Original Article

Assessment of Knowledge and Vaccination Status Related to Women-Centric Vaccinations Among Female Medical Students in Rawalpindi Medical University, Pakistan: Women-Centric Vaccinations Among Female Medical Students

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Abstract

Background: Vaccination is an effective way of preventing infectious diseases. Women require vaccination against tetanus, rubella, hepatitis B, and HPV essential for their health as well as future generations. Despite its significance, gaps in knowledge and practice persist even among medical students.

Objectives: This study aims to assess the level of Knowledge & Practice and vaccination status among female medical students of Rawalpindi Medical University.

Materials & Methods: A descriptive cross-sectional study was conducted among the female medical students of Rawalpindi Medical University. A validated self-structured questionnaire on demographics, knowledge, and practice for TT, Rubella, Hepatitis B, and HPV was used. Data was collected using Google Forms. Non-probability convenience sampling was used, and data were analyzed in IBM SPSS v27 using descriptive statistics.

Results: A total of 354 female medical students of 21.1± 1.365 years participated in the study. A majority of 95.5% (n=338/354) received vaccination. 73.2% (n=259/354) of females were vaccinated against hepatitis B, 15.5% against HPV, 67.1% against tetanus, and 64.7% (n=229/354) against rubella. 41% (n=145/354) of the population affirmed receiving a booster dose of vaccine, including Hepatitis B after awareness camp, Tetanus toxoid after injury and in pregnancy, HPV vaccination after awareness camp or a case diagnosed in the family. Only 25% (n=88/354) of the medical students knew the duration of the hepatitis B vaccination course.

Conclusion: Considerable gaps exist between knowledge and vaccination practices, regardless of high awareness levels, particularly for HPV. Institutional vaccination initiatives and comprehensive education programs are required to bridge the knowledge-practice gap among future healthcare professionals.

Keywords: Vaccination, Female, Hepatitis B, Tetanus Toxoid, Rubella

Introduction

Vaccination is an important and effective way of preventing infectious diseases. Their effectiveness is proven by regression up to the clearance of many diseases. The morbidity and mortality caused by such diseases and their cost of treatment require us to focus more on their prevention.[1] Healthcare professionals and medical students are lagging in promoting vaccination practices, particularly for women, who require specific vaccines against Tetanus, Rubella, Hepatitis B, and HPV for their health and future generations.[2, 3,4, 5]

Tetanus, also referred to as "Lockjaw," is a dangerous illness, but it can be avoided by vaccination and safe delivery practices.[2] Neonatal and maternal tetanus pose serious threats to newborns and pregnant women, contributing to illness and death. Despite being preventable through vaccines, these conditions persist. Pregnant women should receive the toxoid between 27 and 36 weeks.[6]

Rubella is a sudden illness triggered by the rubella virus, marked by fever and a rash.[3] Rubella is usually a mild illness, but when contracted during the first 16 weeks of pregnancy may result in severe side effects such as congenital rubella syndrome (CRS), abortion, stillbirth, and miscarriage.[7] The burden of rubella and CRS has been reduced by the 95% effective single dose of the rubella-containing vaccine (RCV)[8].

Hepatitis B virus infection is a preventable condition with global public health importance. The illness primarily impacts the liver and usually manifests as jaundice, tiredness, lack of appetite, nausea, or stomach pain.[4] During the clinical rotations, medical students who are directly exposed to infected patients, blood products, injections, and surgical tools are at an increased risk of contracting HBV.[9] According to the WHO, the Hepatitis B vaccine is the first vaccine with anticancer benefits, recognized for its exceptional track record of safety and efficacy. It is 95% successful in preventing chronic infections in adults and children. For effective prevention, a three-dose regimen is advised at 0, 1, and 6–12 months.[10]

Sexually transmitted infections are most frequently caused by HPV. 85% of cervical cancer-related fatalities occur in poor nations, making it one of the most prevalent malignancies among women globally.[5] Based on an individual's age and immune status, typically two or three doses of the HPV vaccine are advised.[11]

Limited research addresses all four vaccinations globally and locally. A Saudi Arabian study showed moderate attitudes among medical students towards MMR vaccination.[12] For a KAP study conducted in Bangladesh regarding the Hepatitis B vaccine, only one-fourth of the students demonstrated satisfactory levels of overall knowledge, attitude, and practice.[13]

Research on knowledge and practice of rubella and tetanus vaccines in Pakistan is limited, with female medical students showing satisfactory

knowledge, but low KAP levels about Hepatitis B and HPV vaccines. [14,15]

Our study aimed to assess the knowledge and vaccination status of female medical students at Rawalpindi Medical University regarding Tetanus Toxoid, Rubella, Hepatitis B, and HPV vaccines.

