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Factors influencing the utilization of the tetanus toxoid immunization program among pregnant women at terjun public health center, Marelan district

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ABSTRACT

Neonatal tetanus remains a significant cause of infant mortality, particularly in developing countries, despite being preventable through Tetanus Toxoid (TT) immunization during pregnancy. This study aimed to analyze the factors influencing the utilization of TT immunization among pregnant women at Terjun Public Health Center, Marelan District. Using a cross-sectional quantitative approach, data were collected from 46 third-trimester pregnant women through questionnaires. Bivariate and multivariate analyses were conducted using chi-square tests and logistic regression. The results showed that knowledge (p=0.002) and attitude (p=0.001) were significantly associated with TT immunization uptake, while age (p=0.536) and spousal support (p=0.603) were not. Multivariate analysis revealed that attitude was the dominant factor influencing immunization utilization (OR=4.7; p=0.045). Although knowledge had a higher odds ratio (OR=5.59), it did not reach statistical significance (p=0.056). The model explained 38.9% of the variation in immunization status (Nagelkerke R^2 = 0.389). These findings underscore the importance of promoting positive maternal attitudes and improving knowledge through targeted health education to enhance immunization coverage and prevent neonatal tetanus.

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INTRODUCTION

Tetanus is an acute infectious disease caused by the exotoxin Clostridium tetani, characterized by skeletal muscle stiffness, convulsions, and pain in the neck and lower jaw. Pregnant women are a high-risk group for tetanus. Each year, approximately 800,000 to 1,000,000 people in developing countries are estimated to die from tetanus, with the majority of victims being newborn babies. Neonatal tetanus alone causes approximately 248,000 deaths annually, prompting governments to prioritize pregnant women for tetanus immunization during pregnancy. One preventive measure against neonatal tetanus in infants is through tetanus toxoid (TT) immunization (Laksmi 2021).

In 2020, more than 11,750 cases of tetanus were reported to the WHO, with the majority of cases reported from African and Southeast Asian countries, and 2,230 of these were neonatal tetanus. Therefore, neonatal tetanus has become a concern for the WHO and many countries (Ningsih, S., & Sari 2021).

The administration of tetanus toxoid (TT) immunization in pregnant women is adjusted according to their previous immunization history. If the pregnant woman has received two doses of TT during a previous pregnancy or before marriage, a single booster dose of 0.5 cc in the upper arm is sufficient. If she has never received TT or is unsure of her previous immunization status, administration should begin at the first antenatal visit (K1) with two doses administered at least four weeks apart. The second dose should be given at least two weeks before delivery. For pregnant women at high risk, at least two doses of TT are required. TT1 does not provide full immunity, so it must be followed by TT2 to provide protection for three years. If the pregnant woman has previously received two doses of TT during a previous pregnancy with an interval of less than two years, then only one dose of TT is required during the first pregnancy visit (Dalle, A., Jaya, N., & Yakub 2021).

In Indonesia, according to a report from the Directorate General of Disease Control and Environmental Health, Ministry of Health of the Republic of Indonesia, in 2023 there were still 27 cases of neonatal tetanus and 13 deaths, an increase from the previous year, which had 21 cases of neonatal tetanus and 12 deaths. TT immunization for pregnant women in North Sumatra during the 2023 SKI was recorded at only 55.5%. Meanwhile, to maintain the eradication status of maternal and neonatal tetanus, immunization must reach 80% at the district/city level (Kementerian Kesehatan Republik Indonesia. 2017).

A minimum tetanus immunization coverage of 80% is required to achieve herd immunity and protect the community from tetanus, especially pregnant women and newborns. One of the causes of maternal and infant mortality (75%) is infection, and one such infection is neonatal tetanus (WHO, 2024). It is also dangerous because of its high mortality rate. In 2020, the Case Fatality Rate (CFR) due to TN disease in Indonesia increased to 50% compared to 11.76% in 2019 (Kementerian Kesehatan Republik Indonesia 2024).

The coverage of tetanus toxoid (TT) immunization for pregnant women in the ANC 10T program in North Sumatra in SKI 2023 only reached 55.5%, still far below the 80% target set by the Ministry of Health to maintain the status of Maternal and Neonatal Tetanus Eradication. As a result, four cases of neonatal tetanus were identified in North Sumatra in 2023, with one case in Nias District and three cases in Langkat District (North Sumatra Provincial Health Office, 2024). This situation highlights the need to increase the coverage and utilization of TT immunization among pregnant women to prevent the risk of tetanus in both mothers and newborn babies(Dinas Kesehatan Provinsi Sumatera Utara. 2024).

