The Incidence Rate of Neonatal Deaths/Abortion in Pregnant Females Infected with Toxoplasma Gondii in District Torghar: A Retrospective Study

Saddam Hussain[1], Abeera Zafar[2], Muhammad Wajahat[3*], Assad Rehman[4], Ahsan Naeem[5], Syed Sohail Ahmad[6] Sana Jalal[7], Hilal Ahmad[8], Naveed Shah[9], Sajjad Hussain[10] Imranullah Rahimi[11] Fahim Ullah[12] Tufail Muhammad[13] Wali ur Rehman[14] Adnan Hussain Tanoli[15] Rahmuddin Ihsas[16] Shah Zeb[17*]

[1] FCPS II in General Surgery at ST2-IMG Scholarship Program, Royal College of Surgeon Ireland.

[2] Consultant gynaecologist at King Edward Medical University, Lahore 54000.

[3, 5, 9, 10, 11, 15, 17] Faculty of Biomedical & Health Sciences, Department of Microbiology, University of Haripur, Haripur 22620.

[4, 7] Faculty of Biomedical & Health Sciences, Department Medical Lab Sciences, University of Haripur

[6, 8, 12] Department of Microbiology, Hazara University, Mansehra 21300.

[13] Department of Medical Lab Technology, Abdul Wali Khan University, Mardan 23200.

[14,] Lecturer at Department of Health Sciences, City University of sciences and Information Technology, Peshawar 25000.

[16] Lecturer at Department of Biology, Sayesd Jamaluddin Afghani University, Kunar, Afghanistan.

[17] Medical Microbiologist at Department of Microbiology & Infection Control, Pakistan Kidney and Liver Institute & Research Center, Lahore 54000.

Correspondence

***Shah Zeb**

Email: microbiologist018@gmail.com

ORCID: https://orcid.org/0000-0002-5156-9243

***Muhammad Wajahat**

Email: 397wajahat@gmail.com

Abstract

Toxoplasma gondii, a parasite that consists of only one cell, is the agent that causes toxoplasmosis, often known as the toxoplasmosis infection. The retrospective study was conducted on 350 pregnant females at different Basic Health Units of the District Torghar from July 2020 to August 2022. Toxoplasma gondii screening using Toxoplasma IgG/IgM cassettes (LINEAR) and Rapid Labs' Toxoplasmosis Latex Test Kit. We added data from 350 positive pregnant females such as the first trimester 152, 43.3%, second trimester 113, 32.2%, and third

trimester 85, 24.2%. The mean of neonatal deaths/abortion in pregnant females was calculated as 116.6, SD 27.47 and Variance, σ2 was observed as 754.88 against 95%, 1.960σ$\bar{x}$, 116.6667 ±31.091 (±26.65%). The mean of affected age groups with Toxoplasmosis was calculated as 87.5, SD 19.65 and Variance, σ2 was observed as 386.25 against 95%, 1.960σ$\bar{x}$, 87.5 ±19.26 (±22.01%). The mean of Positive cases of Toxoplasmosis reported by BHUs was calculated as 70, SD 36.98 and Variance, σ2 was observed as 1368 against 95%, 1.960σ$\bar{x}$, 70 ±32.42 (±46.31%). The mean of Neonatal deaths/abortion by Toxoplasmosis was calculated as 58.33, SD 54.7 and Variance, σ2 was observed as 2998.55 against 95%, 1.960σ$\bar{x}$, 58.3333 ±43.816 (±75.11%). The mean of Neonatal deformities caused by Toxoplasmosis was calculated as 8.2, SD 3.70 and Variance, σ2 was observed as 13.76 against 95%, 1.960σ$\bar{x}$, 116.6667 ±130.256 (±111.65%). The n=350 patients tested positive for IgG 46 (13.1%), IgM 279 (79.7%), and IgG/IgM 25 (7.1%). The mean of Toxoplasmosis antibodies (IgG, IgM, IgG/IgM) was calculated as 116.6, SD 115.1 and Variance, σ2 was observed as 13249.5 against 95%, 1.960σ$\bar{x}$, 8.2 ±3.251 (±39.65%). The mean of Lifestyle/nature of patients was calculated as 72, SD 23.2 and Variance, σ2 was observed as 542 against 95%, 1.960σ$\bar{x}$, 72 ±26.345 (±36.59%). Our study findings suggested that Lack of health facilities, lack of knowledge of Toxoplasmosis transmission, infection and prevention, medical education, and awareness is contributing pillar of the infection and neonatal deaths.
Keywords: Toxoplasma gondii, Seroprevalence, Risk factors, District Torghar, Pregnant Women, Abortion/Deaths