Materials and Methods

It was a descriptive cross-sectional study conducted at Rawalpindi Medical University. The inclusion criteria include all female medical students at Rawalpindi Medical University from the first year to the final year. Exclusion criteria exclude all those participants who did not give consent for the collection of data. The WHO Sample Size Calculator was used to calculate the sample size with a total population size of 1300 female medical students, a 95% confidence interval, and 5% margin of error, which came out to be 297 participants. The Study was conducted from March to August 2025. Data was collected using Google Forms, which allowed for easy distribution, collection, and compilation of responses. The sampling technique was non-probability convenience sampling.

A validated self-structured questionnaire was developed after conducting a detailed literature review to ensure the relevance and validity of the questions. The questionnaire consisted of multiple sections. The first section included demographic details (age, marital status, parents' profession, vaccination status in childhood, and booster dosage after childhood). This was followed by questions related to Tetanus Toxoid (TT) (knowledge, course of administration, vaccination status, reason for vaccination, beneficiary of the course). The next section addressed the Rubella Vaccine (knowledge, course of administration, vaccination status, reason for vaccination, beneficiary of course). Followed by a section related to Hepatitis B (knowledge, course of administration, vaccination status, reason for vaccination, beneficiary of the course). The questionnaire concluded with a section related to the Human Papillomavirus vaccine (HPV) (knowledge, course of administration, vaccination status, reason for vaccination, beneficiary of the course).

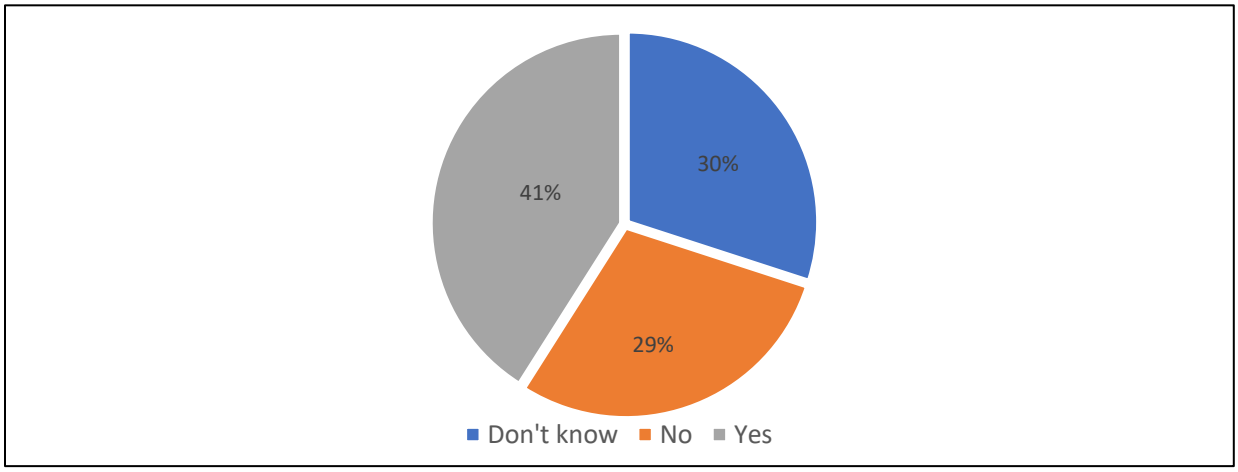
Data obtained from the Google Forms was exported to Microsoft Excel and subsequently imported into IBM SPSS Statistics Version 27 for analysis. Descriptive statistics such as mean and standard deviation were calculated for quantitative variables, while percentages and frequencies were calculated for qualitative variables. This research was registered with the Department Review Board (DRB). The study was conducted under the guidance and supervision of the Community Medicine Department. The university's research supervision ensured adherence to ethical research standards, and informed consent was obtained from all participants before collecting their data. Participant confidentiality and anonymity were strictly ensured.

