

Effect of Educational Instructions on Pregnant Women's Knowledge and Attitudes regarding Toxoplasmosis

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Abstract

Background: Toxoplasmosis is one of the most dangerous infections during pregnancy that is associated with severe life-threatening complications. *The aim of this study* was to evaluate the effect of the educational instructions on pregnant women's knowledge and attitudes regarding toxoplasmosis. **Subjects and methods:** A quasi experimental study design was utilized. This study was conducted at the antenatal units (inpatient and outpatient) of obstetric departments of Tanta University hospitals and El-Menshawy hospital. A purposive sample of 100 pregnant women was included in the study. Two tools were used; **Tool I:** Pregnant women's knowledge regarding toxoplasmosis. **Tool II:** Pregnant women's attitudes regarding toxoplasmosis. **Results:** More than four fifths (83.0%) of the studied pregnant women had low level of knowledge regarding toxoplasmosis pre the educational instructions while most (93%) of them had high level of knowledge immediately with slight decrease one month post implementation of the educational instructions and nearly one fifth (18%) of them had positive attitude regarding toxoplasmosis pre the educational instructions compared to most (90%) of them immediately which becomes (97%) one month post the educational instructions. **Conclusion:** The studied pregnant women's knowledge regarding toxoplasmosis had significantly improved immediately with slight decrease one month post implementation of the educational instructions and they had positive attitudes regarding toxoplasmosis immediately with obvious improvement one month post implementation of the educational instructions. **Recommendations:** The mass media should be utilized to disseminate correct and relevant information about toxoplasmosis to women, families, and the community.

Keywords: Toxoplasmosis, Educational Instructions, Knowledge, Attitudes,

Introduction

Toxoplasmosis is among the most famous parasitic zoonosis in the world. It is the first infection of the TORCH complex (Toxoplasmosis, Rubella, Cytomegalovirus and Herpes simplex) and is one of the most important congenital diseases. Toxoplasmosis is caused by *Toxoplasma gondii* that is intracellular protozoan with a single-cell which infects animals and human (De Barros et al., 2022; Tabasi F. (2020) 2020).

Worldwide, it is estimated that primary maternal toxoplasmosis infection occurs in 0.1% to 0.8% of pregnancies, resulting in 1 to 120 cases of congenital toxoplasmosis per 10,000 births (Nessim, Luna-Ramirez, Moreno-Gómez, Galvis-Soto, & Gomez-Marin, 2023; Stokkermans & Havens, 2022). Additionally, the WHO estimates that every year there are over a million cases of toxoplasmosis in the European region caused by contaminated food.

In Egypt, toxoplasmosis sero-prevalence among pregnant women reached more than 50% in certain governorates (Senosy, 2020). In Dakhalia governorate, a statistically significant higher prevalence of protozoan *Toxoplasma gondii* infection was found in the studied women (61.85%) (Hassan, 2018).

The source of infection with *Toxoplasma gondii* can be acquired through oocysts from cat feces which may be present in the soil, water, or food, eating raw or poorly cooked meat and it can be transmitted vertically to the fetus via the placenta. Also, *Toxoplasma gondii* infection can also be acquired by blood transfusion and organ transplantation. The definitive hosts of *T. gondii* infection are cats and the intermediate hosts of *T. gondii* infection are all warm-blooded animals (Ismail & Al-Kafri, 2023; Stokkermans & Havens, 2022).

Although one-third of the world's population is infected with the toxoplasmosis, it often remains unrecognized, as most women do not exhibit symptoms. Women might experience nonspecific flulike symptoms including fever, headache, muscle pain, and lymphadenopathy. So, serological screening in routine prenatal care is essential for early diagnosis and identification of susceptible pregnant women to reduce the risk of complications (David, S. A., Kela, S. L., Nkup, J. Y., & Cifrat, N. A. 2023). Toxoplasmosis is associated with serious fetal and maternal complications. When the *T. gondii* infection is acquired during pregnancy, it can lead to congenital toxoplasmosis, which can cause mild to severe congenital abnormalities and even fetal loss. Damage to the fetus is characterized by severe necrotic changes to the central nervous system, the brain and eyes. These commonly occur when infection with *T. gondii* is acquired during the first trimester of pregnancy Kadri, Z., & Sorchee, S. (2022). Nurses play an important role in reducing maternal and fetal morbidity and mortality, as well as improving their health and well-being through giving the pregnant women effective nursing instructions about the disease prevention, safe health practices and how to obtain health care services (Liu et al., 2023). Nursing instructions are aimed to optimize behavior that is beneficial for dealing with health problems and improving health status. Health instructions should be provided by nursing professionals and heavily focus on promoting women self-management (Boso, van der Merwe, & Gross, 2021, (AL-Jaleel, Humade, & Shakoore, 2022).

