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School of Computer Science & Engineering

IILM University Greater Noida

Presents

1st National Conference

on

Technologies for Sustainable Development Goals 2025 (TECH4SDG-2025)

3rd March 2025

Technically Co-Sponsored by IEEE UP SECTION (INDIA)

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On behalf of the *International Journal of Research in Modern Engineering & Emerging Technology (IJRMEET)*, I extend my heartfelt gratitude to all the authors and research scholars for choosing our platform to publish their valuable research contributions.

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Our journal aims not only to disseminate high-quality research globally but also to highlight critical engineering problems and their practical resolutions. I encourage researchers, academicians, faculty members, and industry professionals to continue contributing to IJRMEET and to inspire their peers and students to join us in this academic pursuit.

We sincerely thank our respected Editors, Reviewers, Technical Advisors, Authors, Web Developers, Subscribers, Supporters, and the extended academic community whose efforts and encouragement make each issue of IJRMEET a successful endeavor.

With warm regards,

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डॉ. मोहम्मद रिहान / Dr. Mohammad Rihan
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MESSAGE

I am happy to know about Tech4SDG-2025, a distinguished national conference that aims to explore and highlight the transformative power of technology in achieving the United Nations Sustainable Development Goals (SDGs). This event serves as a critical platform for fostering collaboration among experts, innovators, and leaders who are dedicated to creating solutions that drive sustainable change.

As we face global challenges ranging from environmental sustainability to social equity, it is clear that technological advancements will play a pivotal role in shaping our collective future. Tech4SDG-2025 presents a unique opportunity to examine how cutting-edge technologies can contribute to solving the most pressing issues of our time, from climate change to poverty alleviation.

I look forward to the engaging discussions and innovative ideas that will emerge from this conference. I believe that by working together, we can harness the potential of technology to drive meaningful progress towards a sustainable and equitable world.

I extend my best wishes to all the participants and organizers of Tech4SDG-2025.

27.02.25

(Dr. Mohammad Rihan)

Dated: 27th February, 2025
Place: Gurugram

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4. Leave 1 inch margin for each – top, bottom, left and right.
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Awareness of Human Papillomavirus Vaccination Among Adolescent Girls and Their Parents

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Abstract : Human papillomavirus vaccination is an important component of cervical cancer prevention, but informed participation requires adolescents and parents to understand its purpose, appropriate timing, safety, and limitations. This assessment examines HPV vaccination knowledge among adolescent girls and their parents, compares awareness within matched pairs, and explores selected parental correlates. A cross-sectional framework was developed using a simulated sample of 200 adolescent–parent pairs, comprising 400 respondents. Girls were aged 10–19 years, and one parent was included for each girl. A ten-item questionnaire assessed HPV-related disease, preventive vaccination, timing, schedules, safety, and continued screening. Correct responses received one point. Scores were categorized as lower, intermediate, or higher knowledge. Descriptive statistics, Wilson confidence intervals, exact McNemar testing, and Pearson chi-square tests were calculated. Mean scores were 3.69±2.23 among girls and 4.75±2.37 among parents. Higher knowledge occurred in 12.0% of girls and 26.0% of parents. Within pairs, 36 parents had higher knowledge when their daughters did not, whereas eight daughters had higher knowledge when their parents did not; this difference was significant ($p<0.001$). Parental higher knowledge was associated with secondary education or above and previous professional information exposure. The analysis demonstrates the value of assessing both family members while distinguishing knowledge from vaccine acceptance and verified vaccination. Actual observations and locally validated instruments are required to establish population-specific findings.

Keywords: Human papillomavirus; HPV vaccination; adolescent girls; parents; awareness; cervical cancer prevention.

Introduction

Human papillomavirus comprises a group of viruses, some of which can cause persistent infections associated with cervical and other cancers. HPV vaccination prevents infection with targeted types and is most useful before exposure. It does not treat an established HPV infection or existing HPV-related disease [1,2]. who.int

Adolescent vaccination involves communication with both young people and their parents. Parents often influence consent, transport, payment, and appointment attendance, while adolescents may have questions about injections, safety, privacy, and the reason for

vaccination. Assessing only one family member can overlook differences in understanding that affect discussion and decision-making.

Awareness must also be defined carefully. Having heard of HPV vaccination differs from understanding its preventive purpose. Knowledge differs from willingness to vaccinate, and willingness differs from documented vaccine receipt. Combining these outcomes may produce misleading conclusions about readiness or coverage.

WHO identifies girls aged 9–14 years as the primary target population for HPV vaccination. Its position paper includes reduced-dose options, while the appropriate schedule depends on applicable guidance and individual circumstances [1]. A survey should therefore avoid treating one dose schedule as universally correct. who.int

The present manuscript develops a paired assessment of girls and parents. It examines specific knowledge domains and within-family differences without claiming that knowledge establishes vaccination behavior.

