contact with the environment. The first routes of human-to-human transmission are the oral-oral or fecal-oral routes. Living with an infected person or in a crowded home, drinking contaminated water, and not practicing good hygiene all contribute to the risk of having H. pylori **(Shehab et al., 2023).**

One of the most frequent causes of gastritis and peptic ulcers worldwide is H. pylori infection, which frequently manifests as

burning or gnawing epigastric pain. Other symptoms are nausea, vomiting, loss of appetite and weight loss **(Centers for Disease Control and Prevention, 2024).** Most patients with active chronic gastritis may remain clinically silent throughout patients` lives, but a significant minority have numerous problems, including gastro-duodenal disorders, ulceration, bleeding, gastric cancer, and lymphoma of the gastric mucosa **(World Gastroenterology Organization, 2021).**

A variety of H. pylori infection diagnostic techniques with good sensitivity and specificity are already available. These techniques range into two groups: Invasive and non-invasive. Non-invasive methods involve urea breathing test, stool antigen test, tests for serology, and molecular tests, while invasive methods necessitate an endoscopy and include endoscopic imaging and histology determination **(Addissouky et al., 2025).**

Treatment of H. pylori infection encompasses 14 days of antibiotics and requires a combination of antimicrobials and acid-suppressing medications plus anti-secretory agents to manage it completely. It is important to follow up to prevent the recurrence of H. pylori infection post treatment course. Follow up and investigations are usually performed six to eight weeks after treatment **(Agwa et al., 2024).**

Commitment to protective measures is essential for preventing H. pylori infection. Raising awareness of the need to consume water that is clean, eat fresh fruits and vegetables, avoid fast food, consume probiotic yogurt, and give up smoking. In addition, students should wash hands thoroughly and utilize only personal utensils and consume well-cooked food. Also, regular screening and follow-up are also crucial for students who are at high risk **(Ding, 2020).**

Nano-teaching is one of the most recent developments in education. It is a new educational method that entails providing bite-sized knowledge sections and adapting to different learning styles to maximize educational experiences for university students. The time of the educational session usually lasts from 5-15 minutes to improve the willingness to attend, receive, and remember information. Thus, it is believed that the nano-teaching session is a useful and efficient way to raise university students' awareness of H. pylori infection prevention **(Khan, 2025).**

In addition to raising awareness about H. pylori infection and implementing nano-teaching sessions to prevent H. pylori infection, Community Health Nurses (CHNs) have an imperative role in university student education. In order to maintain health, enhance quality of life, and assist in modifying behavior and attitude, CHNs teach university students about the meaning, modes of transmission, manifestation, complications, and preventative measures **(Hafiz et al., 2023).** CHNs counsel university students on the value of adhering to health practices, including personal hygiene, keeping and residing in hygienic surroundings, drinking safe water, and following proper food preparation techniques, as well as participating in screening, treatment, and follow-up **(Ibrahiem & Saad, 2021).**

Significance of the study:

Helicobacter pylori is a common and prevalent disease, particularly in developing nations. The prevalence of H. pylori infection diverges between 60 and 90 percent throughout the Middle East. In Egypt, 90% of adults have an H. pylori infection. Between 20-25% of cases with an active H. pylori infection proceed to develop serious illnesses like gastric cancer or peptic ulcer disease. Children and teenagers were shown to be the most susceptible age group to experiencing H.

pylori infection (30–50%), and they are also crucial in the spread of this infection to the members of the family **(Ibrahiem & Saad, 2021; Alsulaimany et al., 2020)**. So, this study was implemented to assess the effect of nano-teaching sessions on improving university students' knowledge and attitudes to establish and encourage the best practices in the prevention of H. pylori infection.

Aim of the study

Was to evaluate the effect of nano teaching sessions for university students regarding prevention of helicobacter pylori infection.

Research hypothesis:

Nano teaching sessions will increase knowledge, improve practices, and promote positive attitude of university students regards prevention of helicobacter pylori infection.

Subjects and Method:

Study design:

This study was applied by using a quasi-experimental research design.

Setting:

This study was implemented at three non-medical faculties that selected randomly which are named; Faculty of Commerce, Law and Agriculture. Benha University consists of 16 faculties, 4 medical faculties and 12 non-medical faculties; the study was conducted on 25.0% of non-medical faculties.

Sample:

Sample type: Simple random sample was employed in the current research at the previously mentioned settings.

Sample size: The total number of 1st year university students in the previously mentioned settings was 7300 students and the equation that calculates the sample size was as follows: **Yamane, (1967)**

$$n = \frac{N}{1 + N(e)^2}$$

Where: n = sample size, N= total population size, e = margin error 0.05.

The total sample of 1st year university students who participated in the study was 379 students and chosen randomly.

Faculty	The total number of 1st year university students	Randomly chosen students included in the sample
Commerce	3500	175
Law	2283	122
Agriculture	1562	82
Total	7300	379

Tools for data collection:

Two tools were applied:

Tool I: A structured interview questionnaire:

It was written in three parts in simple, intelligible Arabic and was created by researchers utilizing a literature review.