Maternity nurse should instruct pregnant woman about basic rules while cooking and consuming food, such as careful washing vegetables, food utensils and cutting

boards before and after use, cooking meat to the required temperature to kill any microorganism, keeping food items covered, stored properly, washing hands before eating, and immediately after handling raw meat, as well as avoiding sample tasting of undercooked meat while cooking (Perry et al., 2022).

Significance of study:

Toxoplasmosis is a serious and neglected disease which may lead to adverse effects to the fetus, mother, family and society as a whole. So, accurate knowledge and attitudes of pregnant woman may lead to appropriate preventive behaviors toward toxoplasmosis. Educational instructions regarding toxoplasmosis are considered one of the general widely adopted health promotion strategies. So, providing educational instructions regarding toxoplasmosis for pregnant women is of great importance to improve their knowledge, attitudes, and the ability to recognize early signs of toxoplasmosis and prevent its complications Ibrahim H, Mohamed A, (2017); Senosy (2020). Thus, the researcher was motivated to study the effect of educational instructions on pregnant women's knowledge and attitudes regarding toxoplasmosis.

The aim of this study was to: Determine the effect of the educational instructions on pregnant women's knowledge and attitudes regarding toxoplasmosis.

Research Hypothesis:

Women's knowledge and attitudes regarding toxoplasmosis are expected to be improved after implementation of the educational instructions.

Subjects and method

Research design:

A quasi experimental research design was used to conduct the present study.

Setting:

This study was conducted at the antenatal units (inpatient and outpatient clinics) of obstetric departments of:

- Tanta University hospital affiliated to Ministry of Higher Education and Scientific Research.
- El-Menshawy hospital affiliated to Ministry of Health and Population.

Subjects:

A purposive sample of 100 pregnant women was selected from the previously mentioned study settings according to the inclusion criteria and the flow rate of pregnant women to each setting.

Inclusion criteria of selected pregnant women:

- Age ranged between 20-35 years.
- At the first trimester of pregnancy.
- Free from any medical and obstetric complications.

Tools of data collection:

To achieve the aim of this study, the following two tools were used for data collection.

Tool I: Pregnant women's knowledge regarding toxoplasmosis:

This tool was developed by the researcher after reviewing recent related literature (Gaulin C, Ramsay D (2020), Maqsood T, Shahzad K (2021), Fard S, Khajeh A (2020) Fabiani S, Caroselli C (2022), Wehbe K, Pencole L (2022). It was used by the researcher to assess pregnant women's level of knowledge regarding toxoplasmosis and it included three parts as follows:

Part one: Socio-demographic data of the pregnant women: It was used to collect data such as age, residence, educational level,

occupation, marital status, family income and telephone number.

Part-two: Obstetric history of the pregnant women: It included data regarding current pregnancy such as number of gravidity, history of previous toxoplasmosis, history of abortion, number of parity, number of living children and history of neonate health problems.

Part three: Pregnant women's knowledge regarding toxoplasmosis: It included definition, causative agent and host for toxoplasmosis, signs and symptoms, high risk group, methods of transmission, diagnosis, its effect on pregnancy outcomes, as well as treatment and prevention.

The scoring system was as follows:

- Correct and complete answers were given a score of (2).
- Correct and incomplete answers were given a score of (1).
- Incorrect answers and didn't know were given a score of (0).

The total score of pregnant women's knowledge regarding toxoplasmosis was calculated as follows:

- High level of knowledge $\geq 75\%$ of the total score.
- Moderate level of knowledge 60 - 75% of the total score.
- Low level of knowledge $< 60\%$ of the total score

Tool II: Pregnant women's attitudes regarding toxoplasmosis:

A three Points likert Scale was adapted by the researcher from **Gaheen M, Elkaseh E (2014)** to assess pregnant women's attitudes regarding toxoplasmosis. It consisted of 20

questions related to women's attitude regarding toxoplasmosis such as:

- Preparation and cooking of meat, healthy ways to deal with cat, healthy ways to wash fruits and vegetables, procedures for protection and early detection from toxoplasmosis infection.
- Each statement was rated by using the 3-points Likert scale. The total score of attitudes was 40 points calculated according to (20 statements x 2= 40).

Scoring system of the studied pregnant women's attitudes regarding toxoplasmosis was as follows:

- Agree was scored as (2).
- Uncertain was scored as (1).
- Disagree or don't know was scored as zero (0).

The total score of women's attitudes was categorized as follows:

- Positive attitude $\geq 60\%$ of the total score (equal or more than 24 points).
- Negative attitude $< 60\%$ of the total score (less than 24 points).