In terms of compliance with TT vaccination, the study by Mutia et al. found that education, knowledge, attitude, and family support influence pregnant women's compliance with TT immunization (Mutia, F., Nasution, A. R., Siregar, R., & Sari 2024). The factors influencing the utilization of TT immunization by pregnant women, based on the above study, can be described using Lawrence Green's PRECEDE-PROCEED Model in (Tumanggor 2023) as three main factors: predisposing factors, enabling factors, and promoting factors. Predisposing factors include education, knowledge, and attitudes toward immunization. Enabling factors include access to healthcare services and healthcare providers who provide education. Behavioural factors consist of support from husbands and families, which enhances maternal compliance. These three factors interact to determine the success of the TT immunization program among pregnant women (Green, L. W., & Kreuter 1999).

Despite being included as a component of routine antenatal care (ANC), the coverage of Tetanus Toxoid (TT) immunization among pregnant women in Indonesia, particularly in North Sumatra, has shown stagnation or even a decline over the years. Several historical and systemic

factors contribute to this trend. One significant factor is the inconsistent implementation of maternal and child health programs across regions due to disparities in resource allocation, supervision, and commitment at the district health office level. Additionally, shifting health priorities—such as the increased focus on COVID-19 response during 2020–2022—have diverted attention and funding from preventive maternal services, including TT immunization.

Furthermore, the persistence of knowledge gaps among pregnant women, as observed in the pre-research survey at Terjun Health Center, may reflect deeper systemic issues. Many respondents reported that they had never heard of TT immunization, indicating not only limited community awareness but also possible deficiencies in communication and outreach efforts by healthcare workers. This may be attributed to inadequate training, lack of updated knowledge, or the overwhelming workload faced by health staff, especially in urban public health centers that serve high patient volumes. Some midwives and community health workers may lack the pedagogical skills or tools to effectively counsel pregnant women during ANC visits. This systemic issue—where the delivery of basic health education becomes inconsistent or deprioritized—may perpetuate low immunization uptake despite its inclusion in national guidelines.

Cultural barriers, gender norms that limit women's autonomy in health decision-making, and insufficient male involvement in maternal health also contribute to the limited perceived importance of TT immunization. Together, these factors create a cycle of underutilization, which undermines efforts to sustain Maternal and Neonatal Tetanus (MNT) elimination status and increases the risk of preventable neonatal deaths.

A pre-research survey was conducted through interviews with pregnant women and health center staff at the Medan Marelan Health Center. The pregnant women interviewed stated that they had never heard of TT immunization before. This statement was supported by the response of health center staff in Terjun, who mentioned that there are still pregnant women in their area who need to be educated first about TT immunization. The pre-research survey indicated a lack of knowledge among pregnant women regarding tetanus toxoid immunization at the Medan Terjun Health Center.

RESEARCH METHOD

This study is a quantitative cross-sectional study aimed at identifying the factors that influence pregnant women in utilizing tetanus toxoid immunization. The variables studied include the age of pregnant women, their knowledge of tetanus immunization, their attitudes toward tetanus immunization, and their husbands' support for tetanus immunization. This study was conducted at the Terjun Medan Marelan Community Health Center. The study was conducted from March to May 2025. The population in this study consisted of pregnant women in their third trimester who visited the Terjun Health Center during the same period. The sample size was calculated using the rule of thumb with an adjustment, where the sample size equals 10 times the number of independent variables, multiplied by the prevalence rate from a previous study (Dahlan 2010). Since this study consists of 3 independent variables, the sample size is 30 samples, multiplied by the prevalence of 0.659 (Fitriani, 2025), resulting in a total of 46 respondents. The sample was obtained using accidental sampling technique.

The research procedure began with data collection, whereby the researcher first requested research permission from the Head of the Terjun Community Health Center. The researcher then requested permission to conduct the research from the respondents, explained the purpose of the research, and sought the respondents' consent. All respondents signed an informed consent form before completing the questionnaire, after which the researcher distributed the questionnaires to the respondents. The researcher collects the questionnaires back after the respondents have completed them. The researcher checks the completeness of the submitted questionnaires and asks the respondents to complete any incomplete answers before collecting them again.