Results

A total of 354 female medical students participated in this study, with a mean age of 21.1 ± 1.365 years. Out of which 44.9% were in third year (n=159/354), followed by 35.8% (n=127/354) in fourth year and second year. Regarding parental professional background, approximately 70% reported their mothers as homemakers. Fathers having a non-medical background had a preponderance (90.1%) as compared to mothers (22.6%). The proportion of parents as medical professionals was less than 10%. An overwhelming majority of 95.5% (n=338/354) indicated that they had received childhood vaccination according to the EPI schedule.

In contrast, less than half affirmed (41%, n=145/354) receiving a booster dose of any vaccine after childhood. Reported booster vaccination included Covid-19 Vaccination within the past five years, the Hepatitis Vaccination recently after an awareness campaign, Tetanus Toxoid after sustaining injury in an accident, and Typhoid and MMR at the age of 13. The remaining 59% (n=209/354) either did not receive any booster shots or were unable to recall receiving one. As shown in Figure 1.

Figure 1. *Pie Chart Depicting the Status of Any Booster Dose Vaccination After Childhood Among Female Medical Students*



Note. Data presented as Percentages

Upon enquiring about the Vaccination Status of Female Medical Students, around 73.2% of female medical students were vaccinated against Hepatitis B. HPV vaccination status was extremely low, with only 15.5% (n=55/354) having received it (Table 1)

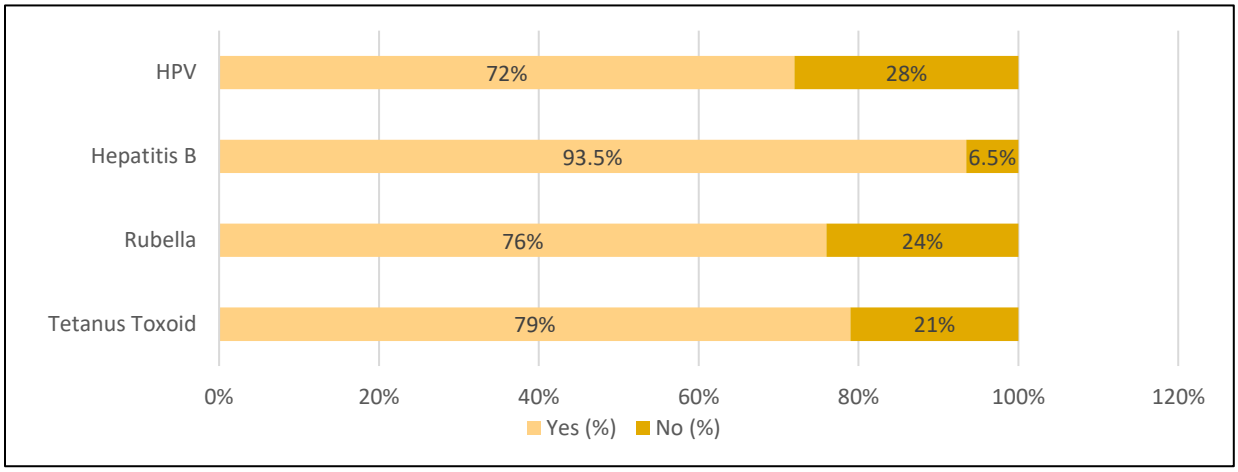
Table 1 *Vaccination Status of Female Medical Students*

Vaccination Status	Yes	No
Tetanus Toxoid	237 (67.1%)	116 (32.9%)
Rubella	229 (64.7%)	125 (35.3%)
Hepatitis B	259 (73.2%)	95 (26.8%)
HPV	55 (15.5%)	299 (84.5%)

Note. Data presented as Frequencies (n) and Percentages (%)

The most common reasons opted for tetanus toxoid vaccination were post-injury (188/354), administration during pregnancy (3/354), through the Expanded Programme on Immunization (EPI) (55/354), or as part of the standard tetanus toxoid regime recommended in the reproductive age group (8/354). Approximately 68% of female medical students were vaccinated against Rubella during childhood (241/354). Students believed that rubella vaccination benefited the baby (71.2%, 252/354) more than the mother (28.8%, 102/354). Hepatitis B had the highest reported knowledge (93.5%) compared to other vaccines, as represented in Figure 2.

