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Pregnancy health literacy and willingness for HPV Testing among pregnant women in Lahore, Pakistan

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Abstract

Human papillomavirus (HPV) infection is a primary risk factor for cervical cancer development. In low-resource settings, HPV screening uptake is often limited by health literacy barriers. This study examined how health literacy affects willingness to undergo HPV screening (as a cervical cancer prevention method) among 384 pregnant women (aged 15-45) in Lahore, Pakistan using cross-sectional data. We assessed health literacy using Kharazi's validated questionnaire, with evaluation done across four dimensions: health information comprehension, critical evaluation, informed decision-making, and practical application. We assessed the HPV screening willingness using a WHO's instrument, with evaluation done across two dimensions: an awareness and an attitude and willingness section. Data were analyzed using SPSS version 26 through simple and multiple linear regression models. The results from the simple linear analysis showed that health literacy had a significant positive effect on women's willingness to undergo HPV testing (β=0.811, 95% CI=0.753,0.875, p=0.001). From the multiple linear regression analysis, the different dimension of health literacy had significant positive effect on willingness to undergo HPV testing, with the health information comprehension dimension having the strongest positive effect (β=0.724, 95% CI=0.676, 0.801, p=0.001). These findings suggest that enhancing pregnancy health literacy could improve HPV screening acceptance. The results have important implications for designing cervical cancer prevention programs in high-risk populations through antenatal care services. *(Afr J Reprod Health 2025; 29 [8s]: 22-30).*

Keywords: HPV, Pregnancy health literacy, Lahore

Résumé

L'infection par le papillomavirus humain (HPV) est un facteur de risque majeur dans le développement du cancer du col de l'utérus. Dans les contextes à ressources limitées, l'adhésion au dépistage du HPV est souvent freinée par des obstacles liés à la littératie en santé. Cette étude a examiné comment la littératie en santé influence la volonté de se soumettre au dépistage du HPV (comme méthode de prévention du cancer du col) auprès de 384 femmes enceintes (âgées de 15 à 45 ans) à Lahore, au Pakistan, en utilisant des données transversales. Nous avons évalué la littératie en santé à l'aide du questionnaire validé de Kharazi, en mesurant quatre dimensions: la compréhension des informations de santé, l'évaluation critique, la prise de décision éclairée et l'application pratique. La volonté de participer au dépistage du HPV a été évaluée à l'aide d'un outil de l'OMS, structuré autour de deux dimensions: une section sur la sensibilisation et une autre sur les attitudes et la volonté. Les données ont été analysées avec SPSS version 26 à l'aide de modèles de régression linéaire simple et multiple. Les résultats de l'analyse linéaire simple ont montré que la littératie en santé avait un effet positif significatif sur la volonté des femmes de se soumettre au test HPV (β = 0.811, IC à 95 % = [0.753; 0.875], p = 0.001). L'analyse de régression linéaire multiple a révélé que les différentes dimensions de la littératie en santé avaient un effet positif significatif sur la volonté de dépistage, la dimension « compréhension des informations de santé » ayant l'effet le plus marqué (β = 0.724, IC à 95 % = [0.676; 0.801], p = 0.001). Ces résultats suggèrent qu'améliorer la littératie en santé pendant la grossesse pourrait accroître l'acceptation du dépistage du HPV. Les implications sont importantes pour la conception de programmes de prévention du cancer du col chez les populations à haut risque, notamment via les services de soins prénatals. *(Afr J Reprod Health 2025; 29 [8s]: 22-30).*

Mots-clés: HPV, Littératie en santé périnatale, Lahore

Introduction

Human papillomavirus (HPV) is a common infectious and pathogenic agent worldwide.[1] This disease has become an epidemic, especially in developing countries, due to limited access to healthcare and lack of awareness.[2] According to the ICO/IARC HPV Information Centre, the global prevalence of human papillomavirus (HPV) among women with normal cytology varies by region. As of

2023, the highest rates were reported in Sub-Saharan Africa (24%), followed by Latin America and the Caribbean (16%), Eastern Europe (14%), and Southeast Asia (14%).[3]

