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Research Article

Effect of Educational Intervention on Correction of Misconceptions about Toxoplasmosis among Pregnant Women at a Rural Area

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ABSTRACT

Aim: This study aims to determine the effect of educational intervention on correction of misconceptions about toxoplasmosis among pregnant women at a rural area. **Methods:** Quasi- experimental with pre- and post-test design. A multistage random selection of two districts in Menoufia Governorate was done. The researcher randomly selected and conducted this study at maternal and child health center in Teta village from Menouf district and El Iraqia rural health unit from El-Shohada district, Menoufia Governorate, Egypt. A simple random sample of 120 pregnant women selected from maternal and child health center and rural health unit. A structured interview questionnaire consisted of three parts. The first part was concerned with sociodemographic characteristics, the second part was concerned with past and current obstetric history, and the third part was concerned with knowledge of pregnant woman about toxoplasmosis. **Results:** In pre-intervention, 79.2% of pregnant women had poor score of knowledge about toxoplasmosis while most of them had good knowledge after the intervention. Age, education, and occupation were associated with increase in the score of knowledge. **Conclusion:** The educational intervention was effective in correction of misconceptions about toxoplasmosis among pregnant women. There was high statistically significant improvement in the mean scores of pregnant women's total knowledge about toxoplasma infection after the intervention compared with pre-intervention scores. There was highly statistical improvement of pregnant women's knowledge related to toxoplasmosis preventive measures in the post- intervention than pre-intervention. There was positive association between women's level of knowledge before the intervention and their age, education, and occupation.

Keywords: Educational intervention, Misconceptions, Pregnant women, Toxoplasmosis

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Introduction

Pregnancy period is a vital event in women life. Pregnant women are more likely to be affected by many infectious diseases, namely, toxoplasmosis, hepatitis B, rubella, cytomegalovirus, and herpes Simplex virus.[1] Toxoplasmosis is a neglected zoonotic disease caused by the protozoan *Toxoplasma gondii*, which is the most important parasite affecting birds and mammals globally.[2]

Toxoplasmosis is considered the third most common food-borne parasitic infection requiring hospitalization for treatment.[3] The annual incidence of congenital toxoplasmosis was estimated to be 190,100 cases globally.[4] The prevalence rates of toxoplasmosis in some Arabian countries were 38.4 % in Iraq,[5] 41.90 % in Yemen,[6] and 34.1% in Sudan.[7] In Egypt, the prevalence of chronic toxoplasma infection by serological test was 64.7%.[8] Moreover, Menoufia Governorate represented high prevalence of infection that constituted 52.2%.[9]

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Cats are the definitive hosts which excrete immature oocysts in its stool and become infective within few days contaminating food and water sources; then, humans and animals may have the infection to become intermediate hosts. Closing the cycle, other cats become infected after eating the infected animals which contain cysts and begin another cycle.[10]

The primary source of infection with *Toxoplasma gondii* is the ingestion of sporulated oocysts from the contaminated water, soil, or food. In addition, the infection occurs through ingestion of undercooked or raw meat from infected animals or unwashed raw fruits and vegetables.[11] The infection also may occur through transplacental route or gardening without gloves;[12,13] besides, using the raw milk for producing homemade cheese can increase the risk for toxoplasma infection.[8]

Up to 95% of the cases of immunocompetent individuals infected with toxoplasma protozoon remain asymptomatic[14] or have mild "flu-like" symptoms including tender lymph nodes, muscle aches, or headache.[15] Congenital toxoplasmosis can be evident with serious outcomes ranging from spontaneous fetal loss, death *in utero*, intrauterine growth retardation, hydrocephalus, encephalitis, neurological mental illness, and ocular damage such as retinochoroiditis, auditory disorders, and cardiovascular abnormalities.[16,17]