First part: Included socio-demographic characteristics of university students as age, sex, marital status, number of family member, student ranking between their siblings, residence and family monthly income.

Second part: Involved medical history of university students as previous exposure to H. pylori infection, previous hospitalization due to H. pylori infection, completed the course of treatment, repeated investigations after treatment, smoking, type of smoking, and suffered from chronic disease.

Third part: Represented knowledge about helicobacter pylori infection guided by **Kim, (2023).** Included 10 closed-ended questions in MCQ format pertaining to meaning, causes, risk factors, signs and symptoms, mode of transmission, diagnosis, when should doctors

consult, complications, treatment and prevention methods of helicobacter pylori infection.

Scoring system:

The university students' knowledge scoring system is calculated as follows: 0 for not knowing the answer, 1 for correct incomplete answers, and 2 for correct complete answers. The item scores were added together, and the result was divided by the total number of items to determine the mean score. A percentage was created from these scores. The total score= 20 points. If the total knowledge score equaled and was greater than 75% (≥15 points), it was recognized as good; if it was between 50% and less than 75% (10 – <15 points), and it was seen as average, if it was less than 50% (<10 points), it was considered poor.

Fourth part: Involved reported practices of university students about prevention of helicobacter pylori infection guided by **Ruiz et al., (2024)**. It comprised of twenty-eight items that were divided into four sections such as: Nutrition (12 items), personnel hygiene (5items), bathroom cleanliness (6 items), physical activity (2 items), and follow up (3 items).

Scoring system:

Each practice` item has two choices: Done which was given 1 score and not done which was given 0 score. To determine the level score, the total item scores were divided by the total number of items, and a percentage score was calculated using these values. The total score = 28 points. The total practices score was assumed satisfactory if the score was 60% and more (≥16 points) and reflected unsatisfactory if it was below 60% (< 16 points).

Tool II: The Arabic version of the three-point Likert scale (Agree, Uncertain, and Disagree). The Likert scale was used to assess the attitude of university students concerning prevention of helicobacter pylori infection which comprised of 10 questions and adapted from **Alajmi et al., (2023); Alaridah et al., (2024).**

Scoring system:

The scores regarding the attitude scale representing agree, uncertain, and disagree were 2, 1, and 0, respectively. The total attitude score=20 points. If the overall attitude score was 60% or more (≥12 points), it was regarded positive and if it was less than 60% (12 points), it was seen as negative.

Content Validity:

Five Academics Specialists in Community Health Nursing from Benha University's Faculty of Nursing were chosen to evaluate the tools' content accuracy, pertinence, comprehensiveness, and applicability to determine their content validity. According to the experts, the tools were deemed dependable after their opinions on the design, structure, and order of the questions were solicited and all their suggestions were taken into consideration.

Reliability:

The researchers used Cronbach's alpha coefficient test to ascertain the internal consistency of the tools by implementing the same tools on the same study population in the same conditions. The internal consistency of knowledge was 0.89, practices was 0.91, and attitude reliability was 0.88. This demonstrates that research tools are highly reliable.

Ethical consideration:

The Scientific Research Ethical Committee allied to Faculty of Nursing, Benha University confirmed its approval for this research with code **(REC.CHN. P.61)**. Each university student offered the verbal consent before the interview was conducted, and university students were also briefed on the

purpose of the research. Additionally, researchers confirmed that all information obtained would be kept confidential and utilized exclusively for the research. The forms did not request names in order to preserve anonymity and confidentiality. Furthermore, they understood that they could withdraw from the research at any moment and for any reason.

Pilot study

Pilot study was conducted on thirty-eight university students (10%) of the overall students under study, to evaluate the research tools' suitability and clarity for completing the tool. Considering the findings of pilot study, the required adjustments were made before data collection began by eliminating items that were unneeded or duplicated. University students who were involved in the pilot study didn't enroll in the overall research sample.

Nano teaching sessions implementation:

The current research was implemented through 4 phases:

1. Assessment phase: The researchers designed nano teaching sessions following an extensive review of relevant literature. At the onset of the interview, the researchers explained the goals, research activities, discussed work plan, and received their oral consent from each student. The university students were given questionnaires during the assessment phase to obtain baseline data. The pretest period took about four weeks, and the researchers attended three days/week (Saturday, Monday and Wednesday) from 10.00 am to 2:00 pm. The researchers evaluated university students' knowledge and reported practices through interview questionnaire.

2. Planning phase: The researchers determined the most critical needs of the students, prioritized those needs, and created goals and objectives. Based on the university students' comprehension of basic Arabic, the researchers in this phase established the contents, sessions number, various teaching methods, and media. The nano teaching sessions' objectives were then established as follows:

General objective: Was to evaluate the effect of nano teaching sessions among university students regarding prevention of helicobacter pylori infection.