More than 200 types of this virus have been identified, which are categorized into low-risk and high-risk groups. The most common low-risk HPV genotypes are types 6 and 11, which generally cause benign lesions such as genital warts and low-grade precancerous lesions. High-risk types, including HPV 16 and 18, are considered the most prevalent causes of cervical cancer and other anogenital cancers.[4] These viruses are transmitted through genital contact, usually during vaginal, anal, or oral sex.[5] Most HPV infections are asymptomatic and about 90% of them resolve spontaneously within a few months to two years.[5]

According to published statistics, HPV infection is observed in 99% of cervical cancers, 97% of anal cancers, 70% of vaginal cancers, 47% of penile cancers, 40% of gastrointestinal cancers, 47% of urological cancers, and 11% of oral cancers.[6] Some studies have also reported that HPV infection can impair sperm parameters such as acrosome function, leading to male infertility.[7,8]

HPV infects both sexes, but cervical cells are especially susceptible, so HPV-related diseases are more commonly observed in women.[9] Factors contributing to the failure of HPV immunization programs include lack of HPV awareness, insufficient scientific recommendations, concerns about vaccination, limited access in low- and middle-income countries, and implementation-level barriers.[10] One major challenge in preventing HPV infection is the lack of adequate public awareness, particularly among mothers, about the health consequences of this virus and the importance of vaccination.[11] Therefore, one factor that appears to influence prevention, treatment, and willingness to undergo HPV testing is women's pregnancy health literacy.[12]

Pregnancy health literacy is defined as mothers' ability to access, understand, evaluate, and apply information related to prenatal care.[13] Studies show that the level of health literacy in pregnant women directly affects their acceptance of preventive behaviors, including HPV screening tests.[12,14] Research indicates that women with higher health literacy have a better understanding of HPV infection risks and the importance of early detection, which increases their willingness to receive HPV vaccination and undergo testing. [15] This correlation is even stronger in societies where cultural misconceptions about sexually transmitted infections prevail.[16] According to the Theory of Planned Behavior (TPB), pregnancy health literacy can influence attitudes, subjective norms, and perceived behavioral control regarding HPV testing.[17] Evidence also shows that prenatal counseling focused on improving health literacy can increase HPV test acceptance by up to 40%.[18]

Recent studies show that about 10–15% of Pakistani women are infected with HPV, with a prevalence of 15% in urban areas and 8% in rural women.[19] Reluctance to undergo HPV testing in Pakistan is largely due to cultural barriers,[19,20] lack of awareness,[21] limited healthcare access,[20,22] and concerns about social stigma.[20,23] Studies show that about 65% of women avoid testing due to conservative norms.[24] Research in Pakistan also reveals that only 18% are aware of the link between HPV and cancer,[21] only 22% of rural health centers offer HPV services,[22] and 47% of women worry about how test results will affect their marital lives.[22] This situation is exacerbated by a lack of organized screening programs and cultural restrictions.[22]

While several studies in Pakistan have examined HPV awareness, vaccination, and cultural factors, most of these focus on non-pregnant women or general female populations, particularly in Karachi. For example, in an outpatient-clinic study in Karachi, only 25.5% of women knew about the existence of the HPV vaccine, and just 9.8% had actually been vaccinated.[25] To date, no empirical study has specifically investigated the relationship between pregnancy health literacy and willingness to undergo HPV testing among pregnant women in Lahore—a city with significant population diversity and cultural variation. Although the effect of health literacy on maternal health behaviors is well-documented, Pakistani interventions targeting pregnant women have not focused on HPV or cervical cancer screening directly. Given the existing challenges in Pakistan's healthcare system, including cultural barriers, lack of awareness, and limited healthcare access—clearly visible in Lahore—it is essential to examine pregnancy health literacy and willingness to undergo HPV testing in this region. This study aims to assess the association of health literacy among pregnant women in Lahore,

Pakistan, on the willingness to undertake HPV testing. The findings of this research could help develop targeted educational programs and appropriate health policies to increase screening, prevent cervical cancer, and improve maternal and child health in the area.

Methods

Conceptual framework

This study is guided by the Theory of Planned Behavior,[26] which posits that individuals' behaviors are influenced by their attitudes, perceived norms, and perceived behavioral control. In this context, pregnancy health literacy is hypothesized to influence the willingness to undergo HPV testing through cognitive and behavioral pathways. Prior studies have established a relationship between health literacy and preventive health behaviors,[27, 28] and have shown that health literacy directly affects individuals' acceptance of preventive behaviors, including HPV screening tests.[12,14]

Study setting

Pakistan is administratively divided into four provinces, two autonomous territories, and a federal capital territory. The study was conducted in Lahore, the capital of Punjab Province. As a highly urbanized and diverse city, Lahore provides a representative population for sampling pregnant women.