Method

The study was implemented according to the following steps: -

1. An official letter clarifying the purpose of the study was obtained from the Faculty of Nursing, Tanta University and submitted to the administrators of the previously mentioned study settings to obtain their approval and cooperation for carrying out the study.
2. Ethical considerations were considered as the following:
 - a) The study approval was obtained from the ethical committee of Faculty of Nursing, before starting the study (code number 57/5/2022).
 - b) A full explanation of the aim and method of the study was done to obtain the participants'

- acceptance and cooperation, as well as their informed consent.
- c) Right of the pregnant woman to withdrawal from the study at any time was respected.
 - d) The nature of the study did not cause any harm or pain for the entire sample.
 - e) Privacy and confidentiality of the collected data was insured.
 - f) The collected data was used only for the purpose of the present study.
 - g) The researcher emphasized that a pregnant woman was voluntary participated in the educational program.
 - h) The use of code number for the data collection tools instead of the pregnant woman's name.
3. Development of the study tools: **Tool (I)** was developed and translated into Arabic by the researcher after reviewing recent related literature to assess the pregnant women's level of knowledge regarding toxoplasmosis. **Tool (II)** A three points Likert Scale was adapted from **Gaheen M, Elkaseh E (2014)** and translated into Arabic by the researcher to assess pregnant women attitudes regarding toxoplasmosis.
4. The study tools were tested for content and construct validity by 5 experts in the obstetric and gynecological nursing field before conducting the study. Accordingly, correction and modifications were done. The expertise judgments of the questions of the Arabic translated version of the studied pregnant woman's knowledge and attitudes regarding the toxoplasmosis was done. The study tool's reliability was tested using Cronbach's Alpha test which was 0.87 and 0.88 respectively.
5. A pilot study was carried out before the actual data collection on 10% of the sample (10 women) from the previously mentioned settings to test the feasibility and applicability of the tools and to determine obstacles that may be encountered during actual data

collection. According to the obtained results, some statements of tool II were rephrased, and the obtained data were included in the study sample because there were no major or critical changes.

6. Data collection was conducted in a period of six months ranged from the beginning of September 2022 to the end of February 2023. Data was collected from El-menshawy hospital followed by Tanta university hospital in the morning shift, until the predetermined sample size was collected. The researcher attended two days per week in the study setting.
7. The educational instructions were conducted through four phases: (assessment, planning, implementation and evaluation) as follows:

1-Assessment Phase:

This phase was implemented before giving the sessions. At the beginning of the interview the researcher greeted the woman and introduced herself to each woman, and then the studied pregnant women were asked to participate in the study after explaining its purpose. A pre-test structured questionnaire schedule was conducted individually for each pregnant woman before beginning the educational instruction's sessions using the pre developed: Tool (I) Pregnant women's knowledge regarding toxoplasmosis, and Tool II: Pregnant women's attitudes regarding toxoplasmosis.

2- Planning Phase:

a- Preparation of the educational instruction's sessions:

The educational instructions were developed by the researcher based on the data collected during the assessment phase and the related literature. The educational instructions included 2 sessions carried out in the previously mentioned settings. The total number of pregnant women was 100 women;

they were divided into 20 groups. Each group included 5 pregnant women according to the number in each setting; thirteen - groups at Tanta University Hospital consisted of 65 pregnant women and seven groups at El-Menshawy Hospital consisted of 35 pregnant women. The content of the educational instructions were presented by the researcher at two sessions, two days per week. The duration of each session ranged from 30 minutes to 45 minutes including periods of discussion. The program was conducted at the morning shifts.

b- Setting the goals and objectives of the educational instructions:

- **The goal of the educational instructions was to:**
- Evaluate effect of the educational instructions on pregnant women's knowledge and attitudes regarding toxoplasmosis.
- **Objectives of the educational instructions were:** at the end of the educational instructions the pregnant woman will be able to:
 - Define toxoplasmosis.
 - Identify the causative agent of toxoplasmosis.
 - Mention the mode of toxoplasmosis transmission.
 - Enumerate the signs and symptoms of toxoplasmosis.
 - List complications of toxoplasmosis.
 - List the preventive measures for toxoplasmosis.
 - Identify the proper treatment of toxoplasmosis.

c- Preparation of the content of the educational instructions:

An educational booklet was developed by the researcher and distributed to each pregnant woman before conducting the sessions to increase their awareness about toxoplasmosis.

The researcher prepared different methods of teaching such as lectures, group discussion, as well as prepared instructional materials such as posters, pictures and power point presentation to be used in the sessions.

3) Implementation Phase:

The educational instructions were conducted for each pregnant woman at the previously mentioned settings.

It included 2 main separate sessions.

The first session:

- The aim of this session was to explain the goal and objective of the educational instructions and to provide the women with knowledge about the definition, causative agent, the host, signs and symptoms, methods of transmission, and the high risk group of toxoplasmosis.
- **The second session:** At the second session the researcher explained the diagnosis, the effect on pregnancy, treatment, complications, and preventive measures of toxoplasmosis.

4) Evaluation Phase:

-The pregnant women's knowledge and attitudes were evaluated pre, immediately and one-month post implementation of the educational instructions by using the pre developed tools I and II.

-Comparison was done in relation to woman's knowledge and attitudes regarding toxoplasmosis before, immediately and one month post implementation of the educational instructions to identify the effect on pregnant women's knowledge and attitudes regarding toxoplasmosis.

