

Gamified Intervention on Knowledge Regarding Lifestyle Modifications in Polycystic Ovarian Disease

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Abstract: *The pre-experimental study evaluated the effectiveness of a gamified educational intervention on knowledge regarding lifestyle modifications in polycystic ovarian disease among 60 pre university female students in Bengaluru. Knowledge was assessed using a structured questionnaire before and one week after a 60-minute gamified teaching session. Paired t-test analysis showed significant improvement in total knowledge scores from baseline to post-intervention. No significant association was observed between most demographic variables and baseline knowledge except paternal education and family income. The findings suggest gamified educational strategies can enhance adolescent awareness of lifestyle management in polycystic ovarian disease. Integrating such approaches into nursing education and community health programs may improve preventive health literacy.*

Keywords: Polycystic ovary disease, Gamification, Health education, Adolescent health, Lifestyle modification, Nursing education

1. Introduction

Defined by chronic ovulatory dysfunction and high levels of androgens, polycystic ovarian syndrome (PCOS) largely impacts females throughout their reproductive lifespan, typically between 14 and 44 years of age. The rising incidence of PCOS among Indian adolescents has become a significant public health issue, particularly since 50% to 60% of these individuals are also categorized as overweight. This comorbidity frequently triggers a self-reinforcing cycle of insulin resistance and hormonal disturbances¹.

Adolescence is a pivotal stage for the onset of PCOS symptoms like hirsutism, acne, and irregular menses, which can induce significant psychological stress². Traditional "chalk-and-talk" methods often fail to resonate with the modern "Gen Z" student. While closely intertwined through shared metabolic and hormonal characteristics, Polycystic Ovarian Disease (PCOD) and polycystic ovarian syndrome (PCOS) differ in severity. In many clinical contexts, PCOD is viewed as a less severe or initial stage of the broader syndrome known as PCOS. This study utilizes Gamification integrating game elements like points, badges, and leaderboards to transform information into an interactive experience, thereby fostering better practices in self-health management in relation to PCOD.

Objectives

- To evaluate the impact of a gamified educational strategy on the level of knowledge concerning lifestyle modifications for polycystic ovarian disease among pre-university pupils.
- To examine the relationship between the baseline knowledge scores of pre-university students and their specific demographic variables

Operational Definitions

- Knowledge of polycystic ovarian disease:** In this study, it represents the subjects' cognitive awareness of polycystic

ovarian disease, specifically as determined by scores obtained on a structured questionnaire.

- Gamified intervention:** In this study, it relates to a scheduled method of imparting information on PCOD. The content covered: anatomy of the reproductive system, meaning, types, pathophysiology, causes, risk factors, signs, symptoms, screening, treatment modalities, complications of PCOD, and the responsibilities of health personnel in treating PCOD patients. The intervention used riddles, case scenarios, role play, a quiz, and audio-visual aids for 60 minutes, incorporating game components like leaderboards, badges, point systems, and stars
- Pre-University students:** In this study it denotes female students aged 15 to 17 years who are currently enrolled in the designated educational facility.

2. Materials and Methods

Methodology

Research Design: The researcher adopted a pre-experimental design involving a single group with both pre-test and post-test evaluations to determine the impact of the educational intervention.

Setting and Population: The research was carried out within the premises of a designated pre-university college in Bengaluru during the year 2025. The target population included female students aged 15–17 years.

Validation: The tools for the study were validated by 12 experts comprising two senior consultants of Obstetrics and Gynecology, nine Obstetrics and Gynaecological Nursing faculty, and one Statistician. Their recommendations and valuable suggestions were considered, and the tools were reframed in consultation with experts.

Reliability: The reliability of the structured knowledge questionnaire was computed by the split-half method using the Karl Pearson’s correlation coefficient formula. The reliability of the tool was found to be $r = 0.98$, which is greater than 0.7, hence the tool was found to be statistically reliable.

Sampling: The sample size for the study was determined using power analysis for a paired t-test with a significance level of 0.05 and power of 0.80. Assuming a moderate effect size ($d = 0.5$), the minimum required sample size was 34. However, to enhance the power of the study, improve reliability, and account for possible attrition, the sample size was increased to 60 participants.

