Multi-Disciplinary Publishing Institute (SMC-Private) Limited *Special Issue 2025* *Vol. 1, N0. 1*

Submitted: 26 JUL 2023 Accepted: 27 OCT 2025 Published: 29 OCT 2025

Tetanus Toxoid Vaccination Coverage and Associated Factors among Pregnant Women: A Healthcare Study in the Developing Countries

Original Article

Dr. Inayat Ullah Khan Miankhel
Medical Superintendent
Cat D-Hospital Paharpur, Dera Ismail Khan
Department of Health, Khyber Pakhtunkhwa, Pakistan
Email: drinayatminakhel@yahoo.com

Dr. Kesavan Sreekantan Nair
Department of Health Informatics
College of Applied Medical Sciences, Qassim University, Buraydah, Kingdom of Saudi Arabia
Email: k.nair@qu.edu.sa

Abboud Sabriya
Department of Economics
University of California, San Jose, California
United States of America
Email: sabriyaabboud@gmail.com

Dr. Abdul Majid Amin Khetran
MPH Program Department of Public Administration Gomal University, Dera Ismail Khan, Pakistan.
Email: abdulmajidaminkhetran@gmail.com

Citation

Miankhel, I.U.K., Nair, K.S., Sabriya, A., Khetran, A.M.A. (2025). Tetanus Toxoid vaccination coverage and associated factors among pregnant women in the developing countries. *Open Access Public Health and Health Administration Review*, S-1(1), 38-58.

WEBSITE: www.mdpip.com
ISSN: Print: 2959-619X
ISSN: Online: 2959-6203
PUBLISHER: MDPIP

Abstract

Neonatal Tetanus (NNT) is an acute disease that initially has a loss of ability to suck, followed by generalized stiffness and painful muscle spasms, where maternal tetanus is defined as tetanus during pregnancy, where maternal and neonatal tetanus (MNT) are an important cause of maternal and neonatal mortality. This study intends to assess possible reasons that might account for the low immunization coverage of tetanus toxoid vaccine among pregnant women in district Jaffar Abad, Baluchistan. A cross-section study was conducted District Jaffar Abad, Baluchistan. Sample included 372 pregnant women of age group 15 to 49 years and women with children under 12 months. Nonprobability sampling was used. The data was entered into SPSS 16. Among the total respondents, 21.8% were completely immunized against tetanus Toxoid (TT) and have taken more than 2 TT injections during pregnancy. Among demographic characteristics it was found that age remained significantly associated with the completed TT vaccination status ($p<0.05$). Females having more than 20,000 Rs per month household income have better TT vaccination status ($p<0.05$). Females in joint family system have better vaccination status ($p<0.05$), Educated and working female got better TT vaccination status ($p<0.05$). Awareness about tetanus infection among females remained significantly associated with the complete TT immunization status ($p<0.05$) and… It was concluded that the TT vaccination coverage was below the WHO recommendations. The study recommended that stakeholders design and implement appropriate and relevant immunization programs to improve TT vaccination in the study area through routine educational campaign on TT vaccinations as well as on antenatal.

Keywords: Tetanus Toxoid, Vaccination, Pregnant Women, Coverage, Cross-sectional Study.

Introduction

Neonatal tetanus (NNT) is an acute disease that initially has a loss of ability to suck, followed by generalized stiffness and painful muscle spasms as the disease progresses (Lee, Higgins, & Prevedello, 2024; Asmamaw, Debebe Negash, Aragaw, Eshetu, Asratie, & Belachew, 2023). The disease is caused by the tetanus toxin produced by Clostridium tetani. The most common entry point for tetanus spores is the unhealed umbilical cord. Most (90%) of neonatal tetanus cases develop symptoms within the first 3 to 14 days of life, with most patients presenting symptoms at 6-8 days (Kashif, Rahman, Anjum, Ansari, Khan, & Shahzad, 2024; Belizan, McClure, Goudar, Pasha, Esamai, Patel *et al*., 2012). Maternal tetanus is defined as tetanus during pregnancy, or within 6 weeks of the termination of pregnancy (pregnancy ended with birth, miscarriage, or abortion) and has the same risk factors and means of prevention as neonatal tetanus (Taye, Yirsaw, Belete, & Weldearegay, 2024; Hancioglu, & Arnold, 2013); Dietz, Milstein, Loon, & Bennett, 1996). Maternal and neonatal tetanus (MNT) is a main cause of maternal and neonatal mortality, accounting for around 180,000 lives each year in 48 developing countries (Dessie, Zemene, Gebeyehu, Gebeyehu, Adella, Kassie, G.A. *et al*., 2024). In these countries, maternal and neonatal tetanus persists as a public health problem although the disease can be prevented by maternal vaccination with tetanus toxoid vaccine and aseptic obstetric and postnatal care umbilical-cord care practices (Taye, Weldearegay, Yirsaw, Demsie, Asfaw, Teka *et al*. (2025); Midhet & Becker, 2010; Conde-Agudelo, Belizan, & Lammers, 2004).

Neonatal tetanus is estimated to be responsible for more than half a million neonatal deaths worldwide in the early 1980s and estimates suggest that these deaths have been reduced, but still 130,000 babies died around the year 2004 from this very preventable disease (Tetanus Toxoid Vaccinations, Pakistan Demographic Health Survey, Pakistan, 2012-2013). Maximum of the deaths from neonatal tetanus occur in a limited number of large countries with low coverage of skill births and tetanus toxoid vaccination. The high number of maternal expiries in some areas of the world reflects inequalities in access to antenatal care services and highlights the gap between rich and poor. Almost all maternal deaths (99%) occur in developing countries. More than half of these deaths occur in sub-Saharan Africa and almost one third occur in South Asia. The maternal mortality rate in developing countries is 240 per 100,000 births compared with 16 per 100,000 in developed countries (Hasnain, & Sheikh, 2007). Maternal vaccination with TT is recommended and practiced worldwide and has resulted in a decrease in the incidence of maternal and neonatal tetanus (Riaz, Chaudhry, Ahmed, & Hussain, 2013). Tetanus vaccination of pregnant women to prevent neonatal tetanus was included in the WHO Expanded Program on Immunization (EPI) a few years after its establishment in 1974. By contrast with the notable gains in child immunization achieved in the 1980s, only 27% of pregnant women received at least Two doses of tetanus toxoid in 1989 (Naeem, Zia-Ul-Islam, Khan, Abbas, Adil, Khan, Naz, & Usman Khan, 2010).

In recognition of the heavy burden of neonatal tetanus in developing countries, the 1989 World Health Assembly (WHA) implemented a resolution to eliminate neonatal tetanus by 1995, through the increased availability of tetanus toxoid and safe deliveries, and enhanced surveillance. Based on the latest WHO and UNICEF global estimates, the vaccine MNT was introduced as part of routine vaccination in over 1000 countries by the end of 2009 (Naeem, Zia-Ul-Islam, Khan, Abbas, Adil, Khan, Naz, & Usman Khan, 2010). Pakistan is one of the eight high burden countries, accounting for 73% of neonatal tetanus deaths (Baluchistan MICS, 2024). Maternal and neonatal tetanus coverage rates in Pakistan vary with national wide coverage of 41.3% among mothers of children under one year of age (Yasir, Sheree, Shama, & Zulfiqar, 2009). In Pakistan, the maternal mortality ratio (MMR) is highest in rural and less developed provinces. The situation in the Baluchistan province is particularly serious. In Baluchistan, the MMR is 750 maternal deaths per 100,000 live births, compared with 227, 314 and 275 in the other provinces of Punjab, Sindh and Khaybar Pakhtunkhwa respectively (Hasnain, & Sheikh, 2007). The use of routine antenatal care in public health facilities in Pakistan is generally low. According to the Pakistan Demographic Health Survey 2007 (PDHS) only 61% of women had at least one visit and the proportion still falls to 26% for 4 visits (Naeem, Zia-Ul-Islam, Khan, Abbas, Adil, Khan, Naz, & Usman Khan, 2010). The use of ANC services utilization in rural areas is less than 10% (Hasnain, & Sheikh, 2007). In Pakistan, the Expanded Program on Immunization (EPI) routinely recommends two doses of TT vaccine during pregnancy. The percentage of women

receiving two doses of TT vaccine was 56% in 2002, 57% in 2003 (11), 45% in 2004 (512) and 53% in 2006 (Hasnain, & Sheikh, 2007). Vaccination combined with safe delivery methods and full access to the population is the key to success. The percentage of deliveries in rural Sindh and Balochistan is hardest hit by the lowest percentages of TT coverage (33%, 17%) (Yasir, Sheree, Shama, & Zulfiqar, 2009).