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Introduction

Toxoplasmosis is a contagious condition that can affect both humans and animals and is caused by the protozoan parasite called Toxoplasma gondii (Saadatnia and Golkar, 2012). Toxoplasmosis is transmitted by infected animals to humans (Dubey and Beattie, 1988). The vast majority of acquired cases of toxoplasmosis are symptomless and harmless. Depending on the geographic location and their age, more than fifty percent of adults would have antibodies that would protect them from contracting a new infection (Dunay et al., 2018). Forms of the disorder that are present at birth have the potential to be lethal, and they can cause mental impairment, eye illness, and the death of newborns (Pinto-Ferreira et al., 2019). The parasite has been linked to the development of some forms of eye disease in adults; those with impaired immune function are at an increased risk of developing these diseases (Aguirre et al., 2019).

Toxoplasma gondii, a parasite that consists of only one cell, is the agent that causes toxoplasmosis, often known as the toxoplasmosis infection (Stelzer et al., 2019). Toxoplasma is a parasite that can afflict more than 30-40 million people in the United States, even though it can be found all over the

world (Elsheikha et al., 2020). Within the bodies of humans and other animals, the parasite known as toxoplasma can survive for a very long period and even possibly for a lifetime (Dubey et al., 2020). However, only a small percentage of people who are infected will show symptoms since the immune system of a healthy person normally stops the parasite from causing illness (Onduru and Aboud, 2021). Toxoplasmosis of the eye can cause symptoms such as blurred vision (Brandão-de-Resende et al., 2020), reduced eyesight (Sienicka, 2022), pain (which is sometimes exacerbated by strong light), redness of the eye (Marín et al., 2018), and even occasional tear production (De-la-Torre et al., 2014). Eye physicians will occasionally recommend medicine to their patients who are unwell to provide treatment (London et al., 2011). Whether or not therapy is recommended for an ocular infection will depend on the severity, location, and characteristics of the infection, such as whether it is acute and active or chronic and not progressing (Atmaca et al., 2004). A specialist in ophthalmology will be able to provide the most effective treatment for toxoplasmosis of the eye (Thieme et al., 2019).

Methodology

Study area

The retrospective study was conducted at different Basic Health Units of the District Torghar from July 2020 to August 2022.

Selection of patients

We used data from around 350 patients for the research project. Every one of them was organized into several groups depending on age, sex, and area.

Ethical approvals

The Ethical approval was released from the District Health Officer District Torghar under the registration no. DHO/2022/Misc/3211. The concerned officer permits us to direct the clinical analysis of the patient's information under the act and regulations of ethics.

Toxoplasma antibodies (IgG/IgM Combo) Rapid Test

Toxoplasma gondii screening using Toxoplasma IgG/IgM cassettes (LINEAR). Toxoplasma IgG/IgM-reactive samples should be confirmed by diagnostic and clinical data. Lateral flow chromatographic immunoassay for Toxoplasma IgG/IgM. The test cassettes are made up of cellulose acetate membrane strips with two test bands, IgM and IgG, as well as a control C band, and a maroon conjugation cushion with rabbit IgG-gold adjuvant and recombinant T. gondii antigens coupled to colloidal gold (Toxoplasma gondii conjugates). Monoclonal anti-human IgM is pre-coated on the M band, immunoassay reagent is pre-coated on the G band, and a control line antibody is pre-coated on the C band to detect IgM anti-Toxoplasma gondii antibodies (Liesenfeld et al., 2001).