Data Collection: Initial knowledge levels were measured via a pre-test using a structured assessment tool before the gamified teaching session began. Gamified intervention included imparting information regarding the anatomy of the reproductive system, meaning, types of PCOD, pathophysiology, causes and risk factors of Polycystic Ovarian Disease (PCOD), signs and symptoms of Polycystic Ovarian Disease (PCOD), screening, treatment modalities of Polycystic Ovarian Disease (PCOD), complications of PCOD and responsibility of health personnel on treating patients with PCOD using riddles, case scenarios, role play, quizzes and appropriate audio-visual aids for 60 minutes, incorporating game components like leaderboards, badges, point systems and stars. After a one-week interval, the participants' knowledge was reassessed through a post-test utilizing the structured knowledge questionnaire.

3. Results and Discussion

Section I: Sample characteristics

Table 1: Sample Characteristics of Pre-University Students, $n=60$

Variable	Category	Frequency (f)	Percentage (%)
Age (years)	15	3	5%
	16	21	35%
	17	36	60%
Stream of Education	Commerce	60	100%
Religion	Hindu	21	35%
	Christian	26	22%
	Muslim	13	43%
Mother’s Education	No formal education	18	30%
	Primary	6	10%
	High school	28	46%
	PUC	6	10%
	Graduation	1	2%
	Diploma	1	2%
Father’s Education	No formal education	16	27%
	Primary	10	17%
	High school	28	46%
	PUC	5	9%
	Graduate	1	1%
Type of Family	Nuclear	53	88%
	Joint	6	10%

	Extended	1	2%
Mother’s Occupation	Homemaker	49	82%
	Self-employed	11	18%
Father’s Occupation	Government employee	1	1%
	Self-employed	48	80%
Family Income (₹/month)	≤20,000	30	50%
	20,001–30,000	24	40%
	30,001–40,000	5	9%
	>40,000	1	1%
History of PCOD	Yes	0	0%
	No	60	100%
Family History of PCOD	Yes	2	4%
	No	58	96%
Previous Knowledge of PCOD	Yes	5	8%
	No	55	92%
Dietary Habits	Vegetarian	3	5%
	Non-vegetarian	57	95%
Height (cm)	140–150	42	70%
	151–160	13	22%
	161–170	5	8%
Weight (kg)	30–40	21	35%
	41–50	30	50%
	51–60	8	13%
	61–70	1	2%
BMI (kg/m ²)	15–20	38	63%
	21–25	19	32%
	26–30	3	5%
Menstrual History	Regular	45	75%
	Irregular	3	5%
	Painful	12	20%
Sleep Pattern	<6 hours	1	2%
	6–8 hours	44	73%
	>8 hours	15	25%
Medication History	Yes	4	6%
	No	56	94%

These observations in **Table 1** align with research previously carried out among the pre-university population in Bengaluru, which identified a comparable demographic trend, where most were aged 16 years, parents had completed high school, families were primarily nuclear, and a majority of mothers were homemakers. The study also noted limited prior awareness of health-related issues, reflecting comparable sociodemographic and knowledge patterns³.

Section II: Pre- and Post-Intervention Knowledge Assessment: Lifestyle Modifications in PCOD

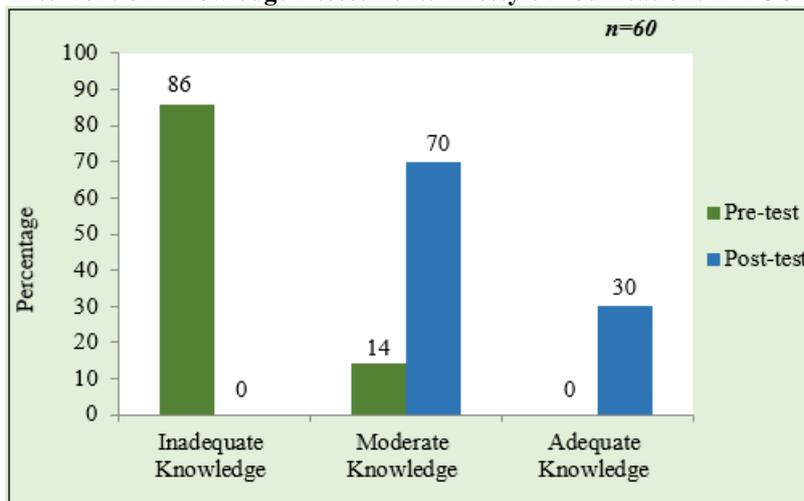


Figure 1: Outcomes of Gamified Educational Intervention on PCOD Knowledge Scores.

The findings (Fig 1) indicate a substantial enhancement in students' understanding of lifestyle modifications for PCOD. While initial tests showed that 14% of the cohort had moderate

knowledge, the post-test results revealed a comprehensive improvement, with all 60 students achieving either moderate or adequate knowledge levels.