Specific objectives: Post nano teaching sessions, university students should be able to:

A-Knowledge objectives:

- Define helicobacter pylori infection.
- Explain the causes of helicobacter pylori infection.
- State the risk factors of helicobacter pylori infection.
- List signs and symptoms of helicobacter pylori infection.
- Identify mode of transmission of helicobacter pylori infection.
- Enumerate diagnosis of helicobacter pylori infection and when should consult the doctor.
- List complications of helicobacter pylori infection.
- Identify treatment and prevention methods of helicobacter pylori infection.

B- Practical skills

- Apply healthy nutritional practices.
- Perform personnel hygiene.
- Keep bathroom cleanliness practices.
- Do physical activity.
- Perform appropriate precautions in follow up.

Contents of nano teaching sessions included: Meaning, causes and risk factors, signs and symptoms, mode of transmission, diagnosis, when should consult doctors, complications, treatment, and prevention methods of helicobacter pylori infection.

- Practices for prevention of helicobacter pylori infection, which was composed of nutrition, personnel hygiene, bathroom cleanliness, physical activity and follow up.

Teaching methods:

All students used the same educational methods and resources from nano teaching sessions regarding prevention of helicobacter pylori infection, including lectures, brainstorming and discussions.

Teaching media: Videos, booklets, and colored posters were created especially for the nano teaching sessions.

3. Implementation phase: Collection of data was done for five months from the beginning of October 2024 to the mid of December 2024 (1st semester) and from mid of February 2025 to the end of April 2025 (2nd semester). The researchers divided total studied university students into 24 groups, each group contained 15-16 university students, and each day included 6 groups. The researchers went three days per week (Saturday, Monday and Wednesday) from 10.00 am to 2:00 pm. The researchers designed nano teaching sessions concerning the level of university students` knowledge and practices which were composed of 9 nano teaching sessions (4 theoretical and 5 practical). Each nano teaching session took about 10-15 minutes. Objectives of the previous session were summarized at the beginning of session. Through discussion, motivation, and reinforcement, learning was enhanced during nano teaching sessions. The students actively participated with the researchers during nano teaching sessions.

Theoretical sessions (4 sessions):

- The first session: Covered meaning and causes of helicobacter pylori infection.
- The second session: Involved a clarification of risk factors and signs and symptoms of helicobacter pylori infection.
- The third session: Involved mode of transmission and diagnosis of helicobacter pylori infection.
- The fourth session: Involved complications, methods of treatment and prevention of helicobacter pylori infection.

Practical sessions (5 sessions)

- The first session: Included how to carry out healthy nutrition.
- The second session: Included how to follow tips of personal hygiene.
- The third session: Included how to keep bathroom cleanliness.
- The fourth session: Provided guidance on performing regular physical activity.
- The fifth session: Included how to follow appropriate instructions of follow-up.

4. Evaluation phase:

The efficacy of the nano teaching sessions was determined by differentiating knowledge, practices, and attitudes of university students before and after the implementation of nano teaching sessions regarding prevention of helicobacter pylori infection. The pre-test and post-test questionnaires utilized in this assessment were identical in format.

Statistical analysis:

Data was examined before being entered into the system. Researchers used version 26 of the Statistical Package for Social Sciences (SPSS) for analysis and displaying the data. Mean, standard deviation, frequency, and percentages were implemented for descriptive statistics. The statistical tests were used as Chi square to ascertain how numbers and percentages are distributed, and the Spearman correlation test (r) was employed to assess the relations among the total score of knowledge, practices, and attitude. A level value was considered highly significant if $p \leq 0.001$, significant if $p \leq 0.05$, and insignificant if $p > 0.05$.

Results:

Table (1): Presents that; 57.8% of the studied students aged from 18 years old to less than 19 years old with mean age was 18.48 ± .614, 52.5% of them were female, 99.2% of them were single. Regarding the number of family members, 69.1% of studied students had three to less than five family members. 31.9% of studied students were the second sibling, 55.1% of them lived in urban areas and 57.3% of them hadn't enough family monthly income.

Table (2): Demonstrates that; 76.0% of the studied students didn't expose previously to H. pylori infection, 93.4% of them hadn't previous hospitalization due to H. pylori, 91.2% of the studied students had completed the course of treatment, 79.1% of them didn't repeat investigations after treatment, 92.3% of them didn't smoke while 7.7 % of them were smoking. Regarding type of smoking, 89.6% of the studied students were smoking cigarettes. 0.8% of the studied students suffered from cardiac disease.

Table (3): Indicates that; all items of the studied students` knowledge regarding H. pylori infection and its prevention marked highly statistically significant differences at pre and post nano teaching sessions implementation (p=<0.001).

Figure (1): Exhibits that; 7.9% of studied students had good knowledge regarding prevention of H. Pylori infection pre nano teaching sessions implementation which enhanced to 71.2% post nano teaching sessions implementation.