Literature Review

Parental acceptance and understanding

Madhivanan and colleagues investigated parental attitudes toward HPV vaccination in Mysore [3]. They found that limited knowledge could coexist with substantial acceptance. Positive attitudes partly reflected confidence in immunization generally, demonstrating why vaccine-specific knowledge and overall trust should be measured separately. pubmed.ncbi.nlm.nih.gov

A subsequent Mysore investigation examined obstacles and facilitators of parental acceptance [4]. Perceived safety, beliefs about cervical cancer, and family influences were relevant to decision-making. These findings support asking about concerns rather than assuming that a low knowledge

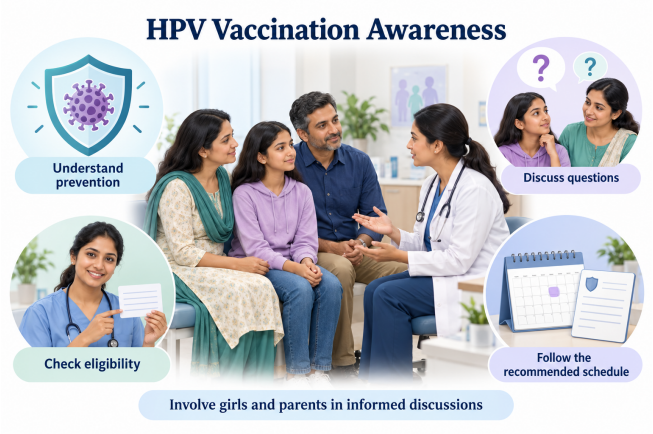
score necessarily represents opposition. pubmed.ncbi.nlm.nih.gov

Another study found that some Indian parents preferred vaccination at older ages [5]. Such preferences identify a communication issue: parents may associate vaccination with an immediate need related to sexual activity rather than preventive protection before exposure. The finding describes parental preferences; it does not establish that delaying vaccination is medically preferable. pubmed.ncbi.nlm.nih.gov

Evidence on vaccine protection

Basu and colleagues evaluated protection against persistent HPV16/18 infection in an Indian multicentre cohort [6]. Their findings supported sustained protection among recipients of different dose schedules. However, the study's observational dose groups require careful interpretation; it should not be described as a completed randomized comparison of every schedule. PMC

Joshi and colleagues investigated immune responses ten years after quadrivalent vaccination [7]. This work contributes evidence about persistence of immune responses, which is distinct from directly measuring cancer prevention. Counseling should communicate the overall evidence without confusing antibody measurements, persistent infection, precancer, and invasive cancer as identical outcomes. PubMed



Barnabas and colleagues conducted a randomized trial of single-dose vaccination among young African women [8]. The trial provided direct evidence of protection against persistent vaccine-type infection. Its findings contribute to the evidence underlying reduced-dose strategies, although eligibility and schedules should still follow applicable recommendations. pmc.ncbi.nlm.nih.gov

Lei and colleagues examined vaccination and invasive cervical cancer in Sweden [9]. Vaccination was associated with substantially reduced cancer risk at the population level. This strengthens the rationale for prevention while remaining different from the question of how much adolescents and parents understand. pubmed.ncbi.nlm.nih.gov

Communication and safety concerns

Brewer and colleagues evaluated communication approaches in a randomized trial involving healthcare practices [10]. Training providers to use vaccination announcements improved initiation compared with control practices. The study supports evaluating how recommendations are delivered, while respectful responses to questions remain essential. pubmed.ncbi.nlm.nih.gov

Gilkey and colleagues found associations between recommendation quality and HPV vaccination behavior [11]. Because their study was observational, the association should not be interpreted as proof that communication alone determines uptake. Access, previous beliefs, and healthcare engagement can also contribute. NIH

WHO's vaccine-safety review addressed infertility concerns and the importance of accurate communication [12]. Such concerns warrant clear, evidence-based discussion rather than dismissal. Awareness questionnaires should distinguish uncertainty from an established belief and avoid reinforcing misinformation through poorly phrased questions. who.int

Research gap

The literature supports assessing adolescent and parental understanding together. A paired design can identify whether knowledge is shared, concentrated in one family member, or limited in both. Further local work should distinguish knowledge, concerns, acceptance, access, and verified vaccination instead of combining them into one awareness measure.

Aim and Objectives

The aim is to assess awareness of HPV vaccination among adolescent girls and their parents.

The objectives are to:

- Describe knowledge of HPV and vaccination.
- Compare knowledge categories within matched adolescent–parent pairs.
- Identify commonly misunderstood vaccination principles.
- Examine associations between parental knowledge, education, and previous professional information.
- Identify priorities for family-oriented education.