Statistical analysis

The collected data were organized, coded, tabulated and statistically analyzed using SPSS software (Statistical Package for the Social Sciences, created by World Health Organization and center for Disease Control and Prevention, Atlanta, Georgia, USA

version 2002. **Dawson BD.,(2001)**. For quantitative data, the range, mean and standard deviation were calculated, paired T-test was used to compare between related sample in quantitative data. for qualitative data, which describe a categorical set of data by frequency, percentage or proportion of each category, comparison between two groups and more was done using Chi-square test (χ^2).

Correlation between variables was evaluated using linear correlation coefficient (r). Significance was adopted at $p < 0.05$ for interpretation of results of tests of significance.

Results

Table (1): Demonstrates the socio-demographic characteristics of the studied pregnant women. It was observed that nearly three fifths (59%) of the studied pregnant women's aged 25 years, or more with a mean age of 26.11 ± 4.63 , more than two thirds (69.0%) were from rural areas, all of them were married, and most of them (88.0% and 86% respectively) were housewives and hadn't enough income, nearly four fifths (79%) had secondary school education, and less than two thirds of them (64.0%) had nuclear family.

Table (2): Illustrates the obstetric history of the studied pregnant women. It was observed that nearly half of them (45%) had two pregnancies, one tenth (10%) had previous history of abortion (more than two thirds 70% of those) had abortion for one time, more than two fifths (43%) were primipara and had one living child, and the mean duration of current pregnancy was (9.54 ± 2.12) .

Table (2) also shows that most (93%) of the studied pregnant women received regular antenatal follow-up visits during the current pregnancy two times, more than two fifths (42.9%) didn't receive antenatal visits due bad financial condition, and one tenth (10%) had

history of previous infection with toxoplasmosis (three fifths 60% of those) had previous abortion.

Figure (1): Represents total knowledge of the studied pregnant women regarding toxoplasmosis pre, immediately and one month post implementation of the educational instructions. It was observed that more than four fifths (83.0%) of them had low level of knowledge regarding toxoplasmosis pre implementation of the educational instructions. Meanwhile, there were significant improvement in the level of their knowledge where the most (93%) of them had high level of knowledge immediately with slight decrease one-month post implementation of the educational instructions with highly statistical significant differences ($p < 0.001^*$).

Figure (2): Displays overall attitudes of the studied pregnant women regarding toxoplasmosis pre, immediately, and one month post implementation of educational instructions. It was noticed that nearly one fifth (18%) of them had positive attitudes regarding toxoplasmosis pre implementation of the educational instructions compared to the most (90%) immediately post, with an obvious improvement (97%) one month post implementation of educational instructions with highly statistical significant differences ($p < 0.001^*$).

Table (3): Demonstrate the correlation between the studied pregnant women's total score level of knowledge and their overall score level of attitudes regarding toxoplasmosis pre, immediately and one month post implementation of the educational instructions. It was obvious that there were highly positive correlations between the studied pregnant women's knowledge and attitudes regarding toxoplasmosis pre,

immediately and one month post implementation of the educational instructions ($p < 0.001$).

Table (4): Portrays the relationship between the level of studied pregnant women's knowledge regarding toxoplasmosis and their socio-demographic characteristics pre-implementation of the educational instructions. It was observed that all studied pregnant women who had high level of knowledge aged ≥ 25 years old, were from urban areas, working, higher/university educated with a significant relationship ($p = 0.001, 0.001, 0.001$ and 0.002 respectively).

Table (5): Illustrates the relationship between the level of studied pregnant women's attitude regarding toxoplasmosis and their socio-demographic characteristics pre-implementation of the educational instructions. It was reported that all studied pregnant women who had positive attitude aged ≥ 25 years old and majority of them were from urban areas, while less than two third were worker and had higher/university education with a significant relationship ($p = 0.002, 0.003, 0.007$ and 0.005 respectively).

Table (1): Socio-demographic characteristics of the studied pregnant women (n=100).

| Socio-demographic characteristics of the studied pregnant women | N=100 | % |
|--|-----------------|----------|
| Age (years) | | |
| <25 | 41 | 41.0 |
| ≥25 | 59 | 59.0 |
| Range | 20.0 – 35.0 | |
| Mean ± SD. | 26.11 ± 4.63 | |
| Median | 25.0Age (years) | |
| Place of residence | | |
| Rural | 69 | 69.0 |
| Urban | 31 | 31.0 |
| Marital status | | |
| Married | 100 | 100.0 |
| Woman's occupation | | |
| Housewife | 88 | 88.0 |
| Working | 12 | 12.0 |
| Woman's educational level | | |
| Read and write | 4 | 4.0 |
| Primary / Preparatory | 6 | 6.0 |
| Secondary | 79 | 79.0 |
| Higher/University | 11 | 11.0 |
| Family income | | |
| Not enough | 86 | 86.0 |
| Enough | 14 | 14.0 |
| Type of family | | |
| Nuclear family | 64 | 64.0 |
| Extended family | 36 | 36.0 |