Many serological tests are used for the detection of various anti toxoplasma antibody classes including immunoglobulin (Ig) G (IgG), IgM in the body fluids, mainly serum by means of enzyme-linked immunosorbent assay test.[18] Although IgM can last for years, their presence is not a reliable marker of recent infection, while the presence of specific IgG and absence of IgM immediately points to a previous infection.[19] Ultrasound is required for pregnant women with suspected or diagnosed with acute infection acquired during pregnancy for early detection of fetal abnormalities such as hydrocephaly, central nervous system abnormalities, brain or hepatic calcifications, fetal growth restriction, ascites, or splenomegaly.[20,21]

The guidelines needed for prevention of infection with toxoplasmosis to the pregnant woman include: Whole cuts of meat should be well cooked to high temperature, fruits and vegetables should be washed adequately before eating, dishes, cutting boards, counters, utensils, and hands should always be washed with hot soapy water after they have contacted with poultry, raw meat, seafood, or unwashed fruits or vegetables.[22] Pregnant women should wear gloves when gardening, during any contact with soil or sand and wash hands afterward, pregnant women should avoid changing cat litter if possible.[3]

Community health nurse has a great opportunity to increase pregnant women's knowledge about toxoplasmosis and its modes of transmission to reduce its prevalence through the simple preventive measures that can protect them from exposure to *Toxoplasma gondii*.[23] Community health nurse should teach them about the importance of antenatal care for health promotion, prevention, and treatment of toxoplasmosis as early as possible during pregnancy to avoid further complications to the mother or the fetus.[24] Therefore, the current study was carried out to correct misconceptions about toxoplasmosis among pregnant women at a rural area through health education program.

Research hypotheses

1. Pregnant women who will receive educational intervention about risk factors and mode of transmission of toxoplasma infection will have higher score of knowledge on post-intervention compared to pre-intervention
2. Pregnant women who will receive educational intervention about preventive measures of toxoplasma infection will have higher levels of knowledge on post-intervention compared to pre-intervention.

Methods

Design

A quasi-experimental with pre- and post-test design.

Setting

The study setting was selected using multistage random selection. It was conducted at maternal and child health center in Teta village, Menouf district and El Iraqia rural health unit, El-Shohada district, Menoufia Governorate, Egypt.

Sample

A purposive sample of 120 pregnant women attending the previously mentioned settings for receiving antenatal care.

Sample size and power of the study

The sample size was calculated using the Epi website,[25] based on the following assumptions: Population size n=3938, frequency of toxoplasmosis in the population = 60% ± 5%, a power (1- β) or (% chance of detecting) of 80% and confidence limits = 5%; using the following equation: Sample size (n) = [DEFF*Np (1-p)]/[(d2/Z21-α/2*(N-1) +p*(1-p)].

Inclusion criteria

Pregnant women in the reproductive age living at rural areas and attending MCH center and rural health unit for antenatal care were included in the study.

Data collection instrument

The data of the study were collected using a structured interview questionnaire. This questionnaire was developed

by the researcher based on pertinent literature including.[26,27] The questionnaire was consisted of three parts:

Part I: Concerned with sociodemographic characteristics of pregnant women such as name, age, age of marriage, occupation, education, income and numbers of family members.etc.

Part II: Concerned with past and current obstetric history.

Part III: Concerned with women' knowledge about toxoplasmosis. It was consisted of 49 questions that divided into five sections. The responses for these questions were in the form of yes, no, and do not know, as do not know = 1, no = 2, and yes =3 (correct answer). The first section concerned with knowledge about meaning of toxoplasmosis (five questions). The second section concerned with pregnant women's knowledge about modes of transmission (eight questions). The third section concerned with women's knowledge about people at risk for toxoplasma infection (13 questions). The fourth section concerned with pregnant women' knowledge about manifestations and complications of toxoplasmosis (12 questions). The fifth section concerned with pregnant women' knowledge about toxoplasmosis prevention (11 questions).

Validity and reliability of the instrument

The data collection instrument was translated, modified by the researcher, and reviewed after translation by Arabic/English speaker specialist and the suggested modifications were carried out. After revision for translation, the data collection instrument was revised for content validity by a jury of four experts in family and community health nursing and their recommended modifications were carried out. The reliability of the instrument was achieved using test-retest reliability method to measure the internal consistency. The data from the instrument were entered for reliability test and the result showed that reliability was equal r = (0.80). Based on these results, the study instrument was considered reliable to be used for data collection.