When the sample well is full, capillary action spreads the sample throughout the test cassette. The immunocomplex is captured on the membrane by the pre-coated anti-human IgM antibody, resulting

in a burgundy M line that indicates a positive or reactive Toxoplasma gondii IgM test result. Conjugates of materials will bind to IgG anti-Toxoplasma gondii. The immunocomplex is captured by the pre-coated reagents on the membrane, and a burgundy G line appears, signifying a positive or reactive Toxoplasma gondii IgG test. A non-reactive response is shown by no T lines (M and G). Regardless of T line color development, the internal control (C band) should display a burgundy immunocomplex of the control line antibodies gold conjugate. A fresh device must test the specimen if the test result is invalid (Wilson et al., 1997).

Toxoplasma Latex Test (Rapid Labs®)

Rapid Labs' Toxoplasmosis Latex Test Kit is a slide agglutination test that can qualitatively and semi-quantitatively detect anti-toxoplasma immunoglobulin. This test is available through the company's website. Adhesive particles that are covered with aqueous Toxoplasma gondii antigens generate an agglutination when coupled with specimens that have anti-Toxoplasma antibodies (Jiang et al., 2008). Rapid Labs Limited is a manufacturer and provider of diagnostic instruments and laboratory supplies for both human and veterinary medicine, and the company is seeing rapid expansion. They are a principal supplier that is privately run in the United Kingdom and they provide a global network of distributors, agents, and non-governmental organizations. They can provide comprehensive supply solutions for any diagnosing chemical requirements because of the collaborative efforts of all departments.

The mission is to provide consumers with a comprehensive assortment of cutting-edge diagnostics, excellent client assistance, and high-quality glassware while upholding the highest possible levels of customer satisfaction standards. They are overjoyed to be of assistance to researchers all over the world because they are steadfast in their belief that individuals should be afforded the option to receive high-quality medical treatment at a reasonable price.

Statistical significance

The documented Data such as (Age, sex, Areas, Medical history, and routine Questions were interpreted through Microsoft Excel by applying specific formulas such as Mean and standard deviation, variance, and Cl95% for demographic data as well as Toxoplasma gondii serological markers like IgG and IgM

Results

The retrospective study was conducted at different Basic Health Units of the District Torghar from July 2020 to August 2022.

Demographics

We added data from 350 positive pregnant females such as first trimester 152, 43.3%, second trimester 113, 32.2%, and third trimester 85, 24.2%. The mean of neonatal deaths/abortion in pregnant

females was calculated as 116.6, SD 27.47 and Variance, σ2 was observed as 754.88 against 95%, 1.960σx̄, 116.6667 ±31.091 (±26.65%).

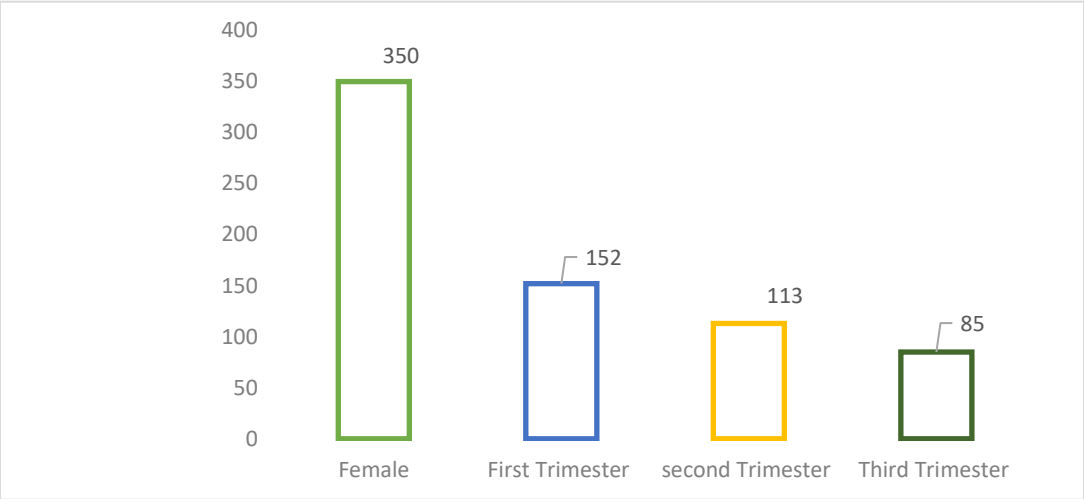

Figure no.1 Distribution of neonatal deaths/abortion in pregnant females infected with Toxoplasma gondii