The data obtained is then processed using a computer through the stages of editing, coding, scoring, data entry, and tabulation. The data analysis used is multiple logistic regression analysis(Sugiyono 2020). First, data grouping was carried out based on key independent variables: age group, level of knowledge, maternal attitude, and spousal support. The outcome variable in this study was the utilization status of the TT immunization program (utilized/not utilized). Second, a bivariate analysis was conducted using the Chi-square test to determine the relationship between each independent variable and the dependent variable. A significance value (p-value) of less than 0.05 was considered statistically significant, indicating a meaningful association between the variables. Third, variables with p-values below 0.05 in the bivariate analysis were included in the multivariate stage using multiple logistic regression to control for confounding factors and assess the most influential predictors. The Enter method was employed to input all selected variables simultaneously into the regression model. Lastly, the final modeling was carried out by selecting the most ideal logistic regression model based on the best fit and statistical significance, and the regression equation was presented in the form:

$$\text{Logit}(p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n,$$

where p is the probability of TT immunization utilization, and $\beta_1 \ldots \beta_n$ represent the regression coefficients for each predictor variable. This modeling process aims to identify the dominant factors that significantly affect the likelihood of TT immunization program utilization among pregnant women in the selected health facility.

RESULTS AND DISCUSSIONS

Univariate analysis was performed to describe the frequency distribution of respondents based on each research variable, including independent variables such as age, knowledge, attitude, and husband's support, as well as dependent variables such as TT immunization status. The distribution is presented in the following table.

Table 1. Frequency Distribution Based on Variables.

No.	Variable	Frequency	Percentage (%)
Immunization Status			
1	Not Immunized	24	52,2
2	Immunized	22	47,8
	Total	46	100
Age			
1	Berisiko	21	45,7
2	Tidak Berisiko	25	54,3
	Jumlah	46	100
Knowledge			
1	Poor	17	37
2	Good	29	63
	Total	46	100
Attitude			
1	Negative	24	52,2
2	Positive	22	47,8
	Total	46	100
Spousal Support			
1	Does Not Support	31	67.4
2	Supports	15	32,6
	Total	46	100

Table 1 shows that out of a total of 46 respondents, 22 respondents (47.8%) were pregnant women who had received TT immunization, 25 respondents (54.3%) were not at risk, 29

respondents (63%) had good knowledge, 22 respondents (47.8%) had a positive attitude, and received spousal support (15 respondents, 32.6%).

Bivariate analysis was then conducted to determine the relationship between each independent variable and the dependent variable, with the independent variables being knowledge, attitude, and spousal support, and the dependent variable being the utilization of TT immunization. The results of the bivariate analysis are shown in the table below.

Table 2. Relationship between Age and TT Immunization in Pregnant Women

No.	Age	TT Immunization				Total		*P-value*
		No		Yes				
		n	%	n	%	n	%	
1.	At risk	12	57,1	9	42,9	21	100	0,536
2.	Not at risk	12	48,0	13	52,0	25	100	
	Total	24		22		46		

Among respondents of childbearing age, 12 respondents did not receive TT immunization (57.1%), which was more than the 9 respondents (42.9%) who did receive TT immunization. Meanwhile, among the 25 respondents who were not at risk of pregnancy, 13 respondents (52.0%) had received the TT vaccination, which was more than the 12 respondents (48.0%) who had not received the TT vaccination. The chi-square test yielded a p-value of 0.536, indicating no significant association between age group and the utilization of TT vaccination among pregnant women.

Table 3. Relationship between Knowledge and TT Immunization in Pregnant Women

No.	Knowledge	TT Immunization				Total		*P-value*
		Tidak		Ya				
		n	%	n	%	n	%	
1.	Insufficient	14	82,4	3	17,6	17	100	0,002
2.	Good	10	34,5	19	65,5	29	100	
	Total	24		22		46		

Table 3 shows that of the 17 respondents with poor knowledge, 14 respondents did not receive TT immunization (82.4%), which is significantly more than those who did receive immunization, namely 3 respondents (17.6%). Among the 29 respondents with good knowledge, 10 (34.5%) did not receive the TT vaccination, which is fewer than the 19 (65.5%) who did receive the vaccination. The chi-square test yielded a p-value of 0.002, indicating a significant association between knowledge and utilization of the TT vaccination.

Table 4. Relationship between Attitudes and TT Immunization in Pregnant Women

No.	Attitude	TT Immunization				Number		*P-value*
		No		Yes				
		n	%	n	%	n	%	0,001
1.	Negative	18	75	6	25	24	100	
2.	Positive	6	27,3	16	72,7	22	100	
	Total	24		22		46		

Table 4 shows that of the 24 respondents with negative attitudes toward TT immunization, 18 respondents did not undergo TT immunization (75%), which is significantly more than those who did undergo immunization, namely 6 (25%) respondents. Among the 22 respondents with a positive attitude, 6 (27.3%) did not receive the TT immunization, which is fewer than the 16 (72.7%) who did receive it. The chi-square test yielded a p-value of 0.001, indicating a significant association between the attitudes of pregnant women and the utilization of TT immunization.