Figure 2: *Knowledge of Different Types of Vaccination Among Female Medical Students*

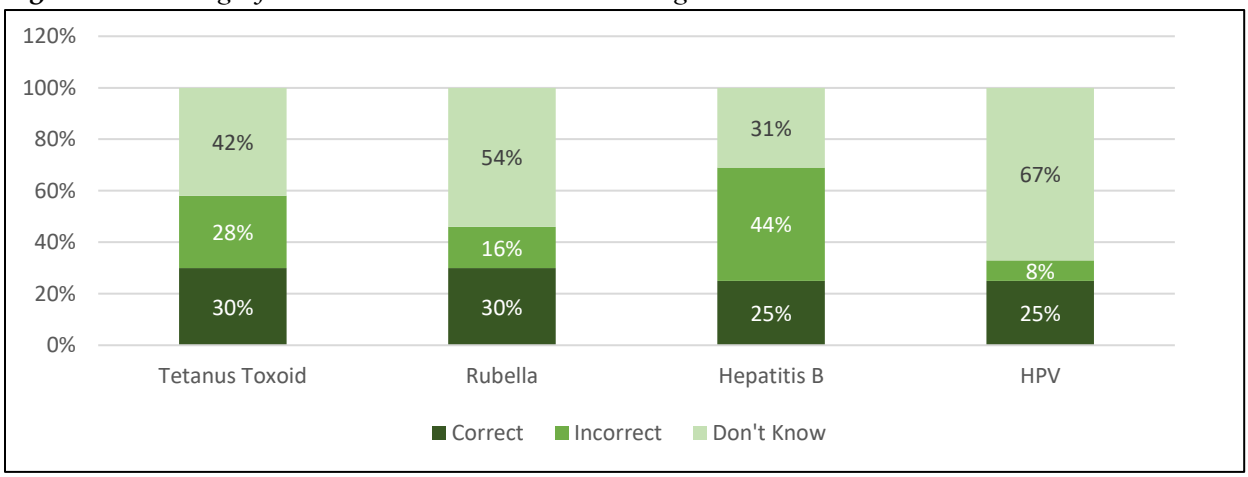


Note. Data presented as Percentages

There was a scarcity in knowledge of vaccination course duration, especially regarding HPV (67%). Approximately 44% incorrect responses were received for the Hepatitis B vaccination course, and 31% did not know about it.

Only 30% correct responses were recorded for Tetanus Toxoid and Rubella, while correct responses for Hepatitis B and HPV vaccination course duration were reported by just 25% of the respondents, as shown in Figure 3.

Figure 3. *Knowledge of Vaccination Course Duration Among Female Medical Students*



Note. Data presented as Percentages

Students identified the primary reason for receiving Hepatitis B vaccines as participation in awareness campaigns (n= 105/354), inclusion in the childhood immunization schedule (n= 93/354), and a few listed it as a requirement during admission/employment/abroad visit (n= 67/354).

Only 3.7% of the females (n= 13/354) had a positive family history of HPV related cancer. Among those who got vaccinated, 23 got vaccinated during childhood, 29 during an awareness campaign, and 3 after a family member got diagnosed with cancer. The majority of the participants recorded correct answers for the protective effect of HPV vaccination against neoplasms like cervical cancer (81.9%, n= 290/354). Followed by other responses like vaginal cancer (8.2%), breast cancer (7.3%), and ovarian cancer (2.5%).