Whereas the age groups such as 18-25years (73, 20.8%), 26-33years (121, 34.5%), 34-41years (74, 21.1%) 42-50 years (82, 23.4%). The mean of affected age groups with Toxoplasmosis was calculated as 87.5, SD 19.65 and Variance, σ2 was observed as 386.25 against 95%, 1.960σx̄, 87.5 ±19.26 (±22.01%).

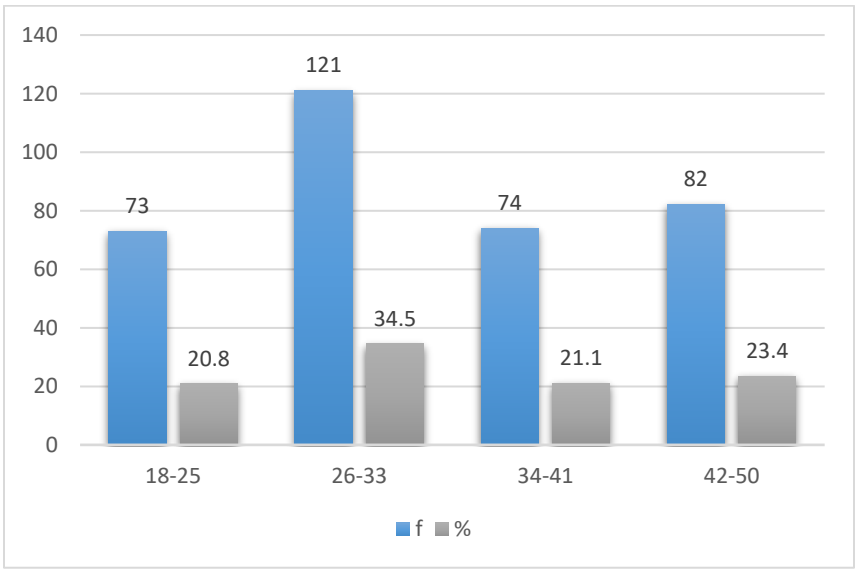

Figure no.2 Distribution of affected age groups with Toxoplasma gondii

Toxoplasmosis reporting stations

We included different Basic Health Units of the District Torghar named Kamesar 137 (39.1%) Darbanai 64 (18.2%), Maira 53 (15.1%), Palosa 71 (20.2%), and Judba 25 (7.1%). The mean of Positive cases of Toxoplasmosis reported by BHUs was calculated as 70, SD 36.98 and Variance, σ2 was observed as 1368 against 95%, 1.960$\sigma\bar{x}$, 70 ±32.42 (±46.31%).

We observed Toxoplasma gondii incidence rate in infected patients and compare them within 2020, 2021 and 2022 and between the 2020, 2021 and 2022 by One-Way ANOVA. But we ot found non-significant comparison (negative results).

Table no.1 Comparative analysis of Toxoplasma gondii incidence rate of 2020, 2021 and 2022 by One-Way ANOVA

Study Variables	SS	df	MS	F=ratio	P=value
Between 2020, 2021, 2022	388.9333	2	194.4667	F = 0.76956	.484
Within 2020, 2021, 2022	3032.4	12	252.7		
Total	3421.3333	14			

SS (sum of squares deviation of data), df (Difference), MS (the mean sum of squares of data), F (the F-statistic)

Post Hoc Tukey Test

We analyzed the Toxoplasma gondii incidence rate of 2020, 2021 and 2022 by Post Hoc Tukey HSD. We compared the 2020 with 2021, 2020 with 2022, and 2021 with 2022 to find out the difference in different pairs. The standardized range statistic (q), the critical values for q corresponding to alpha = .05 (top) and alpha =.01 (bottom).

