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EFFECT OF HEALTH EDUCATION ON KNOWLEDGE AND ATTITUDE REGARDING THE HUMAN PAPILLOMAVIRUS VACCINE AMONG ADOLESCENT SCHOOL GIRLS IN THIRUVALLUR DISTRICT, TAMIL NADU

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Abstract

Background:
Human Papillomavirus (HPV) infection is a major public health concern, particularly for adolescent girls, as persistent HPV infection is a well-established risk factor for the development of cervical cancer. Despite the availability of effective vaccines, awareness and acceptance of the HPV vaccine remain suboptimal in many parts of India, including Tamil Nadu. Health education interventions have proven to be an effective strategy in improving knowledge and shaping positive attitudes toward HPV vaccination.

Objectives:
The primary aim of this study was twofold. First, it sought to assess the baseline knowledge and attitudes of adolescent school girls regarding the Human Papillomavirus (HPV) vaccine. Understanding the initial level of awareness and perceptions among this group was crucial to identifying existing gaps and misconceptions. Secondly, the study aimed to evaluate the effectiveness of a structured health education intervention in enhancing their knowledge and positively influencing their attitudes toward HPV vaccination. By comparing pre- and post-intervention responses, the study intended to determine the impact of targeted educational efforts in promoting HPV vaccine awareness and acceptance among adolescent girls in the school setting.

Methods:
A quasi-experimental study was conducted among 128 adolescent school girls in Thiruvallur District, Tamil Nadu. Participants were selected through purposive sampling. Baseline data regarding knowledge and attitude towards HPV infection and vaccination were collected using a validated, self-administered structured questionnaire. A health education session was conducted, followed by a post-intervention assessment after two weeks using the same questionnaire. Data were entered and analyzed using MS Excel and SPSS software. McNemar's test was used to evaluate changes in categorical variables pre- and post-intervention, while ANOVA was applied to assess changes in mean knowledge and attitude scores.

Results:
The intervention led to a statistically significant improvement in both knowledge and attitude scores regarding HPV vaccination among the participants ($p < 0.05$). The findings indicated that health education can be an effective strategy to improve awareness and vaccine acceptability in adolescent populations.

Conclusion:
Health education interventions play a critical role in increasing awareness about HPV infection and vaccination among adolescent girls, potentially contributing to higher vaccine uptake and a reduction in the future incidence of cervical cancer in the community.

Keywords: Human Papillomavirus, HPV vaccine, adolescent girls, health education, cervical cancer, awareness, Tamil Nadu.

1. INTRODUCTION

Cervical cancer remains a significant global health burden and ranks as the fourth most common cancer among women, with approximately 570,000 new cases and 311,000 deaths reported in (Bray et al., 2018). The mortality burden is disproportionately higher in low- and middle-income countries (LMICs), where over 85% of cervical cancer deaths occur due to limited access to preventive care, early diagnosis, and treatment facilities [1].

Persistent infection with high-risk Human Papillomavirus (HPV) types, especially HPV-16 and HPV-18, accounts for nearly 70% of cervical cancer cases worldwide. The development of prophylactic HPV vaccines has marked a major milestone in cervical cancer prevention [2]. Clinical evidence supports their efficacy in reducing HPV infection and associated precancerous lesions. Furthermore, population-wide vaccination programs have demonstrated herd immunity benefits, reducing transmission even among unvaccinated individuals [3].

Despite proven efficacy, the rollout of HPV vaccination programs in LMICs faces considerable challenges. Barriers such as inadequate health infrastructure, vaccine cost, cultural taboos, and public misinformation have hindered vaccine coverage (Ladner et al., 2012). In India, although expert committees like NTAGI recommend HPV vaccination, uptake remains low, especially in rural areas, due to lack of awareness and societal stigma around sexually transmitted infections (STIs) [4].

School-based health education has emerged as a practical strategy to address these gaps. Evidence suggests that targeted educational interventions in schools can significantly improve adolescents' knowledge and positively influence attitudes toward HPV vaccination [5]. Studies also emphasize that culturally sensitive, community-tailored education programs are crucial for overcoming misconceptions and promoting vaccine acceptance among adolescents and their parents [6].