Table (2): Obstetrical history of the studied pregnant women (n=100).

| Obstetric history of the studied pregnant women | N=100 | % |
|--|--------------|----------|
| Number of gravidity | | |
| One | 30 | 30.0 |
| Two | 45 | 45.0 |
| Three | 17 | 17.0 |
| More than 3 | 8 | 8.0 |
| History of abortion: | | |
| Yes | 10 | 10.0 |
| No | 90 | 90.0 |
| If the answer is yes, number of abortions: (n = 10) | | |
| One | 7 | 70.0 |
| Two | 3 | 30.0 |
| Three and more | 0 | 0.0 |
| Parity | | |
| Nulliparous | 35 | 35.0 |
| One | 43 | 43.0 |
| Two | 14 | 14.0 |
| Three and more | 8 | 8.0 |
| The number of living children | | |
| 0 | 35 | 38.0 |
| 1 | 43 | 48.0 |
| 2 | 14 | 14.0 |
| 3 | 8 | 8.0 |
| 0 | 35 | 38.0 |
| Duration of current pregnancy | | |
| Range | 5.0-13.0 | |
| Mean ± SD. | 9.54 ± 2.12 | |
| Median | 10.0 | |
| Receiving regular antenatal follow-up visits during the current pregnancy | | |
| Yes | 93 | 93.0 |
| No | 7 | 7.0 |

Table (2): Continue...

| Obstetric history | N=100 | % |
|--|-------|-------|
| Number of antenatal visits during current pregnancy:(n=93) | | |
| Twice | 93 | 100.0 |
| Reason for not receiving antenatal follow-up visits: (n = 7) | | |
| Bad financial condition | 3 | 42.9 |
| For lack of interest | 1 | 14.3 |
| Lack of time | 1 | 14.3 |
| Too much traffic | 1 | 14.3 |
| Mather in low refuses | 1 | 14.3 |
| History of previous infection with toxoplasmosis | | |
| Yes | 10.0 | 10.0 |
| No | 90.0 | 90.0 |
| If the answer is yes, the history of neonate and maternal health problems and complications? (n = 10) | | |
| Neonatal blindness | 4 | 40.0 |
| Abortion | 6 | 60.0 |

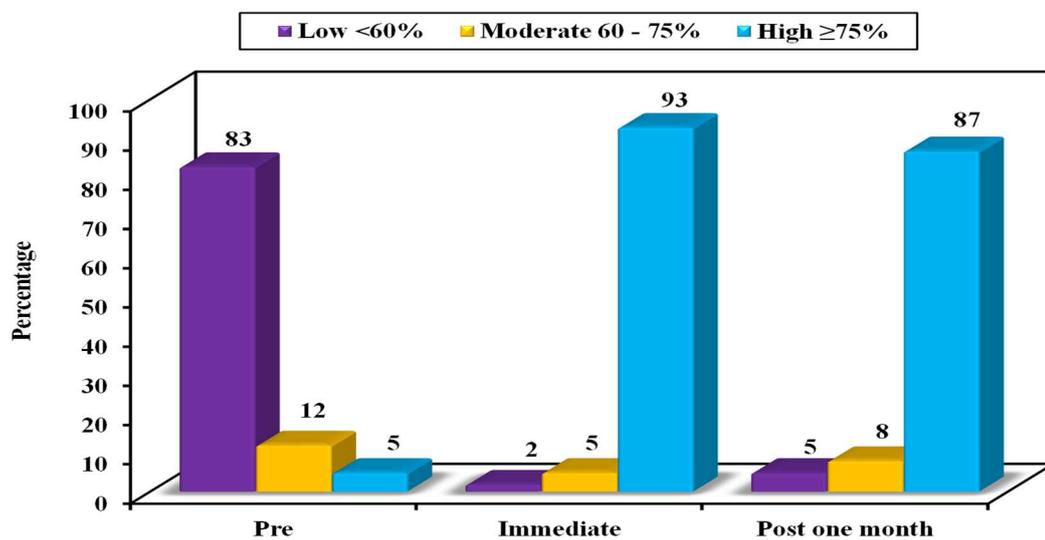


Figure (1): Total score of knowledge of the studied pregnant women regarding toxoplasmosis pre, immediately and one month post implementation of the educational instructions (n= 100).