Study design and sampling

This was a quantitative, cross-sectional study conducted from January to April 2025. The study population consisted of pregnant women aged 15 to 45 years attending public and private health centers in Lahore. The sample size was calculated using Cochran's formula: $n= (Z^2 \times p(1-p)) / e^2$, where
$Z = 1.96$, $p = 0.5$, $e = 0.05$. Using this formula, the estimated minimum sample of 384 women.
A multistage cluster sampling technique was applied: Lahore was divided into five administrative zones, from each of which one public and one private health center were randomly selected (totaling 10 centers). Within each center, eligible pregnant women were consecutively selected during their antenatal visits. The inclusion criteria were age 15–45 years, current pregnancy, attendance at antenatal care in the selected centers, and provision of informed consent. Exclusion criteria included women with known mental disorders or cognitive impairments and those who declined to participate.

Data collection instruments

To assess pregnancy health literacy, the standardized questionnaire by Kharazi *et al*.[29] was used, comprising 32 items rated on a five-point Likert scale (from "strongly agree, which is scored '5' to 'strongly disagree', which is scored '1'), covering four main dimensions: (1) comprehension of health information, (2) critical evaluation of information, (3) informed decision-making, and (4) practical application of information. Scores were calculated as the mean of all items. For HPV testing willingness, we employed the WHO standard questionnaire with two sections: an 8-item knowledge section (scored 1 point per correct answer, range 0-8) and a 5-item attitude/willingness section using a 5-point Likert scale (1 = 'strongly disagree' to 5 = 'strongly agree'), with total scores ranging from 5 to 25 (higher scores indicating greater willingness)[30]. Additionally, a Demographic Questionnaire was administered to collect baseline characteristics, including age, educational attainment, household income, parity, and residential location.

Data collection procedure

Data were collected via self-administered questionnaires to ensure participant confidentiality and minimize interviewer bias. Prior to participation, all eligible women received a detailed explanation of the study objectives, procedures, and their rights as participants. Written informed consent was obtained from each respondent before questionnaire distribution. To enhance data quality, the research team provided clear instructions on how to complete the questionnaires and remained available to address any queries without influencing responses. The questionnaires were designed with user-friendly formatting to facilitate accurate and efficient self-reporting. Completed forms were collected immediately after filling to prevent data loss or external influence. This method was chosen to align with best practices in survey research, ensuring reliable and unbiased data collection while maintaining ethical standards.

Study variables

The research variables are presented in Table 1.

Table 1: Table of research variables

Variable Type	Variables
Dependent Variable	Willingness to undergo HPV testing
Independent Variable	Pregnancy health literacy score (total and by dimensions)

Scoring and statistical analysis

Scores for pregnancy health literacy were computed by averaging responses across the five dimensions (access to information, understanding, appraisal, application, and decision-making), yielding both sub-scores and a total composite score. The HPV willingness score was derived by averaging total scores from the two sections: an 8-item knowledge section (range of 0–8) and the five Likert-scale items (range: 5–25). Descriptive statistics (mean, standard deviation, frequencies, and percentages) summarized the data distribution. Inferential analyses included simple and multiple linear regression (Enter method) to identify predictors of HPV testing willingness, with statistical significance set at $p < 0.05$. First, health literacy scores and willingness to undergo HPV testing were standardized, and then simple and multiple regression analyses were used for data analysis. All analyses were conducted using SPSS (version 26).

Ethical considerations

Ethical approval was obtained from the research ethics committee of Hi-Vision laboratory Lahore. The study was conducted in accordance with the Declaration of Helsinki, ensuring confidentiality, voluntary participation, and the right to withdraw at any stage.

Results

Descriptive results

Demographic characteristics of the statistical sample are summarized in Table 2. The sample consisted predominantly of women aged 25–35 (45.1%), with a mean gestational age of 24 weeks (SD = 6.2).