Table 5. Relationship between Husband Support and TT Immunization in Pregnant Women

No.	Spousal Support	TT Immunization				Number		*P-value*
		No		Yes				
		n	%	n	%	n	%	0,603
1.	No Support	17	54,8	14	45,2	31	100	
2.	Support	7	46,7	8	53,3	15	100	
	Total	24		22		46		

Table 5 shows that of the 31 respondents whose husbands did not support TT immunization, 17 respondents did not undergo TT immunization (54.8%), while 14 respondents (45.2%) did undergo immunization. Among the 15 respondents whose husbands supported TT immunization, 7 (46.7%) did not receive the immunization, while 8 (53.3%) did. The chi-square test yielded a p-value of 0.603, indicating no significant association between spousal support and the utilization of TT immunization among pregnant women.

Multivariate selection was performed using bivariate analysis between each independent variable (age, knowledge, attitude, and family support) and the dependent variable (TT immunization utilization status). Candidate variables were identified using simple logistic regression.

Independent variables were included as candidates if the p-value in the bivariate analysis showed a result of $p < 0.25$. If the p-value was > 0.25, the variable could not be included in the multivariate modeling unless it was substantively important. Based on the variable candidate selection, the variables that could be included in the modeling are as follows, as shown in the table below:

Table 6. Selection of Variables as Candidates for Multivariate Analysis of Multiple Logistic Regression

No.	Variabel	P Value	Description
1.	Age	0,537	Not included
2.	Knowledge	0,003	included
3.	Attitude	0,002	included
4.	Spousal support	0,604	Not included

The selection results show that the variables that can be included in the modeling are knowledge and attitude variables, but the family support variable is still included in the multivariate analysis modeling because of its substantive importance as an independent variable. Thus, the independent variables that are candidates for multivariate analysis are knowledge, attitude, and husband support.

Table 7. Stages of Multiple Logistic Regression Testing

Stage	Variable	B	P Value	OR
Stage 1	Knowledge	1,721	0,056	5,590
	Attitude	1,548	0,045	4,700
	Spousal support	1,015	0,211	2,760
	Constant	-2,359	0,008	0,095
Stage 2	Knowledge	1,480	0,076	4,394
	Attitude	1,442	0,056	4,230
	Constan	-1,779	0,008	0,169

The method was conducted in two steps using logistic regression analysis to arrive at the final results. In the first step, all variables were included as multivariate candidates, namely knowledge, attitude, and spousal support. In step 2, the spousal support variable was excluded

because it had the largest p-value of 0.211. However, since the change in OR for the knowledge variable was >10%, the spousal support variable was reintroduced into the model. Thus, attitude is the most dominant factor influencing the utilization of TT immunization among pregnant women at the Terjun Medan Marelan Health Center in 2025, with a p-value of 0.045 and an OR of 4.7. The final results of the multivariate analysis are presented in the table below:

Table 8. Final modeling of multiple logistic regression of independent variables with TT immunization.

Variabel	B	P-value	OR	95% CI
Pengetahuan	1,721	0,056	5,590	0,959-32,591
Sikap	1,548	0,045	4,700	1,032-21,402
Dukungan Suami	1,015	0,211	2,760	0,562-13,542
Konstanta	-2,359	0,008	0,095	

Nagelkerke R Square: 0.389

The logistic regression model obtained is as follows:
Z= -2.359 + 1.721 (Knowledge)+1.548 (Attitude)+1.015 (Support)
Z = -2.359 + 1.721 (1) + 1.548 (1) + 1.015 (1)
Z = -2.359 + 1.721 + 1.548 + 1.015
Z = 1.925

Probability of TT Immunization:
1/(1+e^(-z))
1/(1+ 〖2.72〗 ^(-1.925)) = 0.873 (87%)

The interpretation of the analysis results is: if someone has high knowledge, a positive attitude, and spousal support, the likelihood of receiving TT immunization is 87%. Knowledge, attitude, and spousal support together account for 38.9% of the influence on TT immunization, while the remaining factors are influenced by other factors.