Table (4): Displays that; all items of the studied students` subtotal reported practices regarding prevention of H. pylori infection had highly statistically significant differences at pre and post nano teaching sessions implementation (p=<0.001).

Figure (2): Explores that; 19.3% of the studied students had satisfactory reported practices about prevention of H. pylori infection pre implementation of nano teaching sessions which improved to 89.7% post nano teaching sessions implementation.

Table (5): Identifies that; all items of the studied students` attitude regarding prevention of H. pylori infection at pre and post nano teaching sessions implementation marked highly statistically significant differences between (p=<0.001).

Figure (3): Reveals that; 23.7% of studied students had a positive attitude regarding prevention of H. Pylori infection pre nano teaching sessions implementation which raised to 87.9% post nano teaching sessions implementation.

Table (6): Clarifies that; the correlations between studied students` total knowledge, total reported practices and total attitude regarding prevention of H. Pylori infection signified highly positive statistically significant at pre and post nano teaching sessions implementation.

Table (1): Distribution of the studied students regarding their socio-demographic characteristics (n=379).

Socio-demographic characteristics	No.	%
Age / years		
18-	219	57.8
19-	136	35.9
20+	24	6.3
$\bar{x} \pm$S.D 18.48 ± .614		
Sex		
Male	180	47.5
Female	199	52.5
Marital status		
Single	376	99.2
Married	3	.8
Number of family members		
>3	4	1.1
3- >5	262	69.1
5-7	113	29.8
Student order between siblings		
1st	85	22.4
2nd	121	31.9
3rd	98	25.9
4th	75	19.8
Residence		
Rural	170	44.9
Urban	209	55.1
Family monthly income		
Enough and save	39	10.3
Just enough	123	32.5
Not enough	217	57.3

Table (2): Distribution of the studied students regarding their medical history (n=379).

Medical history	No.	%
Previous exposure to H. pylori infection		
Yes	91	24.0
No	288	76.0
Previous hospitalization due to H. pylori (n=91)		
Yes	6	6.6
No	85	93.4
Completing the course of treatment (n=91)		
Yes	83	91.2
No	8	8.8
Repeating investigations after treatment (n=91)		
Yes	19	20. 9
No	72	79.1
Smoking		
Yes	29	7.7
No	350	92.3
***Type of smoking (n=29)**		
Cigarette smoking	26	89.6
Hookah	19	65.5
Suffering from chronic disease		
Diabetes Mellitus	1	0.2
Cardiac disease	3	0.8

***Answers not mutually exclusive**

Table (3): Distribution of the studied students` knowledge regarding H. pylori infection and its prevention pre and post nano teaching sessions implementation (n=379).

Knowledge regarding H.-pylori infection and its prevention	Pre nano teaching sessions implementation						Post nano teaching sessions implementation						X^2 p-value
	Complete& correct answer		Incomplete & correct answer		Don't know		Complete& correct answer		Incomplete & correct answer		Don't know		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Meaning	31	8.1	159	42.0	189	49.9	267	70.5	101	26.6	11	2.9	358.25 <0.001**
Causes	23	6.1	166	43.8	190	50.1	304	80.2	58	15.3	17	4.5	567.46 <0.001**
Risk factors	22	5.8	171	45.1	186	49.1	249	65.7	117	30.9	13	3.4	350.66 <0.001**
Signs and symptoms	30	7.9	178	47.0	171	45.1	270	71.2	97	25.6	12	3.2	354.00 <0.001**
Mode of transmission	19	5.0	183	48.3	177	46.7	268	70.7	100	26.4	11	2.9	386.94 <0.001**
Diagnosis	13	3.5	99	26.1	267	70.4	259	68.3	103	27.2	17	4.5	442.63 <0.001**
When should consult doctors	21	5.5	249	65.7	109	28.8	294	77.6	72	19.0	13	3.4	471.425 <0.001**
Complications	5	1.3	49	12.9	325	85.8	244	64.4	121	31.9	14	3.7	341.82 <0.001**
Treatment	24	6.3	39	10.3	316	83.4	296	78.1	75	19.8	8	2.1	535.35 <0.001**
Prevention	51	13.5	83	21.9	245	64.6	317	83.6	55	14.5	7	1.9	422.73 <0.001**

(**) highly statistically significant at (p<0.001)