Data collection period

Data collection for this study was extended from the end of June to the mid of October 2019.

Data collection procedure

An official permission for data collection in the form of official letter from the dean of Faculty of Nursing, Menoufia University, was obtained for carring out the current study. The data collection process for this study was conducted in three phases:

Phase I: Pre-test phase: The researcher introduced herself to the participants and explained the purpose of the study and assured them about confidentiality of information and their right to withdraw at any time. Then, pre-test was administered using data collection instrument.

Phase II: Conducting the educational intervention: The researcher provided the health education for participants individually or in small groups includes (3–4 pregnant women) and they received health education about toxoplasmosis (causative agent, mode of transmission people at high risk, clinical manifestation, complications for fetus and mother, and finally preventive measures). The researcher used lecture and group discussion; videos and PowerPoint presentation also used to enhance learning. Copy of booklets and brochures was administered and explained to pregnant women as well as a copy provide to the study settings.

Phase III: Termination or post-test: It included assessment of pregnant women's post-knowledge regarding toxoplasmosis. Post-intervention evaluation was conducted immediately after health education intervention.

Statistical analysis

The collected data were coded, organized, entered, and analyzed using SPSS (Statistical Package for the Social Sciences), version 22. Quantitative data were presented in the form of number, percent, mean, and standard deviation. Furthermore, paired t-test was used for comparison between two means pre- and post-intervention for the same group. Qualitative data were presented in the form of frequency distribution tables, number, and percentage. It was analyzed by Chi-square (χ^2) test. However, likelihood ratio test used when the table was more than 4 cells. Level of significance was set as $P < 0.05$ for all significant tests.

Results

Table 1 revealed that more than two-thirds (67.5%) of the studied pregnant women aged between 17 and 25 years old with mean age 23.8 ± 4.2; 63.3% of them were married at age 20 years or less, while 36.7% married at age more than 20 years; 70.9% of them had basic education and technical diploma or secondary education while 20.8% were graduated from university. The majority (86.7%) of them were housewives and 10.8% were employees. About 75% of women had enough monthly income and most (94.2%) of pregnant women had 2–4 members in their families.

In Table 2, 36.7% of women were primigravida, 63.3% were multigravida; 20% of them were primipara, and 43.3% were multipara. Regarding abortion, 68.3% had no abortion, 25% had one abortion, while 6.7% had 2–4 abortions; more than half (52.5%) had 1–2 live births and only 4.2% had one still birth. Regarding toxoplasma investigation in previous pregnancy, only 44.7% of multigravidas performed the investigation and among those who performed the investigation, 29.4% of them were positive for toxoplasma infection. Nine out of the 10 (90%) of positive pregnant women for toxoplasmosis received the suitable treatment.

Figure 1 reveals that most of the studied pregnant women (97.5%) were in the second and third trimester (41.7% in the

Table 1: Distribution of studied pregnant women according to their sociodemographic characteristics (*n*=120)

Sociodemographic characteristics	*n*	%
Age (years)		
17–25	81	67.5
26–40	39	32.5
Mean±SD	23.8±4.2	
Age at marriage (years)		
≤20 years	76	63.3
>20 years	44	36.7
Mean±SD	20.2±2.9	
Educational level		
Do not read and write	10	8.3
Basic education	39	32.5
Technical diploma or secondary education	46	38.4
University	25	20.8
Occupation		
Student	3	2.5
Housewife	104	86.7
Employee	13	10.8
Monthly income		
Not enough	23	19.2
Enough	90	75.0
Enough and save	7	5.8
Family number		
2–4	113	94.2
5–6	7	5.8
Total	120	100.0

Table 2: Distribution of studied pregnant women according to their past obstetric history (*n*=120)