Table no.9 Pairwise difference, comparison and Toxoplasma gondii incidence rate of 2020, 2021 and 2022 by Post Hoc Tukey HSD

Pairwise Mean	Difference in pairs	Q	P=value	Alpha (Top)	Alpha (Bottom)
2020=18.60 2021=21.00	2.40	Q = 0.34	p = .96915	.05 = 3.7729	Q.01 = 5.0459
2020=18.60 2022=30.40	11.80	Q = 1.66	p = .49011		

2021=21.00 **2022=30.40**	9.40	Q = 1.32	(p = .62959)		

The standardized range statistic (q), the critical values for q corresponding to alpha = .05 (top) and alpha =.01 (bottom).

Toxoplasmosis in 2020

We plotted Toxoplasmosis positive cases in different Basic Health Units of the District Torghar for 2020, in which Kamesar 41, Darbanai 31, Maira 4, Palosa 16, and Judba 1. The mean of Positive cases of Toxoplasmosis reported by 2020 was calculated as 18.6, SD 15.39 and Variance, σ2 was observed as 237.04 against 95%, $1.960\sigma\bar{x}$, 18.6 ±13.495 (±72.56%).

Toxoplasmosis in 2021

We plotted Toxoplasmosis positive cases in different Basic Health Units of the District Torghar for 2021, in which Kamesar 37, Darbanai 22, Maira 19, Palosa 21, and Judba 6. The mean of Positive cases of Toxoplasmosis reported by 2021 was calculated as 21, SD 9.85 and Variance, σ2 was observed as 97.2 against 95%, $1.960\sigma\bar{x}$, 21 ±8.642 (±41.15%).

Toxoplasmosis in 2022

We plotted Toxoplasmosis positive cases in different Basic Health Units of the District Torghar for 2021, in which Kamesar 59, Darbanai 11, Maira 30, Palosa 34, and Judba 18. The mean of Positive cases of Toxoplasmosis reported by 2022 was calculated as 30.4, SD 16.4 and Variance, σ2 was observed as 272.4 against 95%, $1.960\sigma\bar{x}$, 30.4 ±14.463 (±47.57%).

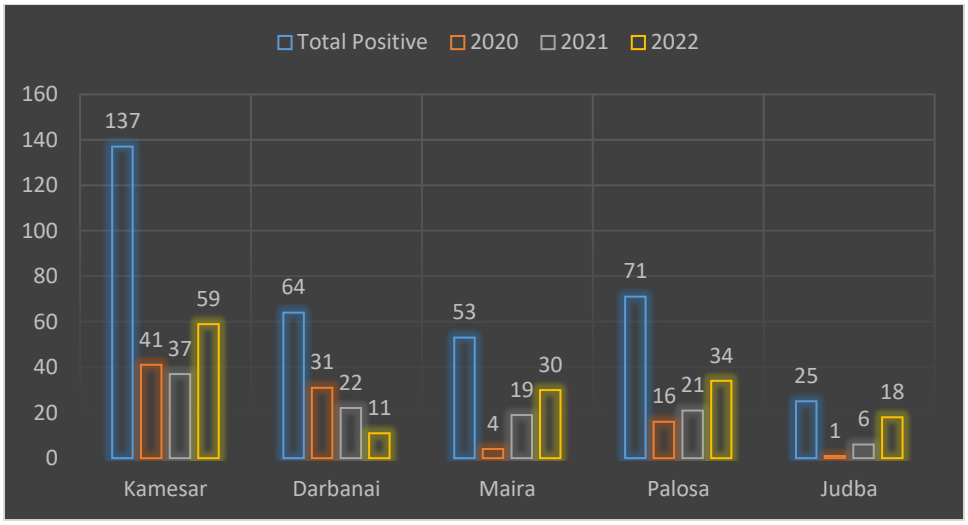

Figure no.3 Positive cases of Toxoplasma gondii reported by BHUs

Neonatal deaths/abortion by Toxoplasmosis

We survey n=350 pregnant female medical histories under the act and regulation of the concerned institution body. We renowned different rates of neonatal deaths/abortion caused by Toxoplasmosis including Abortion was attempted in 178 pregnant females, neonatal deaths after 1 Month in 51 females, neonatal deaths after 2 Months in 12 females, neonatal deaths after 3 Months in 37 females, neonatal deaths after 1 Year in 39 females, and neonatal deaths after 1.5 Year in 33 females. The mean of Neonatal deaths/abortion by Toxoplasmosis was calculated as 58.33, SD 54.7 and Variance, σ2 was observed as 2998.55 against 95%, 1.960$\sigma\bar{x}$, 58.3333 ±43.816 (±75.11%).