Materials and Methods

Study design and setting

An analytical cross-sectional framework is proposed for adolescent-health and general outpatient services in a tertiary hospital. The numerical analysis uses 200 simulated adolescent–parent pairs. No hospital name, recruitment period, or completed fieldwork is assigned.

The unit for family comparisons is the matched pair. Individual responses remain separate so that parental answers cannot substitute for adolescents' knowledge.

Participants and eligibility

Eligible pairs comprise one girl aged 10–19 years and one parent involved in her healthcare. The assessment age range includes girls beyond the primary vaccination target group because the research concerns adolescent knowledge, not a uniform vaccination prescription.

Actual recruitment should require parental permission and adolescent assent for minors, with independent consent for participants aged 18 years or older. Declining participation must not affect healthcare.

Girls and parents should complete questionnaires separately before receiving study-related education. Sensitive questions should be age appropriate and should not require disclosure of sexual activity to assess basic vaccination knowledge.

Sample size and sampling

For planning a descriptive proportion with 95% confidence, an anticipated prevalence of 50%, and 7.5-percentage-point precision:

$$n = \frac{1.96^2(0.50)(0.50)}{0.075^2} = 170.7$$

Allowing 10% for incomplete pairs gives approximately 190 pairs. A target of 200 pairs is therefore reasonable for descriptive planning.

This calculation is not a dedicated power analysis for paired differences. Consecutive recruitment is proposed, with recruitment across clinic days to reduce dependence on one session's attendance pattern.

Questionnaire

A proposed ten-item checklist addresses HPV-related disease, vaccine purpose, pre-exposure vaccination, primary target age, nontherapeutic action, safety, later screening, and scheduling principles. Content is informed by WHO guidance and published research [1–12].

The same concepts should be assessed in both groups using language appropriate to comprehension. Translation, cognitive interviewing, and local validation are required before actual administration.

Responses should include "true," "false," and "do not know." No pilot reliability coefficient or expert-validation result is invented.

Scoring

Correct responses receive one point; incorrect or uncertain answers receive zero. Scores range from zero to ten.

Knowledge category	Score
Lower	0–3
Intermediate	4–6
Higher	7–10

These thresholds are descriptive, not validated measures of decision-making competence. Knowledge of schedules is assessed as recognizing that the appropriate schedule depends on guidance and individual circumstances, rather than recalling one universal dose count.

Variables and analysis

Descriptive variables include girls' age group, parental education, and previous professional HPV vaccination information. Parent education is categorized as primary schooling or less versus secondary schooling or above.

Means and standard deviations summarize scores. Wilson confidence intervals describe proportions with higher knowledge. Exact McNemar testing compares paired higher-knowledge classifications. Pearson chi-square tests examine parental associations.

Tests are two-sided and exploratory, using $p<0.05$. All statistics derive from one simulated paired response matrix. No multivariable or causal conclusions are presented.

Ethical considerations

Actual implementation requires ethics approval, consent and assent procedures, confidentiality, and secure linkage of paired records. Education should follow assessment, with an opportunity for adolescents and parents to ask questions privately.

Results

Participant characteristics

The simulated sample contains 200 girls and 200 parents. Girls aged 10–14 years account for 55.0%. Secondary education or higher is recorded for 55.0% of parents, while 30.0% have previous professional vaccination information.

Table 1. Simulated characteristics of adolescent–parent pairs

Characteristic	Category	Number	Percentage
Girls' age	10–14 years	110	55.0
	15–19 years	90	45.0
Parental education	Primary or less	90	45.0
	Secondary or higher	110	55.0
Previous professional information	Yes	60	30.0
	No	140	70.0

Item-specific knowledge

Parents have more correct responses across all ten items. Knowledge is generally stronger for HPV-related disease and prevention than for timing, later screening, and vaccine characteristics.

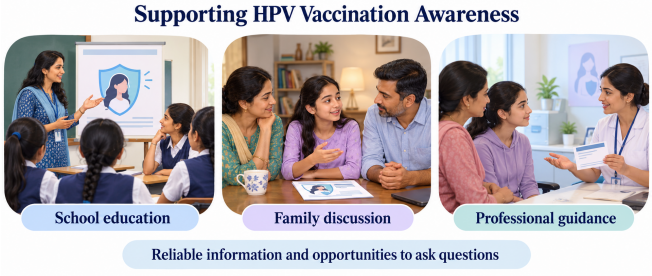


Table 2. Simulated correct responses

Knowledge concept	Girls, n (%)	Parents, n (%)
HPV is a viral infection	113 (56.5)	123 (61.5)
Persistent high-risk HPV can cause cervical cancer	100 (50.0)	128 (64.0)
HPV vaccination helps prevent cervical cancer	91 (45.5)	105 (52.5)
Vaccination is most useful before HPV exposure	51 (25.5)	80 (40.0)
Girls aged 9–14 are the primary WHO target group	65 (32.5)	95 (47.5)
Vaccination does not treat established HPV infection	79 (39.5)	89 (44.5)
Recommended cervical screening remains relevant later	45 (22.5)	71 (35.5)
Temporary injection-site pain can occur	61 (30.5)	80 (40.0)
HPV vaccines do not contain live HPV	59 (29.5)	80 (40.0)
Appropriate schedules depend on guidance and circumstances	73 (36.5)	98 (49.0)

Each group has a denominator of 200; rows are not mutually exclusive.

