

Evaluation of Health Education Program about Toxoplasmosis Infection in Pregnant Women At Qena University Hospital

¹Nadia Abdalla Mohamed and ²Hoda Diab Fahmy Ibrahim

¹Obstetrics and Gynecology nursing, ²Community Health nursing; Faculty of Nursing, south valley University & Assuit University