Obstetric history	*n*	%
Gravida		
Primigravida	44	36.7
Multigravida	76	63.3
Para		
Primigravida	44	36.7
Primipara	24	20.0
Multipara	52	43.3
Abortion		
0	82	68.3
1	30	25.0
2–4	8	6.7
Live births		
0	51	42.5
1–2	63	52.5
3–4	6	5.0
Still births		
0	115	95.8
1	5	4.2
Toxoplasma investigation in previous pregnancy (*n*=76)		
Yes	34	44.7
No	42	55.3
Result of investigation (*n*=34)		
Positive	10	29.4
Negative	24	70.6
Received suitable treatment for positive cases (*n*=10)		
Yes	9	90.0
No	1	10.0

second and 55.8% in the third trimester); only 2.5% of them were in the first trimester.

Table 3 represents that 23.3% of pregnant women performed laboratory investigation for toxoplasmosis in the current pregnancy with low percentage (3.6%) of toxoplasmosis infection among those who performed the laboratory investigations. Muscle ache and fever were the common reported symptoms during current pregnancy (38.3% and 14.2%, respectively).

Table 4 illustrates that the mean total score of knowledge aspects about toxoplasmosis infection of the pregnant women was increased in the post-intervention program compared to pre-intervention. It revealed a highly significant improvement ($P < 0.0001$) in the mean total different aspects of knowledge, as well as the mean grand total knowledge which increased from 83.2 ± 23.4 pre-intervention to 132.3 ± 9.9 post-intervention. These results approved the wards of our first and second research hypotheses.

Table 5 highlights the efficacy of the educational intervention program for the knowledge of the pregnant women. Post-intervention program revealed a highly significant improvement ($P = 0.000$) of different knowledge aspects. The post-program's good knowledge ranged from 99.2% for each of the five toxoplasmosis knowledge aspects to 100% for the total knowledge.

Table 6 clarifies that approximately 85% of the studied sample who were 17–25 years old had poor knowledge

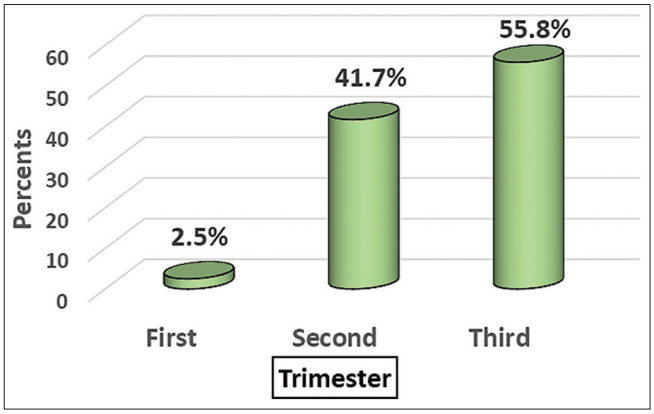

Figure 1: Distribution of studied pregnant women according to trimester of pregnancy (*n*=120)

score, while 35.9% of the older age group (26–40) years had good knowledge score, the difference was significant statistically ($P < 0.01$). It was noticed that poor knowledge percentage was decreasing with higher degrees of education (90% among do not read and write vs. 56% among university educated mothers), so the difference was statistically significant ($P < 0.01$). In relation to their occupation, there was high statistically significant difference between students, housewives, and employees regarding their total

score of knowledge, employees showed higher percentage of good knowledge (69.2%), while all students were poor knowledge (100%).

Discussion

Toxoplasmosis is a controllable disease and is considered a global health hazard as it affects 30%–50% of the human population.[28] It also affects more than 50% of the Egyptian pregnant females.[30] Infants with congenital toxoplasmosis are mostly asymptomatic at birth, but long-term studies indicated that up to 85% of affected infants develop complications including chorioretinitis leading to severe vision impairment, hearing loss, or psychological impairment.[29]

Regarding the sociodemographic characteristics of the studied pregnant women, the current study revealed that more than two-thirds of them aged between 17 and 25 years old, more than 70% of pregnant women had basic education and technical diploma or secondary education. As regard to occupation, the majority of pregnant women were housewives. Concerning the current obstetric history, most of the studied pregnant women were in the second and third trimester. Regarding toxoplasma investigation in the current pregnancy, only 23.3% of the studied pregnant women performed the investigation for toxoplasmosis and 3.6% of those who had toxoplasma investigation were positive. These findings were in agreement with the findings of a study conducted by Amin *et al.*[26] in Saudi Arabia kingdom to assess toxoplasmosis preventive behavior and related knowledge among pregnant women; they reported that 17.7% of pregnant women had investigation for toxoplasma infection and 4.5% of them were positive.