Table 3 shows the descriptive statistics results for the dependent and main independent variables. Descriptive statistics including mean, standard deviation, skewness, and kurtosis were used to describe the research variables as shown. As observed, the skewness and kurtosis values for the variables fall within the range of -2 to +2, indicating that the distribution of variables is approximately normal and symmetrical.

Table 2: Descriptive statistics of participants' demographic and obstetric characteristics (n=384)

Variable	Categories/Mean ± SD	Frequency (n)	Percentage (%)
Age (years)	<25	84	21.9
	25–35	173	45.1
	>35	127	33.1
Education	High school or below	146	38.0
	Bachelor's degree	161	41.9
	Postgraduate	77	20.1
Employment status	Unemployed	250	65.1
	Employed	134	34.9
Parity	Primigravida	154	40.1
	1 child	134	34.9
	2 children	77	20.1
	≥3 children	19	4.9
Gestational age (weeks)	Mean ± SD (Range)	24 ± 6.2 (12–36)	–

Table 3: Descriptive statistics for dependent and main independent variables

Variable	Mean	Std. Dev.	Skewness	Kurtosis
Health Information Comprehension	7.67	3.953	1.991	-1.739
Critical Information Evaluation	4.89	1.457	0.995	1.759
Informed Decision-Making	6.62	2.651	0.793	1.472
Practical Information Use	5.75	2.076	0.664	-0.355
Pregnancy Health Literacy	34.35	2.997	-0.525	0.893
Willingness to HPV Testing	6.56	2.135	0.499	-1.997

Table 4: Simple linear regression model

Dependent Variable	Independent Variable	β	t	P	95% CI
Willingness to HPV Test	Pregnancy Health Literacy	0.811	18.742	0.001	(0.753, 0.875)
Summary of the Linear Regression Model		R^2	Durbin–Watson	ANOVA F	P
		0.659	1.654	38.764	0.001

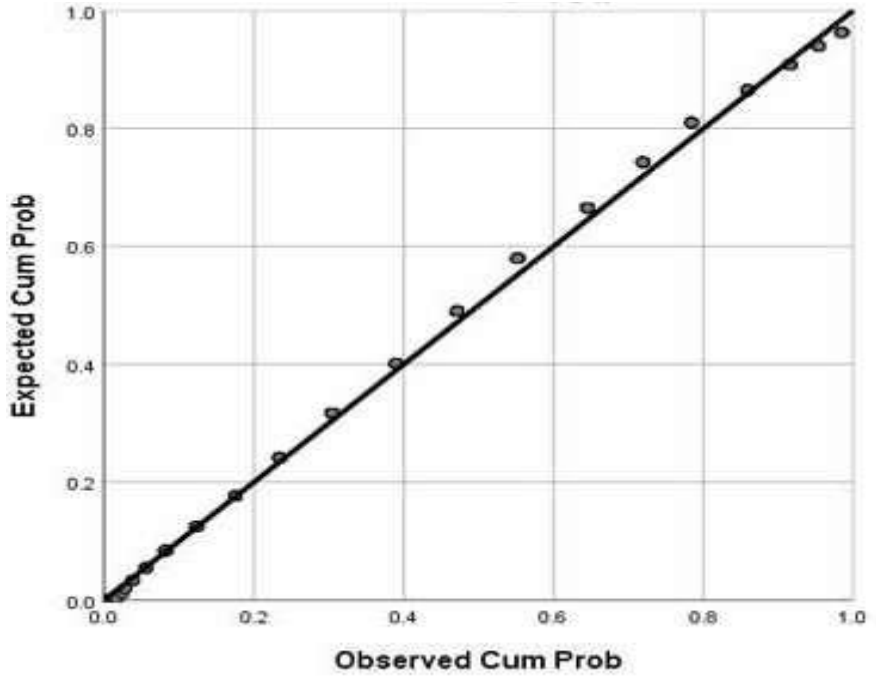

Figure 1: Normal P–P Plot used to assess the normality of residuals in the simple linear regression model

Inferential results

Simple Linear Regression was used to investigate the effect of pregnancy health literacy on the willingness to undergo HPV testing among pregnant women in Lahore, Pakistan. A summary of the model and the estimated regression coefficients are presented in Table 4. As shown, the simple linear regression model is statistically significant in assessing the effect of pregnancy health literacy on the willingness to undergo HPV testing at the 5% significance level ($F = 38.764$, $p < 0.05$). The Durbin-Watson statistic falls between 1.5 and 2.5, indicating that the assumption of no autocorrelation among the error terms is met — in other words, the residuals are independent, and the assumption of independence of errors has not been violated. Furthermore, the Normal P-P Plot (Figure 1) demonstrates that the residuals are approximately normally distributed.