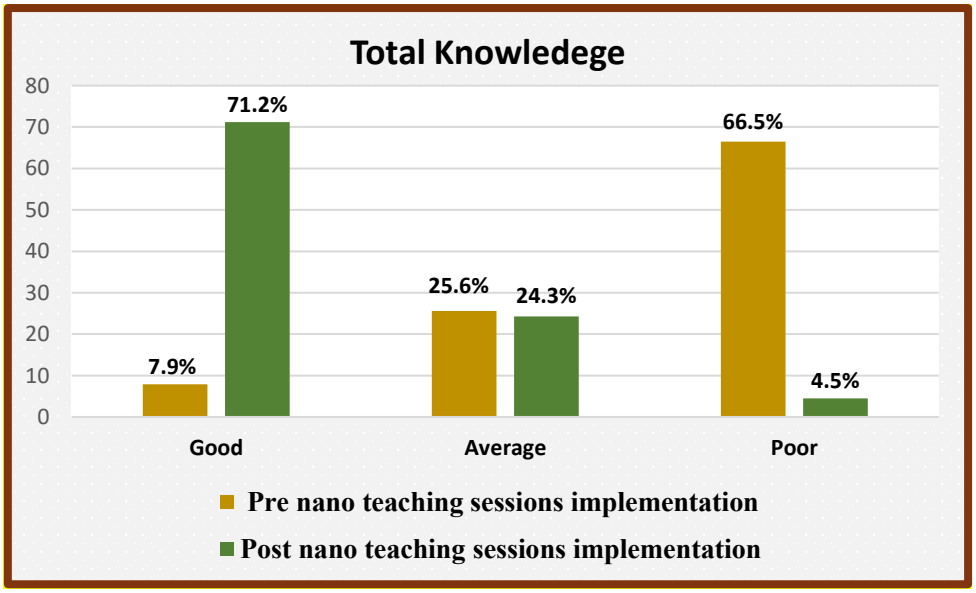

Figure (1): Percentage distribution of the studied students` total knowledge level regarding prevention of H. Pylori infection pre and post nano teaching sessions implementation (n=379).

Table (4): Distribution of the studied students` subtotal reported practices regarding prevention of H. pylori infection pre and post nano teaching sessions implementation (n=379).

Subtotal reported practices	Pre nano teaching sessions implementation				Post nano teaching sessions implementation				X^2	p-value
	Satisfactory		Un-satisfactory		Satisfactory		Un-satisfactory			
	No.	%	No.	%	No.	%	No.	%		
Nutrition	29	7.7	350	92.3	323	85.2	56	14.8	458.45	<0.001**
Personal hygiene	177	46.7	202	53.3	368	97.1	11	2.9	238.21	<0.001**
Bathroom cleanliness	169	44.6	210	55.4	372	98.2	7	1.8	241.49	<0.001**
Physical activity	73	19.3	306	80.7	321	84.7	58	15.3	325.06	<0.001**
Follow up (n=91)	31	34.1	60	65.9	82	90.1	9	9.9	297.14	<0.001**

(**) highly statistically significant at (p<0.001)

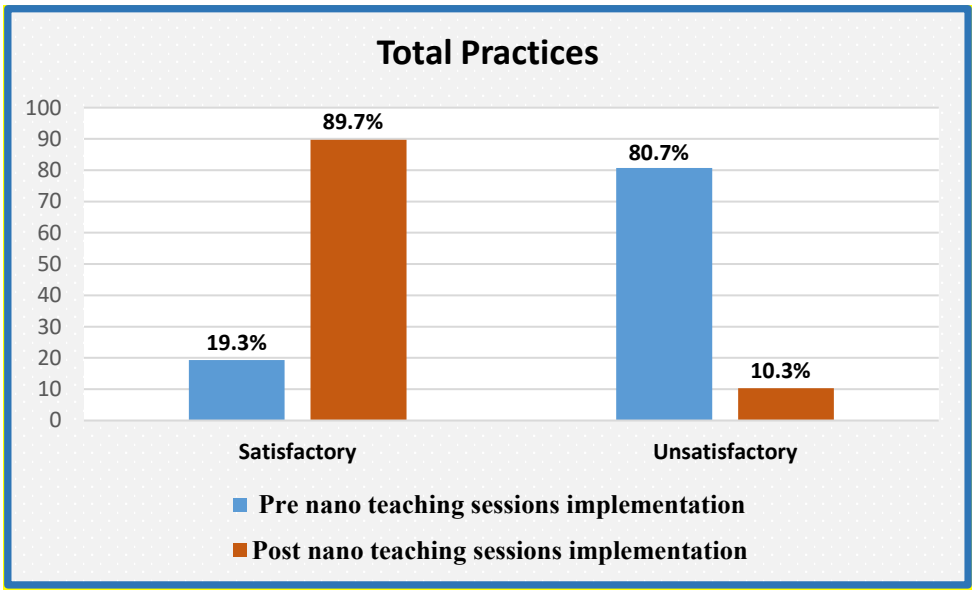

Figure (2): Percentage distribution of the studied students` total reported practices level regarding prevention of H. Pylori infection pre and post nano teaching sessions implementation (n=379)

Table (5): Distribution of the studied students` attitude regarding prevention of H. pylori infection pre and post nano teaching sessions implementation (n=379).