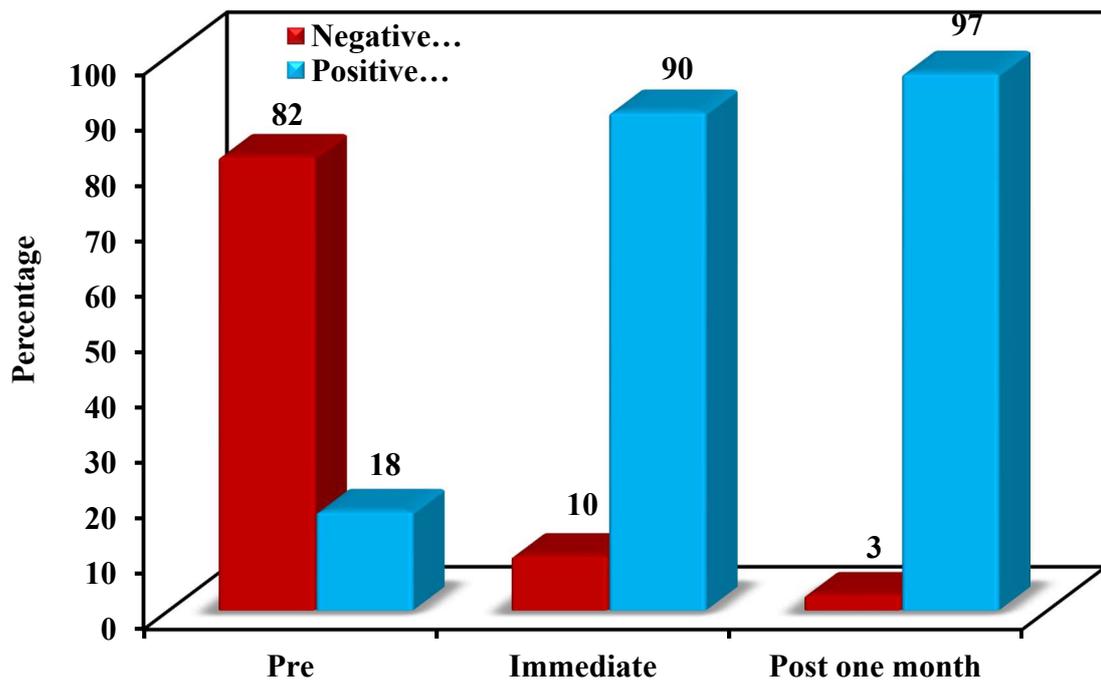


Figure (2): Over all attitudes of the studied pregnant women regarding toxoplasmosis pre, immediately and one month post implementation of the educational instructions (n= 100)

Table (3): Correlation between the studied pregnant women's total score level of knowledge and their total score level of attitudes regarding toxoplasmosis pre, immediately and one-month post implementation of the educational instructions (n= 100)

| | | Attitudes | | |
|-----------|---|-----------|-----------|----------------|
| | | Pre | Immediate | Post one month |
| Knowledge | R | 0.431* | 0.447* | 0.391* |
| | P | <0.001* | <0.001* | <0.001* |

Table (4): Relationship between the level of studied pregnant women’s knowledge regarding toxoplasmosis and their socio-demographic characteristics pre- implementation of the educational instructions (n = 100)

| Socio-demographic data | Knowledge regarding toxoplasmosis | | | | | | χ^2 | P |
|----------------------------------|-----------------------------------|-------|-----------------|------|----------------|-------|---------------|----------------|
| | Low | | Moderate | | High | | | |
| | No. | % | No. | % | No. | % | | |
| Age (years) | (n = 83) | | (n = 12) | | (n = 5) | | 16.862 | 0.001** |
| <25 | 40 | 48.2 | 1 | 8.3 | 0 | 0.0 | | |
| ≥25 | 43 | 51.8 | 11 | 91.7 | 5 | 100.0 | | |
| Place of residence | (n = 83) | | (n = 12) | | (n = 5) | | 20.741 | 0.001** |
| Rural | 62 | 74.7 | 7 | 58.3 | 0 | 0.0 | | |
| Urban | 21 | 25.3 | 5 | 41.7 | 5 | 100.0 | | |
| Woman’s occupation | (n = 83) | | (n = 12) | | (n = 5) | | 34.138 | 0.001** |
| Housewife | 83 | 100.0 | 5 | 41.7 | 0 | 0.0 | | |
| Working | 0 | 0.0 | 7 | 58.3 | 5 | 100.0 | | |
| Woman’s educational level | (n = 83) | | (n = 12) | | (n = 5) | | 9.216 | 0.002* |
| Read and write | 4 | 4.8 | 0 | 0.0 | 0 | 0.0 | | |
| Primary / Preparatory | 5 | 6.0 | 1 | 8.3 | 0 | 0.0 | | |
| Secondary | 73 | 88.0 | 6 | 50.0 | 0 | 0.0 | | |
| Higher/University | 1 | 1.2 | 5 | 41.7 | 5 | 100.0 | | |