Table 5: Multiple linear regression model

Dependent Variable	**Independent Variable**	**β**	**t**	**P**	**VIF**	**95% CI**
Willingness to HPV Test	Health Info Comprehension	0.724	17.095	0.001	1.309	(0.676, 0.801)
	Critical Info Evaluation	0.375	4.343	0.009	2.236	(0.342, 0.423)
	Informed Decision-Making	0.623	14.610	0.001	1.242	(0.598, 0.697)
	Practical Use of Information	0.503	13.948	0.001	3.001	(0.475, 0.589)
Summary of the Multiple Linear Regression Model Using the Enter Method		**R^2**	**Durbin–Watson**	**ANOVA F**	**P**	
		0.668	1.890	42.852	0.001	

The coefficient of determination (R^2) indicates that pregnancy health literacy accounts for 65.9% of the variance in the willingness to undergo HPV testing among pregnant women. The estimated coefficients of the simple linear regression model are presented in Table 2. According to the significance level ($p < 0.05$), pregnancy health literacy has a positive and significant effect on the willingness to undergo HPV testing ($\beta = 0.811$). This implies that for each one standard deviation increase in pregnancy health literacy, the willingness to undergo HPV testing significantly increases by 0.811 standard deviations. Figure 1

To examine the impact of dimensions of pregnancy health literacy on the willingness to undergo HPV testing among pregnant women in Lahore, a multiple linear regression model using the Enter method was employed. The summary of the multiple linear regression model and the estimated coefficients are presented in Table 5. The analysis of variance (ANOVA) results indicate that the multiple linear regression model is statistically significant at the 5% significance level ($F = 42.852$, $p < 0.05$), suggesting that at least one dimension of pregnancy health literacy has a significant influence on the willingness to undergo HPV testing. The Durbin-Watson statistic was 1.890, falling within the acceptable range of 1.5 to 2.5, which indicates the absence of autocorrelation among the residuals. This confirms that the assumption of independence of errors has not been violated. Furthermore, as shown in Figure 2, the Normal P–P Plot confirms that the residuals follow a normal distribution, thus justifying the use of multiple linear regression. The R^2 value of 0.668 indicates that approximately 66.8% of the variance in the willingness to undergo HPV testing is explained by the dimensions of pregnancy health literacy. The estimation results for the regression coefficients also show that the variance inflation factor (VIF) for each of the independent variables (i.e., the dimensions of pregnancy health literacy) is below 10, indicating the absence of multicollinearity. Therefore, the assumptions of linearity and non-multicollinearity are not violated. Based on the significance levels (p-values) of the estimated regression coefficients, it is observed that at the 5% level, the following dimensions of pregnancy health literacy have a positive and statistically significant effect on the willingness to undergo HPV testing: comprehension of health information ($\beta = 0.724$, $p=0.001$), critical evaluation of information ($\beta = 0.375$, $p=0.009$), informed decision-making ($\beta = 0.623$, $p=0.001$), and practical application of information ($\beta = 0.503$, $p=0.001$). Specifically, an increase of one standard deviation in each of these variables is associated with a significant increase of 0.724, 0.375, 0.623, and 0.503 standard deviations, respectively, in the willingness to undergo HPV testing among pregnant women. The standardized regression coefficients further reveal that understanding health information, with regression coefficient of 0.724, had the greatest effect on the willingness to undergo HPV testing, while critical evaluation of information, with regression coefficient of 0.375, has the smallest effect. Figure 2