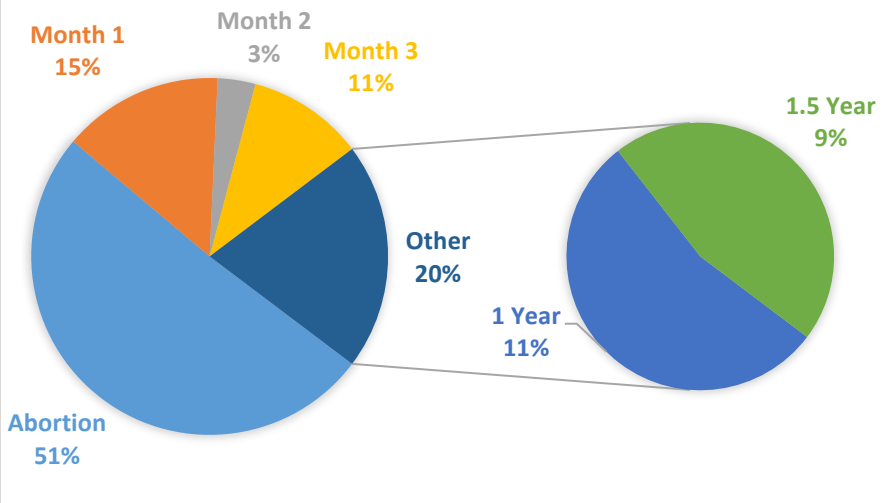

Figure no.4 Neonatal deaths/abortion calendar caused by Toxoplasma gondii

Clinical Manifestation

We used the clinical history of pregnant females including Fever was screened in 84%, Headache experienced by 100%, Body aches experienced by 100%, and Fatigue experienced by 71%.

Ultrasonography examination

We also documented remarks of concern medical practitioners against the deformed pregnancy in females with infection of Toxoplasma gondii such as hepatosplenomegaly observed in 13%, hydrocephalus seen in 1%, seizures seen in 3%, microcephaly seen in 1%, and Mismatch Blood group recorded in 16%. The mean of Neonatal deformities caused by Toxoplasmosis was calculated as 8.2, SD 3.70 and Variance, σ2 was observed as 13.76 against 95%, 1.960$\sigma\bar{x}$, 116.6667 ±130.256 (±111.65%).

Serological markers

All the patients were screened for Toxoplasmosis antibodies test called serological markers. The concerned medical practitioner recommended Toxoplasmosis antibodies (IgG, IgM, and IgG/IgM) tests. The n=350 patients tested positive for IgG 46 (13.1%), IgM 279 (79.7%), and IgG/IgM 25 (7.1%). The mean of Toxoplasmosis antibodies (IgG, IgM, IgG/IgM) was calculated as 116.6, SD 115.1 and Variance, σ2 was observed as 13249.5 against 95%, 1.960$\sigma\bar{x}$, 8.2 ±3.251 (±39.65%).