Table 2: Domain-Wise Comparison of Knowledge Improvement: Mean and Paired t-test Data for PCOD Intervention

Aspect	Knowledge scores		Maximum Score	Mean	Mean Difference	SD	Paired t-Value	p-value
	Pre-test	Post-test						
Meaning, Anatomy of the ovary and Epidemiology of PCOD	Pre-test		6	1.616	2.584	0.099	14.114	0.0001*
	Post-test			4.200				
Types and pathophysiology of PCOD	Pre-test		10	2.466	3.634	0.091	14.318	0.0001*
	Post-test			6.100				
Causes, Risk factors and signs and symptoms	Pre-test		5	1.400	1.883	0.095	9.331	0.0001*
	Post-test			3.283				
Diagnostic measures and treatment modalities of PCOD	Pre-test		5	1.083	1.767	0.061	7.997	0.0001*
	Post-test			2.85				
Complications and responsibilities of healthcare personnel on PCOD patients	Pre-test		4	0.916	1.424	0.078	9.491	0.0001*
	Post-test			2.34				

Note: The asterisk (*) denotes a statistically significant variation at a 95% confidence interval, where the calculated value exceeds the critical table value ($t_{59} = 1.671$)

Aspect-wise knowledge scores depicted in Table 2 showed marked improvement following the gamified intervention. The highest enhancement (43.06%) was observed in the area related to meaning, anatomy of the ovary, and epidemiology

of PCOD. The computed paired t-values for all five aspects exceeded their respective table values, indicating a statistically significant gain in knowledge across all domains.

Table 3: Pre- and Post-Intervention Comparison of Total Knowledge Scores Among Pre-University Students. n=60

Knowledge scores	Max-Score	Mean	Mean Difference	SD	Paired t-Value	df	p-value
Pre-test	30	7.483	11.317	2.671	21.410	59	0.0001*
Post-test		18.8		2.563			

Note: The asterisk (*) indicates a statistically significant variation at a 95% confidence interval, where the calculated result exceeds the critical table value of 1.671 ($t_{59} = 1.671$).

As illustrated by the cumulative results in Table 3, the baseline knowledge scores recorded a mean of 7.483 ± 2.671 . Following the intervention, these scores rose to an average of 18.8 ± 2.563 , indicating a substantial gain of 11.318. The analysis yielded a paired 't' value of 21.4104, which significantly exceeds the critical threshold of 1.671 ($df=59$, $p<0.05$). Consequently, the research hypothesis (H_1) is supported, confirming a statistically significant improvement in student awareness regarding PCOD lifestyle management.

after educational interventions. One such study showed the overall mean knowledge score increasing from 7.48 ± 2.67 to 18.8 ± 2.56 , with a paired t value of 21.41 ($p < 0.05$), confirming the effectiveness of the intervention. Similarly, a comparative study in Hubballi found video-assisted teaching to be significantly more effective than lecture methods ($F = 73.12 > 4.03$) in improving knowledge about PCOD management among adolescent girls⁴.

The outcomes are similar to earlier findings reporting significant improvement in students' knowledge on PCOS

Section III: Association of knowledge scores regarding Gamified intervention among pre university students with Participant Demographic Profiles.

Statistical analysis revealed that for the majority of the demographic variables, the calculated Chi-square values did not reach the critical threshold. However, paternal education and monthly family income emerged as significant factors, showing a notable association with baseline knowledge levels ($p < 0.05$). Consequently, the research hypothesis (H_2) was partially supported, confirming that these specific socio-economic factors influence a student's initial understanding of PCOD management, while no such relationship was found for the remaining characteristics.

The results of this investigation align with prior research involving Bengaluru-based pre-university students, which also identified a notable correlation between awareness levels and socio-demographic factors. Specifically, that study corroborated the influence of household income, family structure, and parental educational attainment on a student's baseline understanding of PCOD, reinforcing the idea that socio-economic status is a key determinant of health literacy⁵.

The conclusions drawn from the study are:

- Before the intervention, the majority of pre-university students demonstrated inadequate knowledge regarding lifestyle modification for PCOS, highlighting a significant need for structured educational strategies.
- The gamified teaching approach significantly improved knowledge across all aspects, with the highest enhancement observed in the meaning, anatomy of ovary, and epidemiology of PCOD.
- The post-test results showed a marked shift, with none of the students remaining in the inadequate category, confirming the intervention's effectiveness in enhancing awareness.
- The paternal educational attainment and household income were significant determinants of initial awareness. This suggests that a student's socio-economic environment notably influences their baseline understanding of PCOD, while the remaining demographic factors appeared to have no measurable impact on pre-intervention knowledge.