The suitability of the regression model is assessed using the Hosmer and Lemeshow test as one of the primary methods for measuring goodness of fit. This test works by comparing the predicted values from the model with the actual observed values, then testing whether there is a significant difference between the two. If the chi-square significance value is less than 0.05, the model is considered not to fit. Conversely, if the significance value is greater than 0.05, H_0 is accepted, and the model is deemed to fit the data (Ghozali 2018).

a. Overview of Factors Affecting TT Immunization Utilization

Descriptive analysis shows that 52.2% of pregnant women have not received TT immunization, while 47.8% have been immunized, indicating a disparity that requires further study. 54.3% of respondents were in the non-risk age group (20–35 years), but the high proportion of non-immunization in this group suggests that non-age factors play a significant role. Although 63% of respondents had good knowledge about TT, the dominance of negative attitudes (52.2%) indicates a potential gap between cognition and risk perception. A critical finding is the low level of spousal support (only 32.6%), which is suspected to be related to socio-cultural dynamics in household health decision-making.

b. The Relationship Between Age and TT Immunization Utilization

The study results show no relationship between age and TT immunization utilization among pregnant women. These findings align with (Nufus, H., Widya Gani, S., & Fadhil 2022) study on the relationship between age and education with TT immunization compliance among

pregnant women at the Lhoknga Health Center, where non-parametric statistical tests yielded a p-value of 0.692 (<0.05).

The Health Belief Model (HBM) theory explains that health behavior, including immunization utilization, is more influenced by individuals' perceptions of benefits, barriers, and disease threats than demographic factors such as age(Blencowe, H., Lawn, J., Vandelaer, J., Roper, M., & Cousens 2010). In addition, these decisions are also influenced by modifying variables and the presence of cues to action. This is in line with findings that age is not significant in the utilization of TT immunization, as cognitive factors (such as knowledge and attitudes) and social support have a more dominant influence on pregnant women's decisions than biological age.

Non-demographic factors such as knowledge, attitude, and support have a greater influence on the utilization of TT immunization in pregnant women than age. This assumption is supported by statistical analysis results showing no significant relationship between age and immunization utilization (p-value = 0.692 > 0.05)(Dewi, R. K., & Handayani 2021). In line with (Nuraini, L., & Widyastuti 2019) In this study, the age of pregnant women did not show a significant relationship (p > 0.05) with the use of TT immunization, while mothers' knowledge and positive attitudes were strongly related to immunization compliance.

c. The Relationship Between Knowledge and TT Immunization Utilization

Knowledge is a cognitive product obtained through the human sensory process toward specific objects. Actions based on knowledge have a more significant impact on behavior than actions without adequate knowledge (Notoadmojo 2012).

The results of the study indicate that knowledge is significantly related to the utilization of TT immunization among pregnant women. These findings align with the research by (Sugihartati, R., Widodo, Y., & Ningsih 2021), which concluded that there is a relationship between the level of knowledge and compliance with TT immunization.

Mothers who have a good understanding of the vulnerabilities, benefits, and barriers related to TT immunization can increase their compliance and implementation of TT immunization. Based on the analysis of this study, it can be assumed that there is a positive relationship between the level of knowledge of pregnant women about tetanus toxoid (TT) immunization and their compliance in undergoing immunization. This assumption is supported by the finding that respondents with good understanding tend to be more compliant (65.5%) compared to those with insufficient knowledge (17.6%).

d. The Relationship Between Attitudes and the Utilization of TT Immunization

In the context of pregnant women, a supportive attitude toward health stimuli will manifest in the form of acceptance, positive responses, responsibility, or conversely, rejection (Rini Gustina Sari. 2019).

Research findings indicate that the attitudes of pregnant women significantly influence the utilization of TT immunization. These results align with (Fadhila, N. N., Yanti, D. E., & Angelina 2025) study on the relationship between attitudes, family support, and the role of healthcare workers in the administration of tetanus toxoid immunization in Palembang, which showed a p-value of 0.012 (<0.005).

These findings are reinforced by the findings of Wijayanti et al. in (Rini Gustina Sari. 2019), which indicate that pregnant women with positive attitudes toward immunization tend to have supportive responses toward TT immunization administration.

e. The Relationship Between Spousal Support and TT Immunization Utilization

Friedman in (Wardayani 2021) explains that spousal support can be interpreted as a form of interaction in the relationship between husband and wife that occurs reciprocally. Spousal

support is categorized as internal support within the family, while external support originates from outside the nuclear family, although it remains within the broader family network.