Regarding the symptoms that the pregnant women suffered from during the current pregnancy, the current study revealed that muscle ache and fever were the most common reported symptoms during the current pregnancy, while headache and lymph nodes enlargement were the least frequent complains;

Table 3: Distribution of the studied pregnant women according to their current obstetric history (*n*=120)

Current obstetric history	*n*	%
Toxoplasma investigation in current pregnancy		
No	92	76.7
Yes	28	23.3
Result of investigation (*n*=28)		
Positive	1	3.6
Negative	27	96.4
Symptoms in current pregnancy		
Enlargement of neck lymph nodes		
Yes	3	2.5
No	117	97.5
Headache		
Yes	3	2.5
No	117	97.5
Muscle ache		
Yes	46	38.3
No	74	61.7
Fever		
Yes	17	14.2
No	103	85.8
Total	120	100

Table 4: Pre- and post-intervention mean score of knowledge aspects about toxoplasmosis (*n*=120)

Knowledge aspects	Pre-intervention program	Post-intervention program	Paired *t*-test	*P*-value
	Mean±SD	Mean±SD		
Meaning of toxoplasmosis (5–15 score)	9.6±3.1	12.6±1.5	10.8	0.000**
Modes of transmission of toxoplasma infection (8–24 score)	13.6±4.2	21.5±2.0	21.2	0.000**
Vulnerable people for toxoplasmosis (13–39 score)	22.5±7.1	35.2±2.9	19.9	0.000**
Manifestations and complications of toxoplasmosis (12–36 score)	16.6±5.1	32.6±2.7	31.6	0.000**
Prevention of toxoplasmosis (11–33 score)	20.9±7.3	30.3±2.3	14.3	0.000**
Grand total score of knowledge (49–147 score)	83.2±23.4	132.3±9.9	24.2	0.000**

**Means highly significant

Table 5: Distribution of studied pregnant women according to knowledge aspects about toxoplasmosis in pre- and post-intervention (*n*=120)

Knowledge aspects	Pre-intervention		Post-intervention		Test of sig. χ^2 value	*P*-value
	Poor knowledge %	Good knowledge %	Poor knowledge %	Good knowledge %		
Meaning of toxoplasmosis	52.5	47.5	0.8	99.2	81.9	0.000 **
Modes of transmission of toxoplasma infection	76.7	23.3	0.8	99.2	108.6	0.000 **
Vulnerable people for toxoplasmosis	70.0	30.0	0.8	99.2	90.6	0.000 **
Manifestations and complications of toxoplasmosis	91.7	8.3	0.8	99.2	198.3	0.000 **
Prevention of toxoplasmosis	55.0	45.0	0.8	99.2	90.7	0.000 **
Grand total score of knowledge	79.2	20.8	0.8	99.2	85.2	0.000 **

**Means highly significant

Table 6: Relation between pregnant women sociodemographic characteristics and their level of pre-intervention knowledge about toxoplasmosis infection (*n*=120)