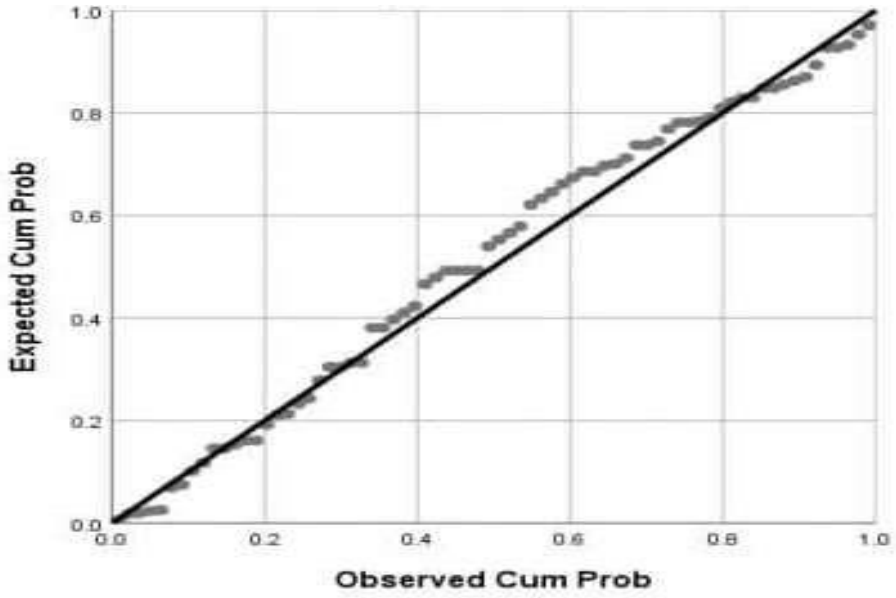

Figure 2: Normal P–P Plot used to assess the normality of residuals in the multiple linear regression model

Discussion

The main objective of this study was to examine the effect of pregnancy health literacy and the willingness to undergo HPV testing among pregnant women in Lahore, Pakistan. Data analysis showed that pregnancy health literacy positively influences the willingness to undergo HPV testing in this population, consistent with previous research.[12,20,14-18] This suggests that women with higher health literacy have a better understanding of medical concepts, are less concerned about social stigma, can effectively access and assess informational resources, and most importantly, better understand the importance of prevention and early detection of HPV. Consequently, their willingness to undergo HPV testing increases.

Findings also revealed that health information comprehension positively affects HPV test willingness among pregnant women in Lahore. This is consistent with other studies.[12,20,14-18] The ability to read and understand medical brochures helps women grasp the importance of HPV testing, understand the complications and risks of the disease, and recognize the potential severity of cervical cancer and the benefits of early diagnosis, thus encouraging them to take the test.

Results also showed that critical evaluation positively influences the willingness to undergo HPV testing, aligning with other studies.[12,20,14-18] Women who can assess and analyze health information are better equipped to compare data, recognize myths and false beliefs, distinguish credible sources from unreliable ones, and therefore make more confident decisions about testing.

Also, informed decision-making was found to have a positive impact on HPV testing willingness, aligning with other studies.[12,20,14-18] The ability to make informed decisions helps women weigh the pros and cons of testing, choose the right time for it, and properly interpret test results—ultimately increasing their likelihood of undergoing HPV testing.

Practical application of information was also positively linked to HPV test willingness, aligning with other studies.[12,20,14-18] Women with strong practical information skills can follow test instructions more easily, locate testing facilities more effectively, and better understand follow-up procedures, making them more proactive and willing to be tested.

Study limitations include the geographic focus on Lahore, lack of consideration of socio-economic factors, self-reporting bias, and the cross-sectional nature of the study that impedes causality from been established. In addition, although demographic variables such as age, education, income, parity, and residential location were collected and described to provide a comprehensive profile of the participants, they were not included in

the regression models. This decision was made to focus the analysis specifically on the predictive effect of pregnancy health literacy on the willingness to undergo HPV testing, as guided by the study's theoretical framework. Future studies may incorporate these covariates to further explore potential confounding effects.

From this study findings, it is recommended that officials implement blended educational programs, establish mobile testing centers, and train health counselors. Future researchers are advised to conduct longitudinal studies, deeper qualitative research, assess the impact of educational interventions, perform comparative studies, and analyze cost-effectiveness. From a policy perspective, integrating HPV education into routine prenatal care, allocating funds for free testing, collaborating with religious leaders, and developing mobile educational apps in local languages are recommended. These findings can provide valuable scientific support for health policymakers in designing cervical cancer prevention programs in Pakistan.

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