Attitude	Pre nano sessions implementation						Post nano sessions implementation						X^2 p-value
	Agree		Uncertain		Disagree		Agree		Uncertain		Disagree		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Regular hand washing is important before eating and after toileting.	321	84.7	58	15.3	0	00.0	379	100.0	0	00.0	0	00.0	62.80 <0.001**
If a person's dietetic hygiene is good, he/she may not get affected by H. pylori bacteria	143	37.7	109	28.8	127	33.5	345	91.0	27	7.1	7	1.8	240.51 <0.001**
Regular screening for H. pylori is useful.	59	15.6	103	27.2	217	57.3	324	85.5	47	12.4	8	2.1	398.400 <0.001**
Controlling the H. pylori infection lowers the risk of stomach cancer	19	5.0	124	32.7	236	62.3	318	83.9	58	15.3	3	.8	516.370 <0.001**
There is effective treatment for H. pylori infection	39	10.3	102	26.9	238	62.8	341	90.0	25	6.6	13	3.4	488.389 <0.001**
Special diet can enhance the symptoms of H. pylori infection	25	6.6	145	38.3	209	55.1	316	83.4	54	14.2	9	2.4	473.431 <0.001**
H. pylori can be cured with herbal therapy	21	5.5	249	65.7	109	28.8	294	77.6	72	19.0	13	3.4	409.739 <0.001**
Water that has been filtered or bottled may reduce the risk of acquiring H. pylori	7	1.8	83	21.9	289	76.3	283	74.7	77	20.3	19	5.0	411.520 <0.001**
Fast food consumption might raise the risk of H. pylori infection	10	2.6	89	23.5	289	73.9	285	75.2	77	20.3	17	4.5	419.589 <0.001**
Living in overcrowded areas might raise the risk of H. pylori infection	23	6.1	97	25.6	259	68.3	241	63.6	126	33.2	12	3.2	408.912 <0.001**

(**) highly statistically significant at (p<0.001)

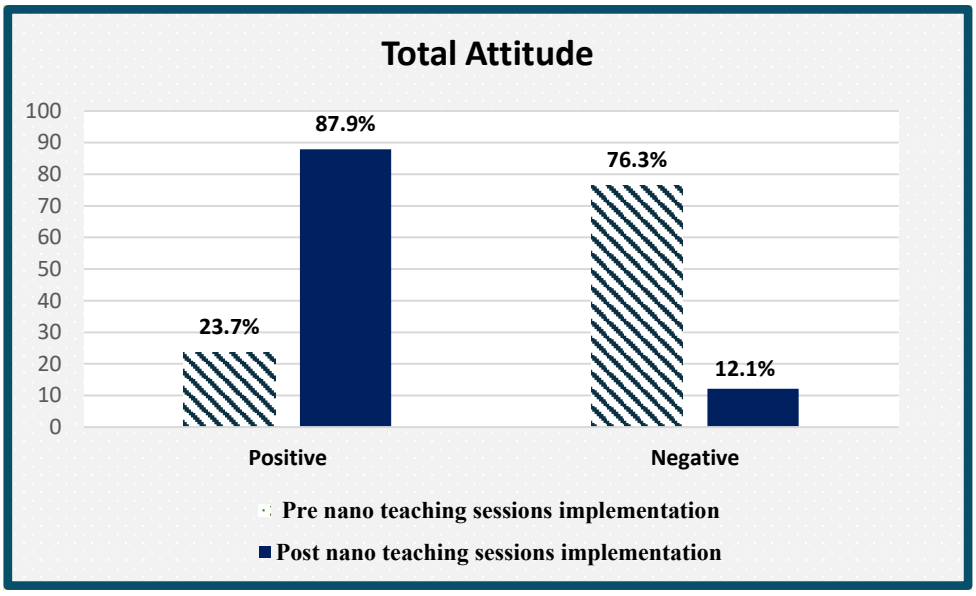

Figure (3): Percentage distribution of the studied students` total attitude level regarding prevention of H. Pylori infection pre and post nano teaching sessions implementation (n=379)

Table (6): Correlation matrix between studied students` total knowledge scores, total reported practices scores and total attitude scores regarding prevention of H. Pylori infection pre and post nano teaching sessions implementation (n=379).

Phases	Total		Knowledge	Practices	Attitude
Pre- nano teaching sessions implementation	Knowledge	r	1	.784	.795
		P	--	.000**	.000**
	Practices	r	.784	1	.842
		P	.000**	----	.000**
	Attitude	r	.795	.842	1
		P	.000**	.000**	----
Post- nano teaching sessions implementation	Knowledge	r	1	.823	.924
		P	-----	.000**	.000**
	Practices	r	.823	1	.939
		P	.000**	-----	.000**
	Attitude	r	.924	.939	1
		P	.000**	.000**	-----

(**) highly statistically significant at (p<0.001)

Discussion

Helicobacter pylori infection is a spreading and dangerous infection with a form of spiral-shaped bacterium that can only live under extremely challenging growth conditions and doesn't require oxygen to thrive, and whose elimination is seen as a major public health concern. Nano teaching sessions are essential strategies for serving as a foundation for creating educational content, improving students' comprehension, and encouraging discussion related to prevention and spread of H. pylori infection **(Hafiz et al., 2023).**

Regarding socio- demographic characteristics of the studied students, the current study indicated that less than three fifths of students aged from 18 years old to less than 19 years old with mean age was 18.48 ± .614 and more than half of them were female. More than two thirds of studied students had three to less than five family members, and more than half of them lived in urban areas. Concerning monthly income, less than three fifths of them had not enough monthly income.