The tetanus toxoid (TT) vaccine has been commonly used in the developed countries for decades. Randomized control trials recommend that babies born to mothers with immunity also become protected, so vaccination of women can prevent neonatal tetanus infection. Low TT Vaccination coverage, the leading cause of NT in Pakistan, is due to many factors including the demand failure for TT vaccine due to inadequate knowledge of TT vaccine in females of reproductive age and insufficient information on the benefits of TT provided by health care workers and the media. Other factors related to low immunization coverage include residing in rural areas, lack of formal education, poor knowledge of where and when to get vaccinated, and lack of awareness of the importance of the vaccination. There is a disparity in TT coverage and antenatal 1 care between urban and rural areas due to access and use of health services. NT reports are incomplete, as private sector and rural cases are under-reported (The Expanded Program on Immunization (EPI, Pakistan 2014).

Table 1

Tetanus Toxoid Immunization Schedule for Women of Childbearing Age and Pregnant Women Without Previous Exposure to TT.

Dose of TT (according to card or history)	When to give	Expected Duration of Protection
1	At first contact or early as possible in pregnancy	None
2	At least 4 weeks after TT1	1-3 Years
3	At least 6month after TT2 or according to during subsequent pregnancy	At least 5 years
4	At least one year after TT3 or during subsequent pregnancy	At least 10 years
5	At least one year after TT4 or during subsequent pregnancy	For all childbearing age years and possibly longer

Source: Core information for the development of immunization policy 2002 update. Geneva. World Health Organization, 2002 (document WHO/ V&B/02.28), page 130.

Rationale and Objectives

This study intends to assess possible reasons that might account for the low immunization coverage of tetanus toxoid vaccine among pregnant women in district Barkhan, Balochistan. This study served as a source of information for district health managers for health planning activities and other stakeholders in the reformulation of strategies where necessary to achieve set targets. The aim of the study was to improve maternal and neonatal health in context to tetanus toxoid. The objectives of the study were to assess the coverage of tetanus toxoid vaccination among the pregnant women in union council Rakni, district Barkhan, Baluchistan; to assess the determinants associated with the tetanus toxoid vaccination among the pregnant women in Union council Rakni, district Barkhan Baluchistan, and to assess the difference in factors affecting dropout from TT1 to TT 2 among the pregnant women in Union council Rakni, district Barkhan, Baluchistan.

Literature Review

Several studies have been conducted globally; Most of the studies conducted in developing countries on TT immunization coverage have shown that factors like knowledge, education and place of residence, occupation, religion and ethnicity are significantly associated with low TT immunization coverage.

Pakistan in Perspective

Ansa Riaz, Abid Ghafoor Chaudhry, Aftab Ahmed, and Sajjad Hussain (2013) conducted a study that aimed to explore TT vaccination coverage in pregnant women of childbearing age. Data collection was conducted in two villages. Primary and secondary data collection techniques were used to collect the data from this study. For primary data, a questionnaire technique was used to collect baseline information from respondents and to collect secondary data, the respected area LHWs field dairies were used for the TT vaccination record. The results showed that 90% of the respondents interviewed had received 2 doses of highly recommended TT vaccination during 6 and 7 months of gestation period, 5.00% received only 1 dose and 5.50% did not receive vaccination During pregnancy for personal reasons. Data show that 63.75% of respondents belong to the 15 to 25 age group, while only 2.50% of respondents were in the 36 to 45 age group. The overall literacy rate among respondents was estimated to be 85.00% with different levels of formal education, where 15.00% were considered illiterate. The rate of antenatal visits as data showed that 77.50% of respondents complete their 4 antenatal visits during pregnancy. Based on the findings of this study, it can be concluded that the deployment of health workers in rural areas after a strict surveillance mechanism can dramatically increase the coverage of TT vaccination while making women and newborns immunized against this deadly disease. Increased coverage of immunization will then reduce the rate of maternal and neonatal deaths (Riaz, Chaudhry, Ahmed, & Hussain, 2013). Naeem *et al*. (2010) conducted a cross-sectional study in Peshawar, Pakistan, from 9 June to 19 June 2010. A total of 304 women of reproductive age (17-45 years) were selected in urban and rural areas of Peshawar using random sampling. A structured questionnaire was previously administered to women. Questions were asked about demography, income, husband education, occupation, accessibility to health centers and frequency of visits of health workers. Knowledge and opinions about vaccination were also asked. The results show that 55.6% were vaccinated. The urban population was 54.3% while the rural population was 45.7%. The reasons for not vaccinating were: No sensitization (38.4%), occupied (18.1%), center too far (18.1%), misconceptions (10.86%) and fear of reactions (4. 3%). Most women felt that immunization was effective (89.5%). Maternal/husband education, knowledge and views of women on immunization, income, distance and frequency of health visits were the main factors associated with immunization status. Most women are not vaccinated. Effective media campaigns on immunization against maternal tetanus should be carried out. Women's health workers should be mobilized effectively to increase immunization coverage (Riaz, Chaudhry, Ahmed, & Hussain, 2013).

Shafiq, Yasir & Khowaja, Asif & Yousafzai, Mohammad & Ali, Syed & Zaidi, Anita & Saleem, Ali Faisal (2017) conducted a cross-sectional study in Karachi on knowledge, attitudes and practices related to tetanus toxoid vaccination in women of childbearing age. A total of 307 women were selected from urban areas 192 (62.5%) and 115 (37.5%) in rural areas through non-probability sampling. The demographic framework for this study includes all women who are sites for antenatal care in the third trimester of gestation. Data on demographics and reproductive parameters, such as the number of pregnancies, were collected on a pre-designed questionnaire. Women were asked about TT vaccination, the source of information, the number of TT doses received, and the different reasons for not being vaccinated. The results show that the majority, 231 (75.2%) were illiterate, very few 22 (7.2%) reported the 10 years of education. Overall, 193 (62.9%) of the women vaccinated in these 124 (40.4%) received TT2, this percentage decreases with TT3 and forward. Most respondents 202 (65.7%) had knowledge about the importance of TT vaccination. One hundred and ninety-two (62.5%) respondents receive information on the importance of TT vaccination by health care providers. Very few respondents reported other sources of information such as media, parents / friends and neighbors. Ninety-seven (31.6%) women were vaccinated against TT in the Talika hospital, while 25 (8.1%) 24 (7.8%) and 22 (7.2%) Were vaccinated at the basic health unit, at home by Vaccinator and at private clinic respectively. The most common reason for not being vaccinated was a lack of awareness of the importance of TT vaccination (Hasnain & Sheikh, 2007). A study was conducted to assess the cause of low TT vaccination coverage among pregnant women in the Lahore district. This was a cross-sectional study and a survey of a married woman who had recently given birth. A stratified multistage random sampling technique was used for household identification. A representative sample of 362 married women was selected at random for interviews with households. The questionnaire was divided into five sections to collect information on: the social, demographic, and economic characteristics of women; Information on her last pregnancy; His knowledge about vaccination against TT and the reasons for non-

vaccination. The women's responses were checked from their vaccination card which is a file kept by the client. Result shows the TT coverage of the 362 women who responded to the household survey, 314 (87%) reported receiving at least one TT2 vaccination, but this percentage decreased with TT3 and beyond. Most (99%) of respondents who claimed to have received a TT vaccination were unable to produce the registration card. Of those who received TT2, 263 (84%) had a certain level of education, with only 16% completely uneducated. There was a significant association between immunization status and level of education, participation in antenatal care (yes / no) and number of antenatal care visits. TT2 coverage increased with education level. Approximately 45% of respondents with a metric degree and above had TT2 (P <0.0001). TT2 coverage was higher among respondents who had antenatal care than those who did not.