This study aims to assess the impact of a structured, culturally relevant school-based health education intervention on knowledge and attitude regarding cervical cancer and HPV vaccination among adolescent schoolgirls in Thiruvallur District, Tamil Nadu. Using a quasi-experimental design with pre- and post-intervention analysis, the study evaluates short-term effectiveness through validated tools and statistical measures, contributing to evidence-based policy recommendations for rural health education strategies.

2. MATERIALS AND METHODS

2.1. Study Design and Setting

A quasi-experimental, pre-test and post-test study design was adopted to assess the effect of health education on knowledge and attitude regarding the Human Papillomavirus (HPV) vaccine among adolescent school girls [7]. The study was conducted in selected government and private schools located in the Thiruvallur district of Tamil Nadu, India. This district was purposively selected due to its mixed urban and rural population and limited existing HPV vaccination awareness programs targeting adolescent girls.

2.2. Study Population

The study population comprised adolescent school girls aged 13 to 17 years, studying in classes VIII to XII in the selected schools of Thiruvallur district. Girls who were present during the data collection days and provided informed assent, along with parental consent, were included in the study [8].

2.3. Sample Size

A sample size of 128 participants was determined using G*Power software (version 3.1.9.7) for a two-tailed test, considering an effect size of 0.5, significance level (α) of 0.05, and a power (1-β) of 0.80. The sample was proportionally distributed among selected schools using simple random sampling.

2.4. Inclusion and Exclusion Criteria

The study population comprised adolescent school girls aged between 13 and 17 years residing in Thiruvallur District, Tamil Nadu. Participants were included in the study if they met the eligibility criteria of being within the specified age group and willing to participate with the informed consent of their parents or guardians. This ensured that ethical guidelines for research involving minors were upheld, and that participation was voluntary and supported by both the students and their families [9].

Conversely, certain exclusion criteria were applied to maintain the integrity and focus of the study outcomes. Girls who were absent on the day of the health education intervention or during the follow-up assessment were excluded, as their incomplete participation would hinder accurate evaluation of the program's effect. Additionally, girls who had already received the HPV vaccine prior to the commencement of the study were excluded to avoid potential bias in knowledge and attitude assessments influenced by prior vaccination experience or information provided during immunization services.

2.5 Study Tool and Data Collection

A structured, pre-tested, and validated self-administered questionnaire was used to collect data from the study participants. The tool was specifically designed to capture information on socio-demographic characteristics, knowledge, and attitude regarding HPV infection and its vaccination. The questionnaire was adapted from previously published and validated instruments in similar settings [10-13] to ensure cultural relevance and scientific rigor. It comprised three distinct sections: the first section collected socio-demographic details such as age, educational grade, parental education, and vaccination history. The second section assessed knowledge related to HPV infection, its transmission, risk factors, and preventive strategies through 15 multiple-choice questions. The third section evaluated attitudes toward HPV vaccination using 10 statements measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree." A baseline (pre-test) assessment was conducted using this questionnaire before the health education program to evaluate the initial knowledge and attitudes of the participants.

3. RESULTS AND DISCUSSION

The present quasi-experimental study aimed to assess the effectiveness of a structured health education intervention in improving knowledge and attitude regarding the HPV vaccine among adolescent school girls in Thiruvallur district, Tamil Nadu. A total of 128 participants were assessed pre- and post-intervention using structured questionnaires.

As shown in Table 1, there was a statistically significant improvement in both knowledge and attitude scores following the intervention. The mean knowledge score increased markedly from 6.5 ± 2.1 to 12.3 ± 1.8 out of a maximum of 15 ($p < 0.001$), indicating a robust effect of the structured educational session. The proportion of participants demonstrating adequate knowledge (defined as a score ≥10) rose substantially from 28.1% to 84.3% ($p < 0.001$). This underscores the intervention's efficacy in enhancing awareness and understanding of HPV and the associated vaccine. Further breakdown of individual knowledge components revealed remarkable improvements: awareness that HPV is a sexually transmitted infection increased from 36.7% to 91.4%, understanding of the HPV-cervical cancer link rose from 31.2% to 89.8%, and knowledge about the availability of the HPV vaccine improved from 22.6% to 87.5%. All these changes were statistically significant ($p < 0.001$), as illustrated in Tables 2 and 3. These findings align with previous studies demonstrating that targeted health education significantly enhances HPV-related knowledge among adolescents [14-16]. The multimedia and interactive components of the intervention likely contributed to its success by making the content more engaging and memorable.