Discussion

In this study, a total of 354 female medical students participated, with a mean age of 21.1 ± 1.36 years. The majority were in their third year (44.9%), and most reported their mothers as homemakers (70%) and their fathers as having non-medical backgrounds (90.1%), with less than 10% having parents in medical professions. Although parental profession had minimal influence on medical perspectives within this study, prior research indicates that parental education, rather than occupation or income, plays a more significant role in shaping vaccination attitudes. [16] Mothers with higher education levels were more likely to value immunization, while working mothers were paradoxically more likely to refuse vaccines.[17] These findings highlight the importance of medical training and awareness as key drivers of vaccine uptake among students, even when parental backgrounds in health are weak. In this study, 95.5% of students reported having received childhood vaccinations, and 73.2%

were vaccinated against Hepatitis B; substantially higher than the rates reported in similar studies conducted in Bangladesh (34%), Somalia (16.4%), Kenya (20.2%), and Nepal (37%).[13,18] The relatively high coverage of Hepatitis B may be attributed to the influence of medical education, urban residency, and access to institutional vaccines. This aligns with other studies indicating that vaccinated students tend to have higher knowledge and protective behavior scores.[19]

According to our study, only 15.5% female medical students received the HPV vaccine. When compared to Indian medical students, where 13.8% females were fully vaccinated.[20] In our study, despite vaccination status being slightly high, the overall status for HPV vaccination is very low. Despite a relatively higher awareness level in our study, where 81.9% of students correctly identified the role of the HPV vaccine in preventing cervical cancer, vaccine coverage was poor due to a lack of knowledge regarding the vaccination course duration; 67% were unaware of the vaccination course duration. In a comparable study by K Swarnapriya et al (48.54%), participants were not willing to take the vaccine. Concerns regarding the efficacy (30.5%), safety (26.1%), and cost of the vaccine (21.7%) were responsible for this.[21] In another study by A. Yacouti et al, the high cost of the vaccine was cited as the main barrier to willingness to get the HPV vaccine for those who were unwilling to receive the vaccine (48.1%).[22]

The results also indicate that awareness programs are useful in encouraging Hepatitis B vaccination among female medical students, as most of them stated that the awareness campaigns conducted were the key influence in motivating them. This underlines the role of focused educational activities in shaping the vaccination behaviour. [23]

The success of early public health measures was also evident in childhood immunization calendars, which contributed significantly to Hepatitis B vaccine coverage. The proportions nonetheless were smaller among those vaccinated because they made it mandatory either to go into a facility or to get a job, and therefore, institutional policy might be fortified so that participation is wider. The same patterns are observed in other low- and middle-income countries, where the impact of awareness programs on vaccination acceptance is significant. [24]

Conversely, HPV vaccination uptake was found to be low, even though most students (81.9 %) answered correctly to the perception that HPV vaccination prevents cervical cancer. Very few (3.7%) of them had a family history of HPV-related cancers, and those who had been vaccinated were mostly those who had received the vaccine in childhood or through sensitization campaigns. Only three students indicated being vaccinated in the case of a cancer diagnosis of a relative, which does not mirror personal experience with the disease as the primary motivator in becoming vaccinated. The theoretical knowledge level of the

participants was great, but this was not practiced. This disparity between knowledge and actual vaccine uptake is in accordance with the results of a cross-sectional study conducted among university students in Qatar. The study demonstrated that, despite a high level of awareness of HPV and its association with cervical cancer, the willingness to receive a vaccine remained low as a result of cultural hesitations, low perceived risk, and misconceptions.[25]

This awareness-action gap is consistent with previous studies in Pakistan and the neighboring countries, where cultural stigma, the non-existence of HPV programs at the national level, and the price of vaccines are detrimental to uptake.[26] The results also demonstrate that most students knew HPV prevents cervical cancer, but the same cannot be said about its wider protective capabilities against other genital cancers, e.g., vaginal or vulvar cancers. This calls for more rigorous educational efforts that emphasize the whole range of HPV-related illnesses, more vaccinations to be made available, and more institutional support for female students.

Conclusion

The study concluded that female students of Rawalpindi Medical University show a satisfactory level of knowledge and vaccination coverage for some vaccines, like Hepatitis. However, there is inadequate knowledge about the full vaccination course, particularly for HPV, tetanus toxoid, and rubella, and there is a clear gap between knowledge and vaccination status. The results highlight the need for focused institutional efforts to bridge the gap between knowledge and practice, including routine vaccination drives and comprehensive educational programs.

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