These study findings agreed with **Mikhail et al. (2023)**, who conducted a study on 83 Egyptian dental students at Fayoum University to assess risk factors and frequency of H. pylori infection and reported that 61.4% of the students were females and 55.5% of them lived in urban areas. However, these study findings disagreed with **Shehab et al. (2023)**, who conducted prevention program among 157 students at Damietta University about helicobacter pylori infection and reported that 28% of the studied students were male and 49% of the studied students aged from 20–22 years old. Moreover, 65.6% of the studied students lived at rural areas and 75.2% of the studied students had 5–7 family members, and 64.3% of the studied students mentioned that the family income was insufficient.

Concerning the medical history of the studied students, the current study disclosed that less than one quarter of them had previous exposure to H. pylori infection. This study finding was opposed to **Mikhail et al. (2023),** who mentioned that 75.0% of the students had previous H. pylori infection versus 14.1% of those were not H. pylori positive.

The present research confirmed that most of the affected students completed the course of treatment of H. Pylori infection. This study finding was aligned with **El-Maghawry et al. (2022),** who implemented health literacy sessions in Damietta, Egypt to enhance 167 university students' knowledge and practices about helicobacter pylori infection, who reported that 82.1% of the students completed the treatment of H. pylori infection. From researchers` point of view this might be due to their commitment of doctors` instruction and to avoid recurrence of the infection.

As regards to the studied students' knowledge, the current research presented that; all items of the studied students` knowledge regarding H. pylori infection and its prevention were approved highly statistically significant differences at pre and post nano teaching sessions implementation (p=<0.001). These study findings were consistent with **El-Maghawry et al. (2022),** who stated that there was a statistically significant difference in the scores of the participants' knowledge items between pre and post health literacy sessions, P = 0.000. From the researchers` opinion, this could because of the implementation of nano teaching sessions that have emerged as an effective educational strategy that contributes significantly to the facilitation of knowledge acquisition about helicobacter pylori infection.

Regarding the studied students' total knowledge level regarding prevention of H. Pylori infection, the current findings declared that a minority of studied students had good knowledge, a quarter of them had average knowledge and two fifths of them had poor knowledge regarding prevention of H. Pylori infection pre nano teaching sessions implementation which enhanced to less than three quarters of them had good knowledge, more than one fifth of them had average knowledge and a minority of them had poor knowledge regarding prevention of H. Pylori infection post nano teaching sessions implementation.

These study findings were compatible with **Hafiz et al. (2023),** who implemented a quasi-experimental study among 108 university students at King Saud University to assess the effect of an educational program regarding helicobacter pylori and reported that the percentage of students that had good knowledge was 9.3%, fair was 28.7% and poor was 62% pre educational intervention that changed to 55.6%, 41.7%, and 2.8% respectively after the educational intervention.

From the researchers' perspective, this could be due to the positive influence of nano teaching sessions which provide concise, focused, and interactive learning experiences that allow students to grasp key concepts more efficiently regarding prevention of H. Pylori infection. By delivering information in short, structured segments, the sessions minimize cognitive overload and enhance their awareness. Additionally, the interactive nature of nano teaching encourages engagement and immediate feedback which contributes to deeper understanding.

As regards students' reported practices, the current research confirmed that all items of the studied students` subtotal reported practices regarding prevention of H. pylori infection showed highly statistically significant differences at pre and post nano teaching sessions implementation (p=<0.001). These study findings were symmetrical with **El-Maghawry et al. (2022),** who confirmed that, following program implementation, the mean scores of students' practices items were higher than they were prior to the program with p values were (P≤ 0.001), indicating that the variations in the total average scores of the students' practices` dimensions were statistically significant. From researchers' point of view, this might be due to the effect of nano teaching sessions that help in boosting studied students` practices regarding prevention of H. pylori infection and assist studied students in understanding the rationale behind each practice to prevent occurrence of infection.

Regarding to total reported practices level of the studied students regarding prevention of H. Pylori infection, the present study illustrated that approximately one fifth of them had satisfactory reported practices pre implementation of nano teaching sessions, and then this percentage improved to majority of them post implementation of nano teaching sessions. These study findings agreed with **Shehab et al. (2023),** who stated that, following program implementation, 62.4% of students had satisfactory practices, up from 19.1% prior to the program. There was statistical significance in these variations in practice levels (P ≤ 0.001).

From the researchers` opinion, this could be because of the effect of nano teaching sessions that simplify health massage and emphasize actional steps making it easier for students to translate knowledge into behavior and the sessions empowered students to adopt healthier practices and habits.