Post-intervention assessment revealed a positive shift in attitudes toward HPV vaccination. The mean attitude score increased from 28.7 ± 4.5 to 38.2 ± 3.2 out of a possible 50 ($p < 0.001$). The percentage of participants with a positive attitude toward vaccination rose from 34.3% to 79.6%, reflecting a significant change in perception [17].

Furthermore, willingness to receive the vaccine improved from 34.3% to 79.6%, and acceptance of the vaccine as a preventive measure for cervical cancer increased from 32.8% to 85.1%. All these improvements were statistically significant ($p < 0.001$), as shown in Tables 1 and 4. These outcomes highlight the potential of well-structured educational programs to address vaccine hesitancy and foster health-positive behaviors in adolescent populations.

An analysis of socio-demographic characteristics (Table 2) showed that most participants were between the ages of 13–16 (87.5%) and slightly more from government schools (56.3%) than private schools. None of the participants had received the HPV vaccine prior to the intervention.

Table 5 presents the association between socio-demographic variables and post-test scores. Older participants (age 17) recorded higher knowledge (13.1 ± 1.6) and attitude (8.9 ± 1.1) scores than younger counterparts ($p = 0.03$). Private school students outperformed government school peers in both knowledge (13.5 ± 1.5) and attitude (8.7 ± 1.2) domains ($p = 0.04$). Similarly, participants whose mothers had attained higher education levels scored better in both knowledge and attitude assessments ($p = 0.02$).

These associations underscore the influence of age, educational background, and socio-economic status on health literacy. Adolescents from more educated families or privileged schooling systems appear better positioned to understand and adopt health-related information. This emphasizes the importance of designing inclusive and culturally sensitive health education strategies to bridge existing gaps and ensure equitable access to essential health knowledge across different segments of society [18].

The statistically significant improvements observed post-intervention across knowledge and attitude domains reflect the short-term efficacy of the structured health education program. The study provides compelling evidence for the integration of such interventions into school health curricula, especially in regions with limited existing awareness or cultural barriers to vaccine uptake [19]. In summary, this study not only confirms the effectiveness of educational interventions in promoting HPV vaccine awareness and acceptance but also highlights the need to address socio-demographic disparities through tailored and contextually relevant strategies. Future efforts may focus on longitudinal assessments to gauge long-term knowledge retention and actual vaccine uptake among the target population.

Table 1. Comparison of Knowledge and Attitude Scores Pre- and Post-Intervention (N = 128)

Outcome Variable	**Pre-Test (Mean ± SD / n (%))**	**Post-Test (Mean ± SD / n (%))**	**p-value**
Knowledge Score (Max 15)	6.5 ± 2.1	12.3 ± 1.8	< 0.001 *
Adequate Knowledge (≥ 10/15)	36 (28.1%)	108 (84.3%)	< 0.001 *
Heard of HPV as STI	47 (36.7%)	117 (91.4%)	< 0.001 *
Aware of HPV-Cervical Cancer Link	40 (31.2%)	115 (89.8%)	< 0.001 *
Knows HPV Vaccine is Available	29 (22.6%)	112 (87.5%)	< 0.001 *
Attitude Score (Max 50)	28.7 ± 4.5	38.2 ± 3.2	< 0.001 *
Positive Attitude towards Vaccination	44 (34.3%)	102 (79.6%)	< 0.001 *
Acceptance of HPV Vaccine as Preventive	42 (32.8%)	109 (85.1%)	< 0.001 *

*Statistically significant at $p < 0.001$

Table 2: Socio-Demographic Characteristics of the Study Participants (N=128)