Overall knowledge

Mean scores are **3.69±2.23** among girls and **4.75±2.37** among parents.

Table 3. Simulated knowledge distribution

Category	Girls, n (%)	Parents, n (%)
Lower	103 (51.5)	61 (30.5)
Intermediate	73 (36.5)	87 (43.5)
Higher	24 (12.0)	52 (26.0)
Total	200 (100.0)	200 (100.0)

Higher knowledge is present in 12.0% of girls (95% CI: 8.2%–17.2%) and 26.0% of parents (95% CI: 20.4%–32.5%).

Within-pair comparison

Both members have higher knowledge in sixteen pairs. Neither member reaches that category in 140 pairs.

Table 4. Simulated paired classification

Girls' classification	Parent below higher category	Parent in higher category	Total
Below higher category	140	36	176
Higher category	8	16	24
Total	148	52	200

The discordant counts, 36 versus eight, yield an exact McNemar p-value below 0.001. The paired difference is **14 percentage points**.

Parental associations

Higher knowledge occurs in 37.3% of parents with secondary education or higher, compared with 12.2% with primary education or less.

Table 5. Simulated parental associations

Characteristic	Higher knowledge, n/N (%)	χ^2	p-value
Primary education or less	11/90 (12.2)	16.14	<0.001
Secondary education or higher	41/110 (37.3)	—	—
No previous professional information	26/140 (18.6)	13.38	<0.001
Previous professional information	26/60 (43.3)	—	—

Discussion

The simulated findings show greater parental knowledge overall, but substantial gaps in both groups. The paired comparison adds information beyond group averages: most families have neither member in the higher category, while a

smaller group contains an adolescent whose knowledge exceeds that of her parent.

These findings support involving adolescents directly in educational conversations. Their questions should not be assumed to mirror parental concerns, and a parent's understanding should not be treated as evidence that the girl understands the decision.

The relatively limited recognition of pre-exposure timing is particularly relevant. Parental preferences for later vaccination, documented in Mysore, demonstrate why messages should explain prevention before exposure [5]. Education should avoid implying that offering vaccination makes assumptions about an adolescent's behavior.

Parents' greater knowledge does not establish acceptance or uptake. Earlier research showed that low knowledge could coexist with substantial willingness [3,4]. Conversely, a knowledgeable parent may still encounter access barriers. The present assessment therefore does not estimate hesitancy or vaccination coverage.

The parental education association may reflect health literacy, information access, or previous healthcare contact. Because analyses are unadjusted, education cannot be described as an independent determinant. Professional information exposure is similarly vulnerable to reverse direction: interested families may seek advice rather than advice alone producing greater knowledge.

Communication research supports clear recommendations and attention to recommendation quality [10,11]. However, education should remain responsive to questions. Accurate discussion of benefits, expected reactions, and practical arrangements is more informative than reassurance without explanation.

Vaccine evidence also requires careful translation. Persistent-infection outcomes, antibody responses, and invasive cancer outcomes represent different stages of evidence [6–9]. Families do not need detailed statistical explanations, but educational material should avoid promising complete protection or suggesting that vaccination treats existing disease.

Dose schedules require particular care because recommendations have evolved. A respondent should not be scored incorrectly for knowing an applicable schedule that differs from an outdated questionnaire. The answer key must identify its source and date.

Finally, later screening remains relevant after vaccination. Low recognition of this principle suggests a need for education that connects adolescent prevention with future adult healthcare without prescribing premature screening for adolescents.

Implications for Education and Research

Family-oriented education should explain preventive purpose, timing before exposure, expected reactions, and how to obtain reliable advice. Adolescents should receive understandable information and opportunities to participate.

Future studies should measure knowledge, confidence, willingness, access, and documented vaccination separately. Evaluations should assess retained understanding and verified receipt rather than immediate intentions alone.

Research should also include families outside healthcare settings, because clinic-based recruitment may exclude those facing the greatest access barriers.

Conclusion

Assessing HPV vaccination awareness among girls and parents together can identify shared gaps and differences within families. The simulated results show limited knowledge of timing, schedules, and later screening despite stronger understanding of general prevention. Actual paired observations are required to confirm these patterns. Education should support adolescent participation, informed parental discussion, and access to appropriate vaccination services.

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