In relation to the studied students` attitude regarding prevention of H. pylori infection, the present findings revealed that; less than fifth of studied students agreed that regular screening for H. pylori is useful, minority of them agreed that special diet can enhance the symptoms of H. pylori infection, and fast food consumption might raise the risk of H. pylori infection. These findings disagreed with **Alaridah et al. (2024),** who carried out a cross-sectional survey in Jordan for assessing attitudes and practices regarding helicobacter pylori infection, (n= 767), and approved that 94.3% of the participants as young people agreed that medical screening is crucial for H. pylori, 78.1% of them believed that a particular diet might help to alleviate the symptoms of an H. pylori infection and 89.2% of them were convinced that fast food would cause the H. pylori infection.

Concerning the total attitude level of the studied students regarding prevention of H. Pylori infection, the current finding disclosed that less than one quarter of studied students had a positive attitude regarding prevention of H. Pylori infection pre nano teaching sessions implementation which raised to majority of them post nano teaching sessions implementation. These study findings contradicted with **Alajmi et al. (2023),** who assessed knowledge and attitude of 330 Saudi students regarding helicobacter pylori infection and its prevention and management and mentioned that >70% of students had an excellent attitude score regarding H. pylori infection, and its prevention. This might be due to the effect of nano teaching sessions that improved their knowledge regarding H. Pylori infection and its prevention so that this improvement in their knowledge and behaviors had a positive effect on their attitude regarding prevention of H. Pylori infection.

The present study confirmed that; there were highly positive statistically significant correlations between studied students` total knowledge, total reported practices and total attitude regarding prevention of H. Pylori infection pre and post nano teaching sessions implementation (P = 0.000). These study findings aligned with **Shehab et al. (2023),** who disclosed that there was a statistically significant correlation between studied students` knowledge about H. pylori infection and their reported practices.

In addition, this study finding harmonized with **Alaridah et al., (2024),** who approved the relation between attitude and practices among the study sample. From the researchers' point of view, this might be because of the implementation of the nano teaching sessions that increased the students' knowledge regarding H. Pylori infection and its prevention, which in turn positively influences their attitudes and motivates them to adopt healthier practices.

Conclusion

Nano training sessions were successful in raising university students' knowledge, enhancing their practices, and positively altering their attitude about preventing helicobacter pylori infections.

Recommendations

- Continuing nano teaching sessions regarding prevention of helicobacter pylori infection for university students to enhance their knowledge, practices and attitude.
- Dispensation of various educational booklets and brochures for university students involving measures concerning prevention of helicobacter pylori infection.
- Further studies are needed on sizable samples within university students for prevention of helicobacter pylori infection.

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جلسات النانو التعليمية لطلاب الجامعة فيما يتعلق بالوقاية من عدوى جرثومة المعدة

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تُعد جرثومة المعدة من أكثر أنواع العدوى المزمنة انتشارًا على مستوى العالم. وتعتبر جلسات النانو التعليمية وسيلة فعالة لتعزيز الوعي الصحي وتبني الممارسات الصحية للوقاية من جرثومة المعدة بين طلاب الجامعات. لذا هدفت هذه الدراسة إلى تقييم تأثير جلسات النانو التعليمية لطلاب الجامعة فيما يتعلق بالوقاية من عدوى جرثومة المعدة. وتم استخدام تصميم شبه تجريبي. وقد أجريت هذه الدراسة في ثلاث كليات غير طبية تابعة لجامعة بنها، تم اختيارهم عشوائيًا وهم كلية الزراعة وكلية الحقوق وكلية الآداب على عينة عشوائية بسيطة تضمنت ٣٧٩ طالب جامعى. وأظهرت النتائج بأنه كان لدى ٧,٩٪ من الطلاب معلومات جيدة عن جرثومة المعدة قبل تطبيق جلسات النانو التعليمية، والتي ارتفعت إلى ٧١,٢٪ بعد تطبيقها، كما كانت ممارسات ١٩,٣٪ منهم مرضية فيما يتعلق بالوقاية من جرثومة المعده قبل تطبيق جلسات النانو التعليمية، والتي ارتفعت إلى ٨٩,٧٪ بعد تطبيقها. كما كان ٢٣,٧٪ من الطلاب لديهم إتجاهات إيجابية تجاه الوقاية من جرثومة المعدة قبل تطبيق جلسات النانو التعليمية، والتي ارتفعت إلى ٨٧,٩٪ بعد تطبيقها. كما لخصت الدراسة الي أن جلسات النانو التعليمية لها تأثير إيجابي في تعزيز المعلومات، وتحسين الممارسات، وتعديل إتجاهات طلاب الجامعات فيما يتعلق بالوقاية من جرثومة المعدة. وأوصت الدراسة إلي إستمرار جلسات النانو التعليمية عن الوقاية من جرثومة المعدة لطلاب الجامعات لتعزيز معلوماتهم وممارساتهم وإتجاهاتهم.