Table (5): Relationship between the level of studied pregnant women's attitude regarding toxoplasmosis and their socio-demographic characteristics pre- implementation of the educational instructions (n = 100)

| Socio-demographic data | Attitudes regarding toxoplasmosis | | | | χ^2 | P |
|----------------------------------|-----------------------------------|------|-----------------|-------|--------------|---------------|
| | Negative | | Positive | | | |
| | No. | % | No. | % | | |
| Age (years) | (n = 82) | | (n = 18) | | 10.88 | 0.002* |
| <25 | 41 | 50.0 | 0 | 0.0 | | |
| ≥25 | 41 | 50.0 | 18 | 100.0 | | |
| Place of residence | (n = 82) | | (n = 18) | | 9.55 | 0.003* |
| Rural | 67 | 81.7 | 2 | 11.1 | | |
| Urban | 15 | 18.3 | 16 | 88.9 | | |
| Woman's occupation | (n = 82) | | (n = 18) | | 7.27 | 0.007* |
| Housewife | 81 | 98.8 | 7 | 38.9 | | |
| Working | 1 | 1.2 | 11 | 61.1 | | |
| Woman's educational level | (n = 82) | | (n = 18) | | 6.45 | 0.005* |
| Read and write | 4 | 4.9 | 0 | 0.0 | | |
| Primary / Preparatory | 6 | 7.3 | 0 | 0.0 | | |
| Secondary | 72 | 87.8 | 7 | 38.9 | | |
| Higher/University | 0 | 0.0 | 11 | 61.1 | | |

Discussion

Despite that toxoplasmosis is a worldwide disease with no geographical boundaries, it's a neglected disease which may cause serious consequences on the pregnant women's health, well-being, their pregnancies outcome and on the health of their future children especially when infection occurs before or during pregnancy **Al-Hellaly & Chyad (2019)**. The accurate knowledge about toxoplasmosis infection is not only essential to decrease its rates, but it is also important to dispel the erroneous traditions and customs that can further perpetuate the risk of infection **Senosy (2020)**. Thus, this study had shed light on the effect of educational instructions on pregnant women's knowledge and attitudes regarding toxoplasmosis.

Regarding the socio-demographic characteristics of the studied pregnant women, the present study revealed that nearly three fifths of the studied pregnant women's age is equal to or more than 25 years, more than two thirds were from rural areas, all of them were married, most of them were housewives and hadn't enough family income. Moreover, nearly four fifths of the studied pregnant women had secondary school education, and less than two thirds had nuclear family.

These findings disagreed with **Gaheen and Elkazeh (2014)** who assess knowledge and attitude of women regarding toxoplasmosis during pregnancy and measures to overcome it in slums areas. They found that nearly one half of studied pregnant women aged 25-34, the majority was married and housewives, one third of them had secondary school education, and all of them lived in slums areas. From the researcher point of view this disagreement can be attributed to the different in the studies settings.

Regarding the obstetric history of the studied pregnant women, the present study illustrated one tenth of had previous history of abortion (more than two thirds of those) had abortion for one time, nearly one tenth of the studied pregnant women had previous toxoplasmosis infection (one third of those) their neonates had blindness. These findings are supported by **Suliman et al (2021)** who studied toxoplasmosis prevention: knowledge and attitude among pregnant women in Jordan and stated that women who acquired toxoplasmosis infection just before or during pregnancy can undergo serious complications especially abortion and neonatal complications. From the researcher point of view this agreement is related to the dangerous effect of toxoplasmosis infection on the pregnant women and her fetus and neonate.

As regard to receiving regular antenatal follow up visits during current pregnancy, it is evident that most of the studied pregnant women received regular visits for two times. This finding is in the same line with **Semery et al (2021)** who investigated the predicting health facility delivery among women in Egypt based on antenatal care and claimed that the majority of women received the recommended antenatal care during pregnancy.

As regard to the total knowledge of the studied pregnant women regarding toxoplasmosis pre, immediately and one month post implementation of the educational instructions. The present study represented that more than four fifths of the studied pregnant women had low level of knowledge regarding toxoplasmosis pre implementation of the educational instructions. Meanwhile, there was a significant improvement in the level of knowledge where most of them had high

level of knowledge immediately post with slight decrease one month post implementation of the educational instructions with highly statistical significant differences.

The current study findings are consistent with, **Abd El-Aal et al (2021)** who studied the effect of educational intervention on correction of misconception about toxoplasmosis among pregnant women and stated that total score of knowledge aspects about toxoplasmosis infection of the pregnant women was highly significantly increased in the post intervention compared to pre-intervention. In line with the present study the findings of **Ibadi et al (2018)** who studied the impact of health intervention on improving knowledge and attitude of pregnant women with toxoplasmosis at Al-Najaf province in Iraq and found that the majority of them had low knowledge at the baseline assessment, while at the first post-test and second post-test the knowledge score for the experimental group became better. **Ibadi et al (2018)** also pointed out that there is a statistical significant difference within the three stages of data collection for all items of knowledge.

In addition, the findings of the present study is partially congruent with **Hassan (2018)**, who studied the effectiveness of a structured teaching program on anxiety and perception regarding toxoplasmosis among seropositive pregnant women in Northern Upper Egypt and demonstrated that the majority of women scored poor knowledge pre-program, whereas immediately post program more than two thirds of them scored good knowledge, and all of them gained a good knowledge score at the retained test post-program. This accordance between the current study and the previous findings can

be attributed to the positive effect of the educational instructions.