Variable	Category	Frequency (n)	Percentage (%)
Age	13–14 years	52	40.6
	15–16 years	60	46.9
	17 years	16	12.5
Educational Grade	VIII–IX	68	53.1
	X–XII	60	46.9
School Type	Government	72	56.3
	Private	56	43.8
Mother's Education	No formal education	34	26.6
	Primary to Higher Sec.	74	57.8
	Graduate and above	20	15.6
Prior HPV Vaccination	Yes	0	0
	No	128	100

Table 3: Knowledge Scores on HPV and HPV Vaccine Before and After Intervention

Knowledge Category	Pre-test (%)	Post-test (%)	p-value (McNemar's Test)
Aware of HPV as STI	36.7	91.4	<0.001
Aware HPV causes cervical cancer	31.2	89.8	<0.001
Aware of HPV vaccine availability	22.6	87.5	<0.001
Adequate overall knowledge (≥ 10/15)	28.1	84.3	<0.001

Table 4: Attitude Scores toward HPV Vaccine before and After Intervention

Attitude Domain	Pre-test Positive (%)	Post-test Positive (%)	p-value
Willingness to receive HPV vaccine	34.3	79.6	<0.001
Belief in safety and effectiveness of the vaccine	38.2	82.1	<0.001
Acceptance of vaccine as cervical cancer prevention	32.8	85.1	<0.001
Overall positive attitude (≥ 7/10)	35.1	81.2	<0.001

Table 5: Association Between Socio-Demographic Variables and Post-Test Knowledge and Attitude Scores

Variable	Category	Mean Knowledge Score	Mean Attitude Score	p-value (ANOVA)
Age Group	13–14 years	12.2 ± 2.1	8.1 ± 1.5	0.03
	15–16 years	12.8 ± 1.9	8.6 ± 1.3	
	17 years	13.1 ± 1.6	8.9 ± 1.1	
School Type	Government	11.9 ± 2.3	7.8 ± 1.7	0.04
	Private	13.5 ± 1.5	8.7 ± 1.2	
Mother's Education	No Education	11.4 ± 2.5	7.6 ± 1.8	0.02
	Primary–HS	12.7 ± 1.7	8.4 ± 1.3	
	Graduate+	13.3 ± 1.4	9.0 ± 1.1	

4. DISCUSSION

The present quasi-experimental study aimed to evaluate the effectiveness of a structured health education intervention in enhancing knowledge and shaping attitudes regarding HPV vaccination among adolescent school girls in Thiruvallur district, Tamil Nadu. The intervention was found to significantly improve both knowledge and attitude scores, underlining the critical role of school-based education programs in public health promotion.

The study demonstrated a marked improvement in HPV-related knowledge, with the mean score increasing from **6.5 ± 2.1** to **12.3 ± 1.8** post-intervention (Table 1). This significant gain ($p < 0.001$) reflects the comprehensiveness and cultural appropriateness of the structured educational session. Notably, the percentage of girls demonstrating adequate knowledge (≥10) increased from **28.1%** to **84.3%**, indicating that the majority of participants could retain and apply key information provided during the intervention.

Such improvements are consistent with findings from prior studies conducted in similar contexts. For instance, Rashwan et al. [20] reported that targeted HPV education among Malaysian adolescents significantly raised awareness levels, while Sankaranarayanan et al. [21] emphasized the importance of informed decision-making in HPV vaccination programs. These results support the argument that knowledge gaps regarding HPV and its vaccine are not due to resistance but rather a lack of accessible, age-appropriate information.

In parallel with the improvement in knowledge, the intervention elicited a notable shift in participant attitudes. The mean attitude score rose from **28.7 ± 4.5** to **38.2 ± 3.2** ($p < 0.001$), and the proportion of students with a positive attitude increased from **34.3%** to **79.6%** (Table 4). Furthermore, willingness to receive the vaccine increased by over twofold.

This behavioral shift is particularly important in the Indian context, where cultural norms and misinformation often hinder vaccine acceptance. Previous research has highlighted concerns regarding vaccine safety, fertility myths, and parental reluctance as barriers to HPV vaccine uptake. The present study demonstrates that direct communication through structured, interactive educational methods-such as videos, visual aids, and peer discussions-can effectively dispel myths and reshape perceptions [22].