Respondents who received 3+ antenatal l visits had greater TT2 coverage than those with less than 3 visits. The most common reason for not using TT vaccination (32%) was that women did not know the importance of the TT vaccine, followed by 18% who did not know the right place or time to be vaccinated. More than 90% of the women mentioned that vaccinators and other workers had not visited their homes and had never asked or given any information about TT or offered any services. Some women mentioned that they did not have time to get vaccinated due to the burden of work in the home and that some women also mentioned that they had visited neighboring health centers many times, but no one was there to vaccinate them (Nusrat &Nousheen, 2010).

Methods and Materials

A Cross-sectional survey was conducted on pregnant women of age group 15 to 49 years and women with children under 12 months in Union council Rakni, District Barkhan, Baluchistan was the target population of the current study. A sample size of 372 was calculated using the following formula $n= z^2*p*(1-p)/e^2$ where, n is sample size, Z is standard normal variable (1.96) at 95% Confidence Interval, Prevalence of TT vaccination in Balochistan is (41.3%) and e is the marginal error (0.05). Semi-structured guided questioner was modifying and adapted for data collection regarding the TT vaccination and to meet the objectives of this survey. The questionnaires were filled with the help of two female interviewers. Data collectors were selected based on ability to speak local languages and experience of conducting interviews in the field.

They were trained in questionnaires and interview for 3 days prior to the survey. The training method includes lectures, explanations completed with practical role-playing exercises that focus on the objectives of the survey. Pregnant Women of age group 15 to 49 years and women with children under 12 months in Union council Rakni, District Barkhan, Baluchistan were identified according to inclusion exclusion criteria based on available information and selected in the study based on convenient sampling.

Inclusion Criteria

- Women having pregnancy of above 3 month was included
- Women having children under 12 months was included
- Women of age 15 to 49 years was included

Exclusion Criteria

- Nonresident women of the tehsil Rakni, district Barkhan were excluded

Conceptual Framework and Ethical considerations

In the current study Andersen and Newman's predisposing-enabling-need (PEN) explanatory model was applied to assess the TT immunization status among pregnant and females having child less than one year of age. In the model utilization of TT immunization was determined as a function of three sets of individual characteristics including predisposing (age, level of education, knowledge attitude and practices), Enabling factors (income, employment status) and need characteristics (accessibility to healthcare facility). The study was approved

by IRB (Institutional Review Board) of the Health Services Academy. Official letter was written by health services academy to respective official of the study area.

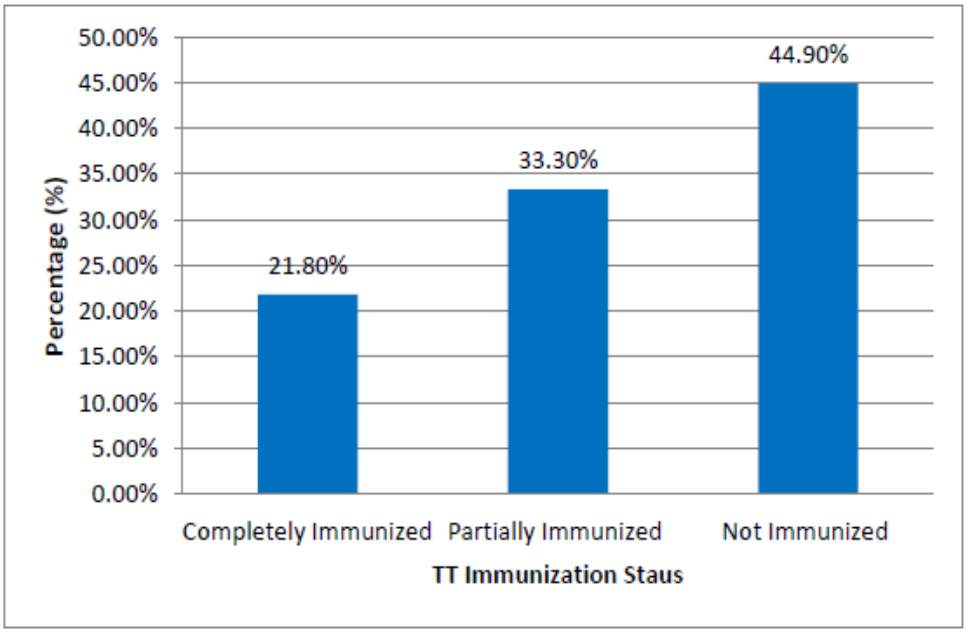
Informed verbal /written consent of the respondents were obtained after giving information and thoroughly explaining the aim of the study to each respondent. The subjects were interviewed in their home individually to maintain privacy. They were not required to give their names. They were informed that they were free to withdraw from participation in the study. They are free to withdraw any time and there is no incentive.

Results and Findings

Among the total respondents 21.8% were completely immunized against tetanus Toxoid (TT) and have taken more than 2 TT injections during pregnancy. 33.3% of respondents remained partially immunized and have taken only one TT injection during pregnancy. Out of the total 44.9% were not immunized and have not administered single TT injection.

Figure 1

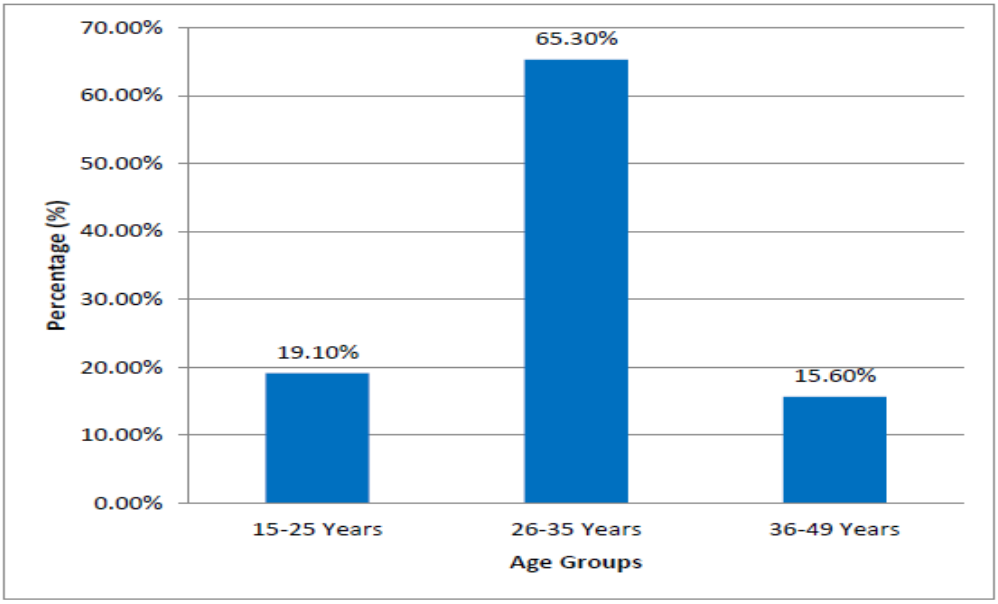
Tetanus Toxoid Vaccination Status among the study Participants (n=372)



Regarding age distribution of the study participants, the maximum (65.3%) remained between 25 years to 35 years age groups followed by 15 to 25 years of age 19.1% and 23 to 49 years of age 15.6%. Figure 2

Figure 2

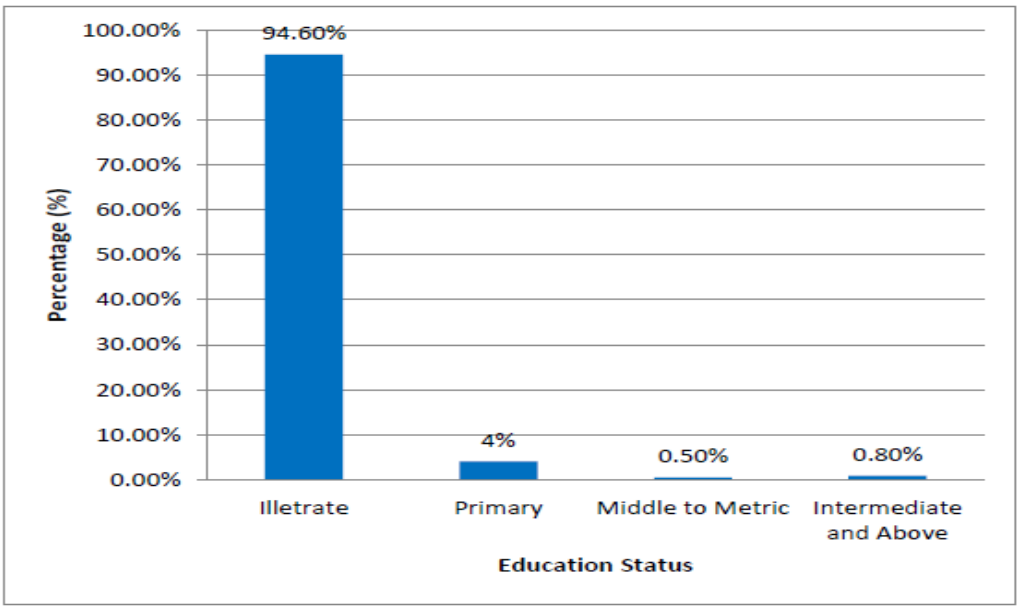
Age distribution of the respondents (n=372)



Among the study participants the majority was illiterate (94.60%), (4%) having an education to the primary level and remaining just get the education to the middle and intermediate and above (0.50%) and (0.80%).