4. Nursing Implication

The results of this investigation offer valuable insights that can be integrated into several professional domains, including clinical nursing practice, academic curriculum, institutional administration, and future scholarly research. By bridging the knowledge gap in adolescent health, these findings provide a foundation for evidence-based interventions in diverse healthcare settings.

Nursing Service:

- Nurses should incorporate gamified learning techniques into routine health education for adolescents to make PCOD awareness and lifestyle modification advice more engaging and memorable.
- Utilizing case-based scenarios, interactive simulations, and gamified learning platforms fosters the growth of essential clinical judgment and analytical skills necessary for managing PCOD.
- These active learning strategies encourage students to navigate complex health decisions and refine their diagnostic reasoning in a risk-free environment.

Nursing Administration:

- Nursing administrators play a key role in planning and organizing gamified learning sessions, workshops, and awareness programs on PCOD and lifestyle modifications for adolescents and young adults in both academic and community settings.
- Integrating gamified teaching methods into institutional health education plans help enhance engagement and retention of information on lifestyle modifications for PCOD.
- Collaboration with educators, dietitians, and gynaecologists enables the development of digital and print resource materials that support gamified modules and can be used by nursing staff in outreach activities.
- Ensuring easy access to updated guidelines, procedure manuals, and reference materials on PCOD management with emphasis on lifestyle interventions supports nurses involved in adolescent health programs.

Nursing Research:

- The findings of this study lay a strong foundation for future investigations on the use of game-based teaching strategies in health education.
- It has the potential to inspire emerging researchers to examine health-related concerns among pre-university students.
- Conducting further evidence-based studies can help improve the quality of health services and raise awareness about PCOD, thereby supporting its prevention.
- Outcomes from this research can be translated into practical resources such as guide sheets, booklets, and leaflets to enhance nurses' and students' knowledge and practice.
- This study can guide the design and methodology of similar research in the future, serving as a reference point.

Community Health Nursing:

- Outreach activities, such as health camps and awareness drives, can include interactive games, quizzes, and visual aids to make learning about PCOD prevention more engaging for young audiences.
- Regular follow-up visits and reinforcement sessions can help track behaviour changes among adolescents and sustain the benefits of gamified interventions.

5. Recommendations

Based on the outcomes of this research, the following pathways for future investigation are proposed:

- To enhance the external validity of these results, future research should involve larger, more diverse cohorts across multiple geographic locations.
- Parallel investigations could be initiated within nursing institutions to gauge the proficiency levels of undergraduate students regarding PCOD management.
- Alternative educational modalities, such as structured instructional manuals, evidence-based guidelines, or multimedia-assisted learning packages, should be compared against gamified interventions.
- Implementing a true experimental design with a control group would provide a more robust evaluation of the intervention's efficacy.

- A time series designed study can be done using post-test after one month, six months, and one year to measure the retention of knowledge regarding PCOD.
- Efficacy of different teaching methods can be tested on the same topic.
- A similar study can be replicated among various groups of subjects with different educational strategies.

6. Limitations

Several constraints must be considered when interpreting the results of this research. First, the use of a relatively small sample (N=60) and a non-probability convenience sampling technique restricts the broader applicability of the data. Furthermore, the assessment was confined specifically to the knowledge domain of PCOD lifestyle management among students at a single institution in Bengaluru. Finally, because the participant pool was drawn exclusively from the commerce stream, the findings may not fully reflect the awareness levels of students in other academic disciplines, such as science or arts. The gamified intervention did not only centre around lifestyle modification. It included all possible relevant topics on PCOD.

7. Conclusion

The gamified educational intervention significantly improved knowledge regarding lifestyle modification in polycystic ovarian disease among pre university students. However, findings are limited by single group design, small sample size, and institutional sampling. Future controlled studies with longitudinal follow up are required to establish sustained behavioural impact. Gamified teaching approaches may be considered as complementary strategies in adolescent reproductive health education programs.

Acknowledgement

The authors acknowledge Ms. Sunitha, Associate Professor and Ms. Grace Rimai, Lecturer from the Department of Obstetrics and Gynaecological Nursing. Their encouragement and insights were greatly appreciated

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