As regard to the overall attitudes of the studied pregnant women regarding toxoplasmosis pre, immediately, and one month post implementation of the educational instructions. The study findings displays that nearly one fifth of them had positive attitudes regarding toxoplasmosis pre implementation of the educational instructions compared to the most of them immediately with an obvious improvement one month post implementation of educational instructions with highly statistical significant differences.

The current study findings partially agree with **Ibadi et al (2018)** who declared that slightly more than one half of the studied pregnant women had positive attitude at the baseline assessment, compared to the most of them had positive attitude at first post-test, which improved at the second post-test. They also pointed that there was a statistical significant difference within the three stages of data collection for all items of attitude. From the researcher point of view this agreement is resulting from maintaining the pregnant women's knowledge is associated with improving their attitudes.

Concerning the correlations between the studied pregnant women's total score level of knowledge and their overall score level of attitudes regarding toxoplasmosis pre, immediately and one month post implementation of the educational instructions. There was a highly positive correlation between the studied pregnant women's knowledge and attitudes regarding toxoplasmosis pre, immediately and one month post implementation of educational instructions.

These findings are in the same line with **Nurseha et al (2023)** who indicated that

there is a significant relationship between knowledge and toxoplasma gondii preventive attitudes. Moreover, the present study is aligned with **Senosy (2020)** who showed that there is a correlation between the study subjects knowledge and attitude toward toxoplasmosis. In addition, **Ibadi et al (2018)** stated that good knowledge is required in changing attitude and preventing toxoplasmosis. Thus, the present study findings support the fact that sufficient knowledge has a crucial role in influencing the individual attitudes.

As regard the relationship between the level of studied pregnant women's knowledge regarding toxoplasmosis and their socio-demographic characteristics pre-implementation of the educational instructions. The present study portrayed that all studied pregnant women who had high level of knowledge aged ≥ 25 years old, were from urban areas, working, higher/university educated with a significant relationship.

These findings are supported by **Hattoufi et al (2022)** and **Abd El-Aal et al (2021)**, they declared that women with higher educational level and older age had a better knowledge as well as worker women had better knowledge than housewives. Again, in alignment with the current study findings **Suliman et al (2021)** and **Senosy (2020)**, mentioned that higher level of education was associated with higher level of knowledge.

In addition, the present study findings are in accordance with **Al-Hellaly & Chyad (2019)** who reported that knowledge of toxoplasmosis was higher among subjects who had higher education and who lived in urban areas. Similarly, who studied the knowledge and attitude regarding toxoplasmosis among university female students, and stated that knowledge of

toxoplasmosis increases with age and subjects, who lived in urban areas.

Concerning the relationship between the level of studied pregnant women attitude regarding toxoplasmosis and their socio-demographic characteristics pre-implementation of the educational instructions. It is reported that all studied pregnant women who had positive attitude aged ≥ 25 years old and majority of them are from urban areas, while less than two third are worker and have higher/university education with a significant relationship.

The present study findings are in the same line with **Nurseha et al (2023)**, who indicated that there is a significant relationship between attitude toward toxoplasma gondii with age, education and occupation. Furthermore, they stated that attitude is influenced by the environment (whether home or work), experience and education. Similarly, **Iqbal et al (2021)** and **Al-Hellaly & Chyad (2019)** claimed that socio-demographic characteristics have been shown to influence attitude of study group as better attitude were found among childbearing age with higher education and lived in urban areas.

According to **Khan et al (2023)**, majority of pregnant women in rural areas lives pastoral life, less educated, lower access to media, and lower access to health care facilities. Moreover, exposed to erroneous traditions and customs that can further perpetuate the risk of infection as soil-related occupation (farming work and gardening) and drinking raw milk, which indicated that especial attention should be directed towards providing health education to those who living in rural areas.

The good knowledge and social education are important in changing attitude of women in preventing toxoplasmosis. Therefore,

educational instructions are very imperative to raise the knowledge and attitudes of pregnant women regarding toxoplasmosis which is essential to avoid those serious complications especially it's preventable disease.

Conclusion

Based on the findings of the present study, it can be concluded that:

1. Most of the studied pregnant women knowledge regarding toxoplasmosis had significantly improved immediately post with slight decrease one month post implementation of the educational instructions.
2. Most of the studied pregnant women had positive attitudes regarding toxoplasmosis
3. immediately post with obvious improvement one-month post implementation of the educational instructions.

Recommendations: Based on the results of the current study, the following recommendations are suggested:

- Educational programs about toxoplasmosis infection and measures to prevent it should be implemented for all women during their reproductive age.
- Planning and developing antenatal childbirth preparation classes for all pregnant women to improve their knowledge and practice regarding preventions of toxoplasmosis.

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