The results of the study indicate that spousal support is not significantly associated with the utilization of TT immunization. These findings are inconsistent with the study by Wardayani (2021) on the influence of spousal support on the administration of TT immunization among pregnant women at Resmiah's independent midwifery practice in Talawi Subdistrict, Batubara Regency, which revealed a significant influence as determined by the chi-square test (calculated X^2 > table X^2). Research by (Rahmawati, D., Yuliana, E., & Nurhasanah 2020) also shows that pregnant women who receive spousal support are 2.5 times more likely to undergo TT immunization compared to those who do not receive support.

The high percentage of pregnant women who still undergo TT immunization despite not receiving support from their husbands (45.2%) indicates that health decisions may be more influenced by the awareness and independence of the mother than by the role of the husband. This may reflect the characteristics of a population with a high level of education or health awareness among mothers, or direct intervention from health workers who provide education during antenatal care (ANC) visits.

These results are in line with the research conducted by (Anggraini, L., & Astuti 2020) at the Medan Labuhan Community Health Center, which showed that spousal support was not significantly related to TT immunization compliance (p-value = 0.187). Pregnant women still carry out immunization based on personal awareness and information from health workers.

f. Analysis of Factors Affecting the Utilization of the Tetanus Toxoid (TT) Immunization Program among Pregnant Women at the Terjun Community Health Center in Marelan District

The results of the multivariate logistic regression analysis indicate that the Attitude variable has a significant influence on the completeness of TT immunization, with a p-value of 0.045 and an Odds Ratio (OR) of 4.700. This indicates that pregnant women with a positive attitude are 4.7 times more likely to complete TT immunization compared to those with a less positive attitude, after controlling for the variables of knowledge and spousal support. Although the Knowledge variable has a higher OR (5.590), its significance does not meet the criteria (p-value = 0.056 > α 0.05). Meanwhile, the Husband Support variable was not significant (p-value = 0.211) with an OR of 2.760. Thus, the attitude of pregnant women is the dominant variable influencing the completion of TT immunization in the study area compared to other variables.

These results are consistent with (Fitriani, Suryani, L., Zaman, C., & Nainggolan 2025) study in the Bingin Teluk Health Center area of Musi Rawas Utara District in 2024, which also concluded that the attitude of pregnant women is the most dominant factor in the implementation of TT immunization. This consistency reinforces the theory that attitude (as a domain of behavior) plays a central role in the implementation of preventive health measures, including immunization.

The results of this study are in line with (Maulida 2020) opinion that the attitudes of pregnant women play a role in determining their decision to undergo TT immunization.

These findings are further supported by the research conducted by (Sari, D. P., & Utami 2022)in the Teluk Betung Selatan Public Health Center District, Bandar Lampung City, which showed that the attitudes of pregnant women are the most significant factor in the implementation of Tetanus Toxoid immunization compared to knowledge and family support. In the study, mothers with positive attitudes were 3.9 times more likely to complete TT immunization than those with negative attitudes, with a p-value of 0.032.

g. The results and discussion are consistent with the objectives and research questions stated earlier.

The results and discussion are consistent with the objectives and research questions stated earlier, as the analysis clearly identifies and explains the factors influencing the utilization of TT

immunization among pregnant women at the Terjun Public Health Center. The findings—showing that knowledge and attitude have a significant relationship with immunization uptake, and that attitude is the dominant factor—directly address the research aim of determining the most influential factors. Furthermore, the discussion compares these findings with previous studies, highlighting agreements and differences, thereby strengthening the interpretation and ensuring alignment with the study's initial objectives and questions.

CONCLUSION

Bivariate analysis showed that only the knowledge and attitudes of pregnant women were significantly associated with TT immunization utilization (p=0.002 and p=0.001, respectively), while age and spousal support did not show a significant association (p>0.05). In the multiple logistic regression modeling, after controlling for confounding effects, attitude emerged as the dominant factor (p=0.045; OR=4.7) influencing mothers' decisions to receive TT immunization, despite knowledge and spousal support also being included in the final model; the Nagelkerke R^2 value of 0.389 indicates that 38.9% of the variation in immunization status can be explained by these three variables. Therefore, enhancing positive attitudes toward TT immunization should be the primary focus for increasing immunization coverage among pregnant women at the Terjun Medan Marelan Health Center by 2025.

The results of this study can be generalized to pregnant women in other urban areas with similar socio-demographic and health service characteristics to those of the Terjun Public Health Center, such as comparable access to maternal health services, cultural norms, and education levels. However, generalization should be made with caution, as differences in regional health policies, availability of health workers, and community engagement in immunization programs may affect applicability.

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