Figure 3

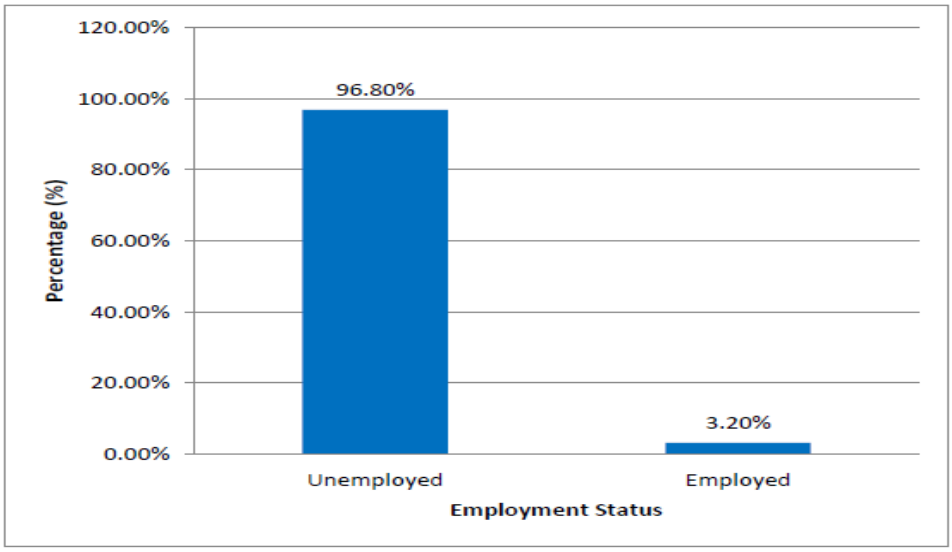
Education Level of the respondents (n=372)



Population in our research were rural and in that type of area majority of the women do not allow to work independently so out of the total 96.8% females were unemployed and the rest 3.2% were employed somewhere.

Figure 4

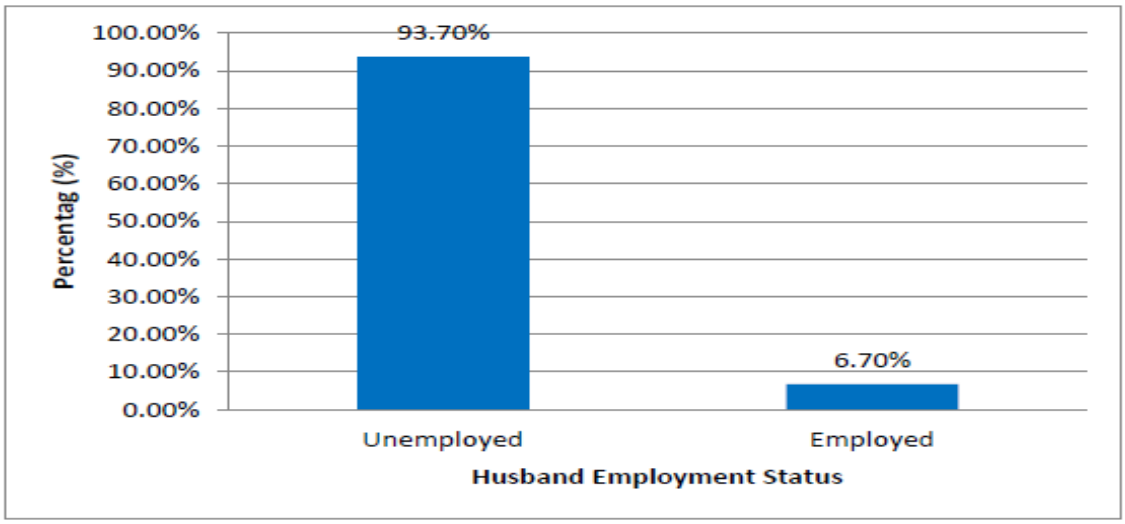
Employment status of the respondents (n=372)



The husbands of the study subjects were unemployed, only a sample proportion 6.7% were employed.

Figure 5

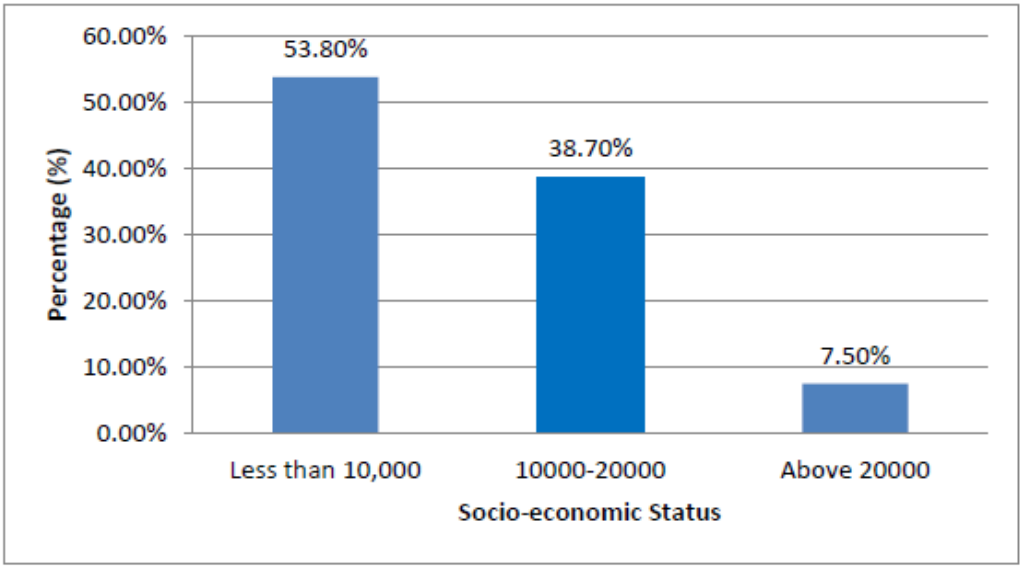
Employment status of the Husband



Out of the total respondents, 53.8% have less than 10,000 Rs monthly household income followed by 38.7% having 10,000-20,000 Rs and only 7.5% respondents have above 20,000 Rs monthly household income.

Figure 6

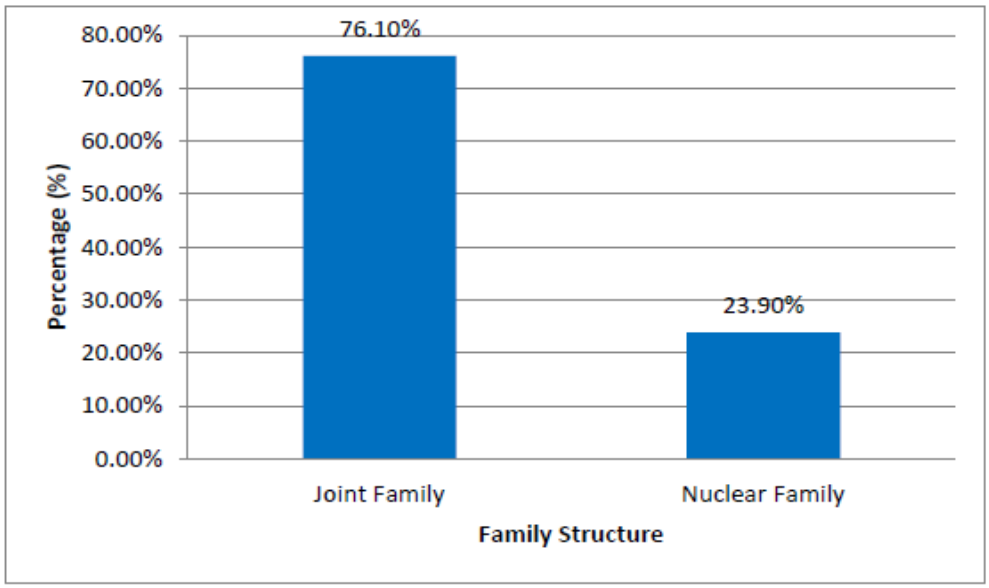
Socio-economic status of the respondents (n=372



Regarding family structure 76.1% were living in joint family system while 23.9% have isolation living.

Figure 7

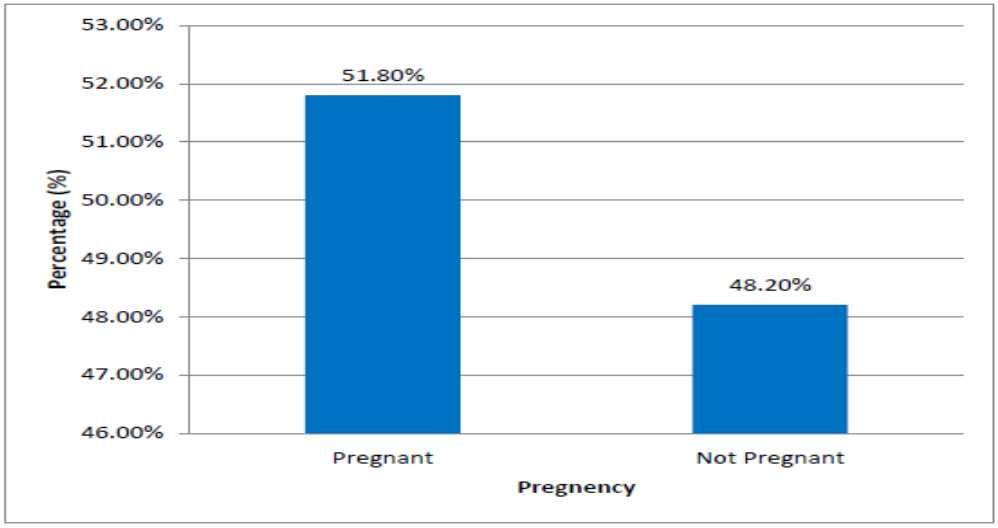
Family structure of the respondents (n=372)



Among the respondents, 51.8% were pregnant while 48.2% have child less than one year.

Figure 8

Pregnancy status of the respondents (n=372)



Respondent's Knowledge Regarding TT Vaccination

Among the respondents 48.1% said that they are aware of tetanus infection while 45.7% said that they are not aware. 57.3% respondents were aware about TT vaccination during pregnancy while 26.1% remained unaware about it. 15.1% respondents said that they were informed about TT vaccination through family and friends, 58.6% if they got awareness from the health care providers while 26% respondent said they got awareness form other different sources. 43% females said that TT vaccination protect mothers and child from tetanus Toxoid, 5.1% told that TT vaccination is the only requirement of the health workers and 51.9% remained fail to provide importance of the TT vaccination. 16.4% respondents have different misconceptions regarding TT vaccination. Out of the total respondents only 52.7% were aware of the number of required during pregnancy.

Table 2

Knowledge about the TT vaccination among the study participants (n=372) Knowledge about the TT Infection

Knowledge about the TT vaccination	Number (%)
Awareness about Tetanus Infection	
• Yes	179 (48.1%)
• No	170 (45.7%)
• Don't Know	23 (6.2%)
Are you aware about TT vaccination during pregnancy	
• Yes	213 (57.3%)
• No	97 (26.1%)
• Don't Know	62 (26.3%)
How you informed about TT vaccination	56 (15.1%)
• Family & Friends	218 (58.6%)
• Healthcare Providers	98 (26.3%)
• Others	
Why TT vaccination important	160 (43%)
• Protect mother & child	19 (5.1%)
• Required by Health Workers	193 (51.9%)

• Don't Know	
Do you have any misconception regarding TT vaccination	
• Yes	61 (16.4%)
• No	308 (82.8)
Know about how many doses of TT vaccines are required during pregnancy	196 (52.7%)
• Yes	108 (29%)
• No	68 (18.3%)
• Don't Know	

Respondent's Practices Regarding TT Vaccination

Among the respondents 47.1% said that they got the TT vaccination care from the health care providers while 52.7% reported that they failed to get card. Among the total, 44.9% never got the TT vaccination, 33.3% got only 1 TT injection and 21.8% got 2 and more TT injections during pregnancy. 44.9% females never got TT vaccination, 30.9% got form BHUs followed by at home by vaccinator 10.2%, DHQ 7.3% and at home by LHWs 6.7%. 44.1**%** of respondents attended antenatal care during pregnancy while rest never got. Only 11% respondents got TT vaccination three and more times, 19% got two-time ANC visits and 14% got only single ANC visit.

Table 3

Practices regarding the TT Vaccination among the study participants (n=372)

Practices	Number (%)
TT Vaccination card provision	
• Yes	176 (47.3%)
• No	196 (52.7%)
How many TT vaccine received during pregnancy	
• TT0	167 (44.9%)
• TT1	124 (33.3%)
• TT2 & above	81 (21.8%)
From where you received TT vaccination	
• Never	167 (44.9%)
• BHU	115 (30.9%)
• At home by LHV	25 (6.7%)
• At home by vaccinator	38 (10.2%)
• DHQ	27 (7.3%)
Attended ANC at during last pregnancy	
• Yes	164 (44.11%)
• No	208 (55.9%)
How many times ANC visits	
• No	208 (56%)
• One time	52 (14%)
• Two times	71 (19%)
• Three or more times	41 (11%)

Reported Health Care Provider's Attitude Regarding TT Vaccination

Among the respondents 40.3% said that the behavior of the health care providers (HCPs) was good, 39.2% said it remained neutral in this regard and 5.9% provided that the behavior of HCPs was bad. 40.3% females said that HCPs provided them with all the necessary facilities to enhance immunization in good atmosphere and 14.8% females said that they never provided good atmosphere. More than 35% respondent remained satisfied with the services provided by HCPs while around 10% females were not satisfied with the HCPs

services. 38% females remained satisfied with the guidance provided by HCPs regarding TT vaccination while 10% remained disagree.

Table 4

Attitude of the Health care providers (n=372)

Practices	Number (%)
How was the behavior of HCP?	
• Good	150 (40.3%)
• Neutral	35 (39.2%)
• Bad	20 (5.6%)
• Never visited	167 (44.9%)
Does the health staff provide you with all necessary facilities to enhance immunization in good atmosphere?	
• Yes	
• No	150 (40.3%)
• Never visited	55 (14.81%)
	167(44.9%)
In general, how would you rate your satisfaction to the level of service for the TT immunization?	
• Highly Satisfy	12 (3.2%)
• Satisfy	139 (37.4%)
• Neutral	21 (5.6%)
• Dissatisfy	31 (8.3%)
• Highly Dissatisfy	2 (0.5%)
• Never visited	167 (44.9%)
Do you think level of guidance by the health provider was sufficient?	
• Strongly disagree	
• Agree	17(4.6%)
• Neutral	130 (34.9%)
• Disagree	23 (6.2%)
• Strongly disagree	33 (8.9%)
• Never visited	2 (0.5%)
	167 (44.9%)

Determinants associated with the TT immunization status Predisposing characteristics associated with TT immunization status

If we investigate table 4A, we found that age remained significantly associated with the completed TT vaccination status. As age of the female increased the complete status, also increase i.e. 15 to 25 years of age group. 12.7% have complete status, 26 to 35 years of age group has 21% and females in 36 years to 49 years have 36.2% complete TT vaccination status during pregnancy ($p<0.05$).), Educated females got better TT vaccination status ($p<0.05$). Awareness about tetanus infection among females remained significantly associated with the complete TT immunization status. 72.4% female were not immunized who were not aware about the TT infection ($p<0.05$). Awareness about TT injection during pregnancy remained significantly associated with immunization status. 81.4% not aware females remained never immunized against TT infection ($P<0.05$). Females got awareness form the health care providers remained more immunized ($p<0.05$).

Table 5

Predisposing characteristics associated with the immunization status (n=372)

Determinants	Completely Immunized (n%)	Partially Immunized (n%)	Not Immunized	P-Value
Age of the participants				
• 15-25 years	9 (12.7%)	21 (29.6%)	41 (57.7%)	0.01*
• 26-35 years	51 (215)	87 (35.8%)	106 (43.2%)	
• 36-49 years	21 (36.2%)	16 (27.6%)	21 (36.2%)	
Family structure				
• Joint Family	71 (25.1%)	88 (31.1%)	124 (43.8%)	0.18
• Nuclear Family	10 (36.2%)	36 (40.4%)	43 (48.3%)	
Education of the mother				
• Illiterate	69 (19.6%)	121 (34.4%)	162 (46%)	0.001*
• Primary	8 (53.3%)	3 (20%)	4 (26.7%)	
• Middle to Matric	1 (50%)	0 (0%)	1 (505)	
• Intermediate & above	0 (0%)	0 (0%)	0 (0%)	
Awareness about Tetanus Infection				
• Yes	58 (32.4%)	85 (47.5%)	36 (20.1%)	0.00
• No	17 (10%)	30 (17.6%)	123 (72.4%)	
• Don't Know	6 (26.1%)	9 (39.1%)	8 (34.8%)	
Awareness about TT vaccine during pregnancy				
• Yes	67 (31.5%)	105 (49.3%)	41 (19.2%)	0.00
• No	8 (8.2%)	10 (10.3%)	79	
• Don't Know	6 (9.7%)	9 (14.5%)	(81.4%)	
			47 (75.8%)	
How you informed about TT vaccine?				
• Family & friends	10 (17.9%)	13 (23.2%)	33 (58.9%)	0.00
• Healthcare providers	61 (28%)	103 (47.2%)	54 (24.8%)	
• Others	10 (10.2%)	8 (8.2%)	80 (81.6%)	
Why TT vaccination important in your point of view				0.00
• Protect mother & child	63 (39.4%)	66 (40.6%)	32 (20%)	
• It is required by health workers	6 (31.6%)	6 (31.6%)	7 (36.8%)	
• Don't Know	12 (6.2%)	53 (27.5%)	128 (66.3%)	

Females having no misconception regarding TT vaccination have better immunization status ($p<0.05$), Females aware about the number of TT injections required during pregnancy remained maximum completely immunized ($P<0.05$). Behavior of the HCPs, HCPs provision of good atmosphere, Females satisfaction level and understanding of the information provided by the HCPs remained significantly associated with the complete immunization status of the females ($p<0.05$).

Table 6

Predisposing characteristics associated with the immunization status (n=372)

Determinants	Completely Immunized (n%)	Partially Immunized (n%)	Not Immunized	P-Value
Do you have any misconception about TT vaccination				
• Yes	6 (9.8%)	11 (18%)	44 *72.1%)	0.00
• No	73 (23.7%)	112 (36.4%)	123 (39.9%)	
Know about how many does of TT vaccination required during pregnancy				
• Yes	76 (38.8%)	90 (45.9%)	30 (15.3%)	0.00
• No	3 (2.8%)	31 (28.7%)	74 (68.5%)	
• Don't Know	2 (2.9%)	3 (4.4)	63 (92.6%)	
How was the behavior of the HCP?				
• Good	43 (28.7%)	78 (52%)	29 (19.3%)	0.00*
• Neutral	2 (8.6%)	3 (8.6%)	29 (82.9%)	
• Bad	2 (10%)	3 (15%)	15 (75%)	
• Never Visited	33 (19.8%)	40 (24%)	94 (56.3%)	
Does the health staff provide you with all necessary facilities to enhance immunization in good atmosphere				
• Yes				
• No	45 (30%)	77 (51%)	28 (19%)	0.00*
• Never visited	3 (5.5%)	7 (12.7%)	45 (81.8%)	
	33 (19.8%)	40 (24%)	94 (56.3%)	
In general, how would you rate your satisfaction to the level of service for TT immunization?				
• Highly satisfied	5 (41.7%)	7 (58.3%)	0 (0%)	0.00*
• Satisfy	39 28.1%)	68 48.9%)	32 (23%)	
• Neutral	2 (9.5%)	6 (28.6%)	13 (61.9%)	
• Dissatisfy	2 (6.5%)	3 (9.7%)	26 (83.9%)	
• Highly dissatisfied	0 (0%)	0 (0%)	2 (100%)	
• Never visited	33 19.8%)	40 (24%)	94 (56.3%)	
Do you think level of guidance by the health provider was sufficient?				
• I strongly agree	3 (17.6%)	10 (58.8%)	4 (23.5%)	0.00**
• Agree	39 30%)	64 (49.2%)	27 20.8%)	
• Neutral	3 (13%)	7 30.4%)	13 (56.5%	
• Disagree	3 (9.1%)	3 (9.1%)	27 81.8%)	
• Strongly Disagree	0 (0%)	0 (0%)	2 (100%)	
• Never visited	33 19.8%)	40 (24%)	94 (56.3%)	

Females having TT immunization card have better immunization status and it was found significantly associated with immunization status (p<0.05). Females attended ANC visits during last pregnancy have better immunization status (P<0.05). Females got vaccination from the BHU showed better immunization status (p<0.05).

Table 7

Predisposing characteristics associated with the immunization status (n=372)

Determinants	Completely Immunized (n%)	Partially Immunized (n%)	Not Immunized	P-Value
Immunization care provision				
• Yes	72 (49.9%)	104 (59.1%)	0 (0%)	0.00*
• No	9 (4.6%)	20 (10.2%)	167 (85.2%)	
How much TT vaccine received during pregnancy?				
• TT0	0 (0%)	0 (0%)	167 (100%)	0.00*
• TT1	0 (0%)	124 (100%)	0 (0%)	
• TT1 & above	81 (100%)	0 (0%)	0 (0%)	
From where you goy TT vaccination?				
• BHU	28 (24.3%)	51 (44.3%)	36 (31.3%)	0.03*
• At home by LHV	6 (24%)	6 (24%)	13 (52%)	
• At home by vaccinator	6 (15.8%)	10 (26.3%)	22 (57.9%)	
• DHQ				
• Never	6 (22.2%)	11 (40.7%)	10 (37%)	
	35 (21%)	46 (27.5%)	86 (51.5%)	
Attended ANC during last pregnancy				
• Yes	60 (36.6%)	80 (48.8%)	24 (14.6%)	0.00*
• No	21 (10.1%)	44 (21.2%)	143 (68.8%)	
How many times are there for ANC visits.	49 (23.6%)	53 (25.9%)	105 (50.5%)	0.00*
• No	11 (17.4%)	17 (28.3%)	31 (54.3%)	
• One time	13 (19.4%)	36 (53.7%)	18 (26.9%)	
• Two times	8 (20.5%)	18 (46.2%)	13 (33.3%)	
• Three or more time				

Enabling Factors associated with the TT Immunization

Females having more than 20,000 Rs per month household income have better TT vaccination status (p<0.05). Mother's employment status remained significantly associated with the TT immunization status (p<0.05).

Table 8

Enabling Factors associated with the TT immunization

Determinants	Completely Immunized (n%)	Partially Immunized (n%)	Not Immunized	P-Value
Monthly income				
• Less than 10,000	30 (15%)	68 (34%)	102(51%)	0.00*
• 10,000-20,000	38 (26.4%)	50 (37.4%)	56 (38.9%)	
• Above 20,000	13 (46.6%)	6 (21.4%)	9 (31.1%)	
Mother's employment				
• Employed	4 (33.3%)	7 (58.3%)	1 (8.3%)	0.03*
• Unemployed	77 (21.4%)	117(32.5%)	166 (46.1%)	
Husband's employment				
• Employed	7 (28%)	10 (403%)	8 (32%)	0.4
• Unemployed	74 (21.3%)	114 (32.9%)	159 (45.8%)	

Need characteristics associated with TT immunization Status

Females living near to the health care facility 65.4% have complete TT immunization status while among females having distance of 3km and more only 10.2% have complete immunization status. Distance of health care facility found significantly associated with the TT immunization status among the female during pregnancy ($p<0.05$). Female having permission of the TT vaccination form their families have better immunization status and found significantly associated ($p<0.05$). Similarly, availability of the transport for health care facility also remained significantly associated with the immunization status ($p<0.05$).

Table 9

Need characteristics associated with the TT vaccination (n=372)

Determinants	Completely Immunized (n%)	Partially Immunized (n%)	Not Immunized	P-Value
How far is healthcare facility				
• 01KM	34 (65.4%)	12 (23.1%)	06 (11.5%)	0.00*
• 02 KM	18 (48.6%)	12 (32.4%)	07 (18.9%)	
• 03 KM & above	29 (10.2%)	100(35.3%)	154 (54.4%)	
Are you allowed for TT vaccination				
• Yes	74 (20.1%)	114 (46.7%)	66 (26%)	0.00*
• No	7 (5.9%)	10(8.5%)	101 (85.6%)	
Transport for HCF available				
• Yes	60 (30.2%)	93 (44.9%)	46 (26%)	0.00*
• No	21 (12.1%)	31 (17.99%)	121 (69.9%)	

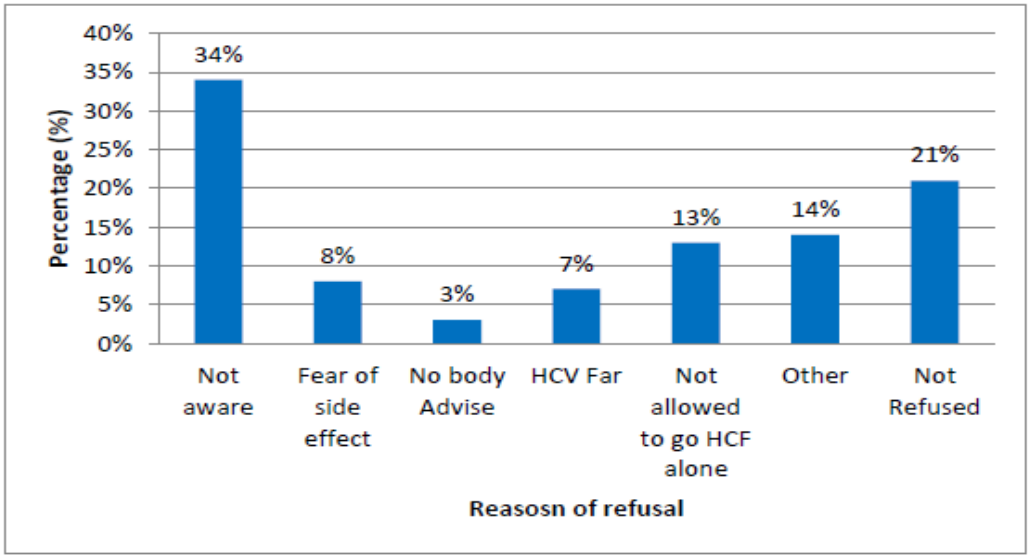
*Statically significant $p < 0.05$

Reported Reasons of Refusal of TT Vaccination

The study respondents provided different reasons of refusal of TT vaccination including now aware 34%, Fear of side effects during pregnancy 8%, no body advised and guided 3%, Far health care facility 7%, not allowed to go alone 13% and some other reasons 14%.

Figure 9

Reasons of refusal of the TT vaccination among the study respondents (n=372)



Discussion

The current study provide that a total 21.8% females were completely immunized against tetanus Toxoid (TT) and have taken 2 and more TT injections during pregnancy. 33.3% of respondents remained partially immunized and have taken only one TT injection during pregnancy. Out of the total 44.9% were not immunized and have not administered single TT injection. The overall percentage of completely immunized females in District Barkhan, Balochistan remained low. According to latest Pakistan Demographic Survey, the percentage of pregnant females received two or more TT injections during last pregnancy were 59% (Nusrat &Nousheen, 2010). According to a survey conducted by Health Department Balochistan the TT vaccination coverage in the Barkhan, Balochistan was 22% among pregnant females (DHIS P: HMIS/DHIS Annual Analysis Report 2010). The current study revealed that age remained significantly associated with the completed TT vaccination status. As age of the female increased the complete status, also increase i.e. 15 to 25 years of age group. 12.7% have complete status, 26 to 35 years of age group has 21% and females in 36 years to 49 years have 36.2% complete TT vaccination status during pregnancy ($p<0.05$). Females having more than 20,000 Rs per month household income have better TT vaccination status ($p<0.05$). Females in joint family system have better vaccination status ($p<0.05$), Educated and working female got better TT vaccination status ($p<0.05$). Similar results were provided by the other published studies. The other studies revealed that literate mothers were about two times more likely to have been immunized than illiterate mothers were; consequently, children born from literate mother were better protected at birth than their counterparts, as found in other studies (Baluchistan MICS, 2004). Another study published has if valid tetanus immunization is also associated with monthly income those who have better were 1.7 times protected than those who earned less monthly income (Nusrat &Nousheen, 2010).

The current study if awareness about tetanus infection among females remained significantly associated with the complete TT immunization status. 72.4% female were not immunized who were not aware about the TT infection. Similarly, other published studies if knowledge about vaccination increases the likelihood of increase vaccination acceptance and reported 65.7% knowledge of women about the importance of tetanus toxoid vaccination and better TT immunization (Yasir, Sheree, Shama, & Zulfiqar, 2009). The current reveled that females attended ANC visits during last pregnancy have better immunization status as number of ANC visits increases chances of better TT immunization increases. Similar results provided by the other studies, according to the Multiple Indicator Cluster Survey (MICS) Balochistan and PDHS 2007 health survey utilization of ANC in rural areas is less than 10% with the standard being at least one visit (DHIS P: HMIS/DHIS Annual Analysis Report 2010). Annual analysis reports of the District Health Information System (DHIS) Balochistan 2010-11 reported 15%registration for ANC in all Balochistan (Baluchistan MICS, 2004). The current study provided behavior of the HCPs, HCPs provision of good atmosphere, Females satisfaction level and understanding of the information provided by the HCPs remained significantly associated with the complete immunization status of the females. HCPs attitude is very important for the TT immunization. Similarly, a published study found that people responsible for managing the vaccination delivery system and in charge of primary health care services also showed that lack of awareness in the community was the most important reason for low TT coverage, other issues associated with management and service delivery such as discouraged health workers and vacant posts of the vaccination staff. These issues should also be addressed, not only to achieve 100% TT2 coverage of the pregnant women but also to increase the immunization coverage of other vaccine- preventable diseases (DHIS P: HMIS/DHIS Annual Analysis Report 2010). The current study if respondents provided different reasons of refusal of TT vaccination including Now aware 34%, Fear of side effects during pregnancy 8%, no body advised and guided 3%, Far health care facility 7%, Not allowed to go alone 13% and some other reasons 14%. Similar results were provided by the published study (Baluchistan MICS, 2004).

Conclusion

It was concluded from the study that tetanus toxoid (TT) coverage is low in district Barkhan Balochistan. Only 21.8% were completely immunized for the TT vaccination among pregnant females as well as females having less than one-year child does. Half of the study participants were not aware about the TT vaccination during pregnancy and have different kinds of misconceptions. It was concluded that the compliance of TT vaccination remained poor among pregnant females and females having child of less than one-year age. It was concluded that various health care facility related factors were involved for poor TT vaccination status. These factors were health care provider's behavior, poor level of guidance for the clients and insufficient arrangements at facility level. Various other factors remained associated with the poor TT vaccination status including age of the clients; as age increases experience also increases and awareness level increases ultimately better vaccination status, better socio-economic status associated with better TT vaccination status. Female living in joint family system have provided better vaccination status because they can get advice or awareness form another experienced person living with them. Educated and working women also showed better immunization status because they have more opportunities to get awareness. Mostly the study target area is male dominant area, females are not allowed to get health care facilities without permission, and females were ignored so the females who have permission have better immunization status. Other management-related factors were availability of nearby heath care facility and availability of transport, which play a vital role in improving their health status.

Recommendations

It is recommended to the stakeholders to design and implement appropriate and relevant immunization programs that will serve to improve TT vaccination in the study area through routine educational campaign on both TT vaccinations as well as on antenatal. Also, mother's immunization for tetanus toxoid vaccine should be given equal attention by all health workers just like the immunization for their children during antenatal care attendance. There should be a policy at hospital level to monitor the behavior and guidance of health care provider for their clients regarding necessary vaccination including TT vaccination. There should be an awareness program for the

Females as well as they're in laws about the importance of TT vaccination in pregnancy and ANC as well. Enough immunization service centers should be available close to the various communities to enable the people to have rapid access to the centers.
circumstances.

Strength of the Study

Similar sex interviewers were used who were local, know the localities, and speaks local languages. Absence of non-response. Furthermore, qualitative design was used to complement the findings.

Limitations

The results of the study are not generalized to the female population of the country because the sample was too small, and the study was performed on a small sample. There is no other group taken for the comparison like from the urban area. Time and budget were limited. There could be recall bias since the women were asked for events within the last five years prior to the survey. However, the most recent births were considered, and local events were utilized to remind them. Selection bias was maximized since it was community-based study with non-probability sampling technique.

Declarations

Ethical Approval and Consent to Participate: This study strictly adhered to the Declaration of Helsinki and relevant national and institutional ethical guidelines. Informed consent was obtained. All procedures performed in this study were by the ethical standards of the Helsinki Declaration.

All procedures were approved by the Ethical Review Committee of Gomal University (GU/ERC/2025/ZI) and followed human welfare standards for the collection and handling of live birds.

Consent for Publication: Here, we, the authors, give our consent for publication.

Availability of Data and Materials: Data will be provided upon written request from the corresponding author.

Competing Interest: There is no conflict of interest among the authors.

Funding: Not applicable.

Authors' Contribution: This research work is a collective effort of all co-authors, and all have reviewed and approved the final version of the manuscript.

Acknowledgement: The authors acknowledge the support of colleagues and respondents in conducting the study.

References

Ansa Riaz, Abid Ghafoor Chaudhry, Aftab Ahmed, and Sajjad Hussain (2013). Coverage of TT vaccination during pregnancy among women of rural areas. A study in village Shah Bollah & Chak Kala, Gujrat. *Sci.Int.(Lahore),* 25(4),1009-1011.

Asmamaw, D.B., Debebe Negash, W., Aragaw, F.M., Eshetu, H.B., Asratie, M.H., & Belachew, T.B. (2023). Spatial distribution and associated factors of poor tetanus toxoid immunization among pregnant women in Ethiopia: Spatial and multilevel analysis. *Front Global Women's Health*, 4, 1138579.

Baluchistan MICS: *Reproductive Health Care of Women*. In. Quetta: 2004

Belizan, J.M., McClure, E.M., Goudar, S.S., Pasha, O., Esamai, F., Patel, A. *et al*. (2012). Neonatal death in low- to middle-income countries: a global network study. *American J Perinatology*. 29(8), 649–56.

Conde-Agudelo, A, Belizan, J.M., & Lammers, C. (2004). Maternal-perinatal morbidity and mortality associated with adolescent pregnancy in Latin America: Cross-sectional study. *American Journal of Obstetrics and Gynecology*, 192, 342–349.

Demographic Health Survey Pakistan (2012-2013). *Tetanus Toxoid Vaccinations, Pakistan.*

Dessie, A.M., Zemene, M.A., Gebeyehu, A.A., Gebeyehu, N.A., Adella, G.A., Kassie, G.A. *et al*. (2024). Hotspot areas of tetanus-unprotected births and its associated factors in Ethiopia: Spatial analysis of EDHS data. *Hum Vaccines Immunotherapeutics*, 20(1), 2298062.

DHIS P: HMIS/DHIS *Annual Analysis Report 2010*. In. Quetta: Health Directorate 2010.

Dietz, V., Milstein, J.B., Loon, F.V., & Bennett, J. (1996). Performance and potency of tetanus toxoid implications for eliminating neonatal tetanus. *WHO Bulletin*, 74: 619-28.

Esen, Berrin, *et al*. (2007). Tetanus immunization status among women of childbearing age in Turkey. Japanese Journal of Infectious Diseases, 60.2/3, 92.

Hancioglu, A., & Arnold, F. (2013). Measuring coverage in MNCH: Tracking progress in health for women and children using DHS and MICS household surveys. *PLoS Med.* , 10(5), e1001391

Hasnain, S., & Sheikh, N. H. (2007). Causes of low tetanus toxoid vaccination coverage in pregnant women in Lahore district, Pakistan. *Eastern Mediterranean Health Journal*, 13(5), 1142-1152

Kashif,T.B., Rahman, U.A., Anjum, U., Ansari, T.M., Khan, A., & Shahzad, F. (2024). Increasing vaccine uptake interventions: Lessons learnt from South Asia. *Journal of Society of Prevention, Advocacy and Research KEMU*. 3(1), 25–33.

Lee, K.S., Higgins, J., & Prevedello, D.M. (2024). Systematic reviews and meta-analyses in neurosurgery part I: Interpreting and critically appraising as a guide for clinical practice. *Neurosurg Rev*. 47(1), 1–11.

Midhet, F. & Becker, S. (2010). Impact of community-based interventions on maternal and neonatal health indicators: Results from a community-randomized trial in rural Balochistan, Pakistan. *Reproductive Health*, 7(1), 30.

Naeem, M., Adil, M., Abbas, S. H., Khan, M. Z., Naz, S. M., Khan, A., & Khan, M. U. (2011). Coverage and causes of missed oral polio vaccine in urban and rural areas of Peshawar. *Journal of Ayub Medical College, Abbottabad: JAMC*, *23*(4), 98–102.

Naeem, M., Khan, M. Z., Abbas, S. H., Adil, M., Khan, A., Naz, S. M., & Khan, M. U. (2010). Coverage and factors associated with tetanus toxoid vaccination among married women of reproductive age: a cross-sectional study in Peshawar. *Journal of Ayub Medical College, Abbottabad: JAMC*, *22*(3), 136–140.

Nusrat, N., &Nousheen, A.M.F. (2010). Tetanus toxoid vaccination coverage amongst pregnant women at tertiary care hospital, Sindh Pakistan. *Gynecology and Obstetrics*, 6, 272-275.

Riaz, A., Chaudhry, A.G., Ahmed, A., & Hussain, A. (2013). Coverage of TT vaccination during pregnancy among women of rural areas. A study in village Shah Bollah & Chak Kala, Gujrat. *Sci. Int. (Lahore)*, 25(4), 1009-1011.

Shafiq Yasir & Khowaja, Asif & Yousafzai, Mohammad & Ali, Syed & Zaidi, Anita & Saleem, Ali Faisal (2017). Knowledge, attitudes and practices related to tetanus toxoid vaccination in women of childbearing age: A cross-sectional study in peri-urban settlements of Karachi, Pakistan. Journal of Infection Prevention. 18.

Taye, B.A., Weldearegay, B.Y., Yirsaw, B.G., Demsie, M.E., Asfaw, F.F., Teka, A.B.., *et al*. (2025). Preference of mode of delivery and associated factors among mothers in East Africa: Systematic review and meta-analysis. *BMC Pregnancy Childbirth*, 25(1), 232.

Taye, B.A., Yirsaw, B.G., Belete, A.K., & Weldearegay, B.Y. (2024). Exploring the determinants of fertility rates in Ethiopia: A decomposition analysis using count regression models with a focus on urban and rural residence, based on the 2019 Ethiopian demographic health survey. *J Health Popul* Nutr. 43(1), 162.

Yasir, P.K. Sheree, Z.B. Shama, M. & Zulfiqar, A.B. (2009). Maternal health and survival in Pakistan: Issues and options. *Journal Obstet Gynaecol Can*, 19(31), 920-929.

Note: **Open Access Public Health and Health Administration Review** is recognized by the Higher Education Commission of Pakistan in the Y category.

Disclaimer/ Publisher's Note: The statements, opinions, and data contained in all publications in this journal are solely those of the individual author(s) and not of the MDPIP and/ or the editor(s). MDPIP and editor(s) disclaim responsibility for any injury to the people or property resulting from any ideas, methods, instructions, or products referred to *in the content.*