Total score knowledge groups sociodemographic characteristics	Knowledge groups					
	Poor know		Good know		Chi-square	
	n	%	*n*	%	χ^2	*P*-value
Age (years)						
17–25 years	70.0	84.4	11.0	13.6	χ^2=7.9	0.005*
26–40 years	25.0	64.1	14.0	35.9		
Age of marriage						
≤20 years	63.0	82.9	13.0	17.1	χ^2=1.7	0.18
More than 20 years	32.0	72.7	12.0	27.3	LR=10.7	0.01*
Education						
Do not read and write	9.0	90	1.0	10.0		
Basic education	35.0	89.7	4.0	10.3		
Secondary school or a technical diploma	37.0	80.4	9.0	19.6		
University	14.0	56	11.0	44.0		
Occupation						
Student	3.0	100	0.0	0.0	LR=21.1	0.000**
Housewife	88.0	84.6	16.0	15.4		
Employee	4.0	30.8	9.0	69.2		
Monthly income						
Not enough	19.0	82.6	4.0	17.4	LR=0.45	0.79
Enough	70.0	77.8	20.0	22.2		
Enough and save	6.0	85.7	1.0	14.3		
Total	95.0	79.2	25.0	20.8		

*Means significant and **means highly significant. LR: Likelihood ratio

these findings were supported by Onduru *et al*., [31] in Tanzania Temeke district, who evaluated the level of awareness about congenital toxoplasmosis and the accompanied practices among pregnant women and health workers; they revealed that pregnant women reported having flu-like symptoms and generalized or cervical lymphadenitis in their gestation period, but they did not know if toxoplasmosis can also present with the same symptoms.

Regarding the pregnant women's general knowledge about toxoplasmosis before the intervention, most of them had limited or no knowledge about toxoplasma infection; the reason for their lack of awareness may be health illiteracy, decreased attention to the disease and its complications. The current study findings were in the same line with the findings of Hassan,[32] Egypt, who reported that in pre-test, most of the pregnant women had poor knowledge about toxoplasmosis. On the other hand, the current findings were in contradiction with the findings of Smereka *et al*.,[33] in Poland, who had a multicenter survey on knowledge about toxoplasmosis among pregnant women; they reported that most of their participants had basic knowledge about toxoplasmosis. This contradiction might be due to that the majority of the current study participants had basic or technical education and reside at rural communities but more than half of participants of the similar study were secondary school and university graduated and almost half of them had urban residence.

Concerning the effectiveness of the educational intervention program of the current study on the knowledge of pregnant women about toxoplasmosis, the findings revealed that in post-intervention, most of pregnant women achieved good level of knowledge while in pre-intervention; the majority of them had poor level of knowledge. The current findings were similar to the findings of Hassan[32] who found that most of pregnant women scored poor knowledge before the intervention program, while immediately post the program, 70% of them had good knowledge and all pregnant women acquired a good knowledge in the retained test knowledge assessment after the program. Moreover, the current findings were in the same line with Ibadi *et al*.[34] who reported that the health intervention given to the experimental group was efficient in elevating the score of knowledge and improving the attitude of pregnant women about toxoplasmosis compared to the control group.

Regarding the relation between pregnant women sociodemographic characteristics and their level of pre-intervention knowledge about toxoplasmosis, the current findings revealed a significant positive association between the age, education, and occupation of study participants and their knowledge level about toxoplasmosis pre-intervention. It was indicated that the mean score of knowledge was significantly higher among women ranged from 26 to 40 years old meaning that knowledge about toxoplasmosis increased with age. This finding was in agreement with Mahfouz *et al*.[35] in Jazan, Saudi Arabian Kingdom; to assess knowledge and attitude concerning toxoplasmosis among female students of Jazan University; they found that the knowledge about toxoplasmosis increased with age.

Concerning the educational level of the current study, the study findings revealed that the highly educated pregnant women had good knowledge about toxoplasmosis in pre-intervention.

In relation to their occupation, there was high statistically significant difference between students, housewives, and employees regarding their total score of knowledge; employees showed higher percentage of good knowledge, while all students had poor knowledge. These findings were supported by Gaheen and Elkazeh[27] who reported that the mean score of knowledge was significant higher between women ranged from 35 to 44 years old, university educated and worked women. Furthermore, the current findings were in the same line with findings of Hassan[32] who reported that there was a positive relationship between women's mean knowledge score and age, educational level, and occupational status in pre- and post-test.

Conclusion

Based on the findings of the current study, it was concluded that there was high statistically significant improvement in the women's total knowledge about toxoplasma infection after the intervention compared with pre-intervention and this approved the first and second research hypotheses.

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