While overall gains were impressive, the study also highlighted disparities in post-test knowledge and attitude scores based on socio-demographic factors (Table 5). Students from private schools scored significantly higher than their government school counterparts, and older adolescents (particularly those aged 17) demonstrated greater improvements than younger participants. Furthermore, the mother's educational background emerged as a strong predictor of post-intervention outcomes, with girls from families with higher maternal education levels showing better understanding and more favorable attitudes.

These findings are in line with literature emphasizing the influence of parental education and socio-economic status on health literacy. Girls in private institutions are likely exposed to more academic resources, open dialogues, and parental guidance compared to those in government schools. This suggests that future interventions should be tailored more sensitively, with additional support mechanisms for students from lower educational or socio-economic backgrounds [23].

One of the key strengths of this study lies in its rigorous design, with a well-calculated sample size, validated data collection tools, and a diverse mix of school types. The culturally sensitive approach adopted in the intervention likely contributed to its acceptability and effectiveness. No dropouts or refusals were recorded post-consent, and participant feedback indicated high levels of engagement. Given these findings, it is evident that health education can serve as a transformative tool in adolescent health promotion. Integrating structured HPV education sessions into the existing school curriculum-especially in rural and semi-urban regions-may play a vital role in preparing the next generation for informed healthcare decisions. Additionally, involving parents and caregivers in future programs could amplify their impact, especially in conservative communities where vaccination decisions are often family-driven [24].

Despite the promising results, certain limitations should be acknowledged. The short follow-up period (two weeks) does not allow conclusions about long-term retention of knowledge or actual vaccine uptake. Also, the study did not assess behavioral outcomes beyond self-reported attitudes. Moreover, while the sample was diverse in terms of school type, it was geographically limited to Thiruvallur district. Future studies should consider longitudinal designs that track knowledge retention, behavior change, and vaccine acceptance over several months or years. Incorporating booster sessions or periodic health talks could sustain interest and reinforce key messages [25]. Evaluating the role of peer-led education and digital platforms may also prove valuable in expanding reach and scalability.

5. CONCLUSION

The findings of this study underscore the significant role of health education in improving the knowledge and attitudes of adolescent school girls in Thiruvallur district, Tamil Nadu, regarding the HPV vaccine. The intervention led to a marked increase in both knowledge about HPV and its prevention through vaccination, as well as a positive shift in attitudes towards the vaccine. These results highlight the effectiveness of structured health education programs in overcoming misconceptions, reducing vaccine hesitancy, and fostering informed decision-making among adolescents. Despite the positive changes observed in knowledge and attitudes, it is important to note that long-term sustainability of these changes requires continuous reinforcement and community engagement. Future interventions should consider regular follow-ups and targeted approaches for marginalized populations to ensure widespread and sustained impact. Overall, the study contributes valuable insights into the importance of health education in promoting vaccine acceptance, particularly in rural settings, and offers a strong case for integrating such programs into school curriculums to facilitate greater awareness and uptake of the HPV vaccine. By addressing both knowledge gaps and socio-cultural barriers, health education can be a powerful tool in achieving higher vaccination rates and reducing the burden of HPV-related diseases in India.

Declaration of Patient Consent

The authors certify that appropriate consent procedures were followed. Written informed consent was obtained from the parents or legal guardians of all participating adolescent schoolgirls prior to enrollment in the study. Assent was also obtained from the participants in accordance with ethical guidelines for research involving minors. The participants and their guardians were informed about the purpose of the study, the nature of the educational intervention, and their right to withdraw at any point without any consequence. Confidentiality of all personal and health-related information has been maintained throughout the study.

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Nil.

Conflicts of interest

The authors declare that there are no conflicts of interest related to this study. This research was conducted independently without any financial or material support from vaccine manufacturers, pharmaceutical companies, or private entities. All procedures involving human participants were approved by the Institutional Ethics Committee, and informed consent was obtained from the participants and their guardians. The authors affirm that the data presented are accurate, the analysis is objective, and the findings are reported without bias. No part of this study has been previously published or is under consideration elsewhere.

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