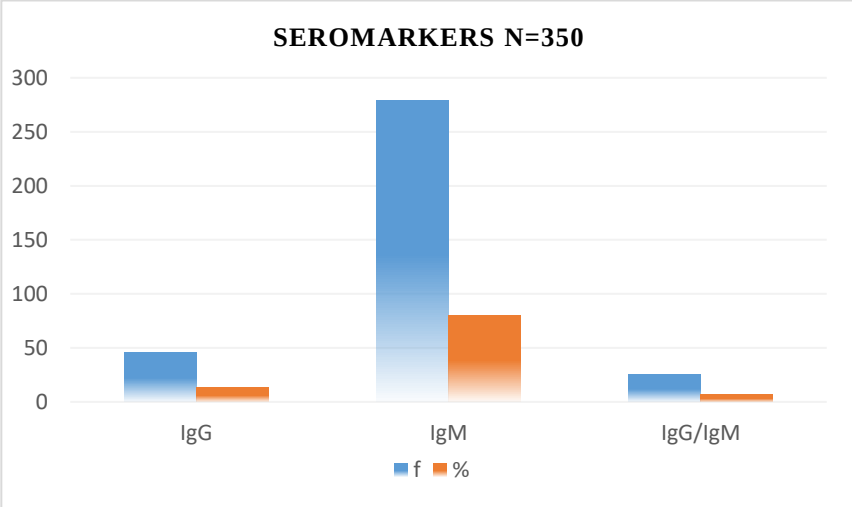

Figure no.5 Seroprevalence of Toxoplasma gondii in pregnant females

Lifestyle/nature of the patients

All of the patients were belong to a hilly area, mud house, and low resources, and they had close contact with domestic animals such as Cats nurture in 43%, Buffalo 100%, Goat in 100%, and Dogs nurture in 73%. The mean of Lifestyle/nature of patients was calculated as 72, SD 23.2 and Variance, σ2 was observed as 542 against 95%, 1.960$\sigma\bar{x}$, 72 ±26.345 (±36.59%).

Discussion

Toxoplasma infection can have significant deleterious effects on a person's health, especially if they are pregnant or have a compromised immune system. Therefore, individuals in these categories should exercise extreme caution.

The vast majority of newborns who contracted an illness while their mothers were still alive during pregnancy do not display any abnormalities when they are born; nonetheless, these newborns may later develop problems as adults. Only a small percentage of neonates affected by this condition have serious visual or brain impairments at birth.

We documented a higher rate of neonatal abortion in the first trimester 152, 43.3% due to new marriage, lack of education, lack of advanced healthcare facilities, lack of medical and health knowledge and lack of counselling. The highly affected age group was 26-33years (121, 34.5%) (Rehman et al., 2021).

We found the Kamesar 137 (39.1%) as highly affected and reported Basic Health Units of the District Torghar. The neonatal deaths/abortions increased by the time and age group. They were residents of a rural, hilly area, with fewer facilities, no proper drinking water sources, travel for medical examination from one region to another and a lack of guidance regarding toxoplasmosis transmission (Ali et al., 2021).

We renowned different rates of neonatal deaths/abortion caused by Toxoplasmosis including Abortion was attempted in 178 pregnant females, due to ultrasonography reports, active signs & symptoms, detected toxoplasma gondii antibodies in the blood (Hanif, 2017).

Hydrocephalus, seizures, microcephaly, and Mismatch Blood groups were reported in pregnant females with toxoplasmosis infection. Hydrocephalus and microcephaly were found in neonatal after birth and during the 3rd trimester of the pregnancy. Few babies die at the age of 1 year or 1.5 years due to deformities caused by the toxoplasma gondii (Khan et al., 2011).

The higher seromarker of Toxoplasmosis was IgM 279 (79.7%). They tested positive for the first time or newly positive for Toxoplasma gondii whereas the low zero markers was IgG 46 (13.1%). They were previously exposed and had no signs and symptoms of Toxoplasmosis but they lost rapidly their babies during pregnancy or after birth at the age of months or year (Ahmad et al., 2014).

The main risk factors we observed in the affected area were domestic animals such as cats, dogs and buffalos. The mismatched blood group in parents, drunk water from open ponds and lacks where domestic animals can reside and can contaminate the water used field vegetables, poor sanitation, lack of sources, lack of knowledge, education and medical/health activities (Perveen and Shah, 2017), (Abbas et al., 2021, Bamba et al., 2017).

Conclusion

Our study findings suggested that Lack of health facilities, lack of knowledge of Toxoplasmosis transmission, infection and prevention, medical education, and awareness is contributing pillar of the infection and neonatal deaths. Ponds, lack of water, and domestic animals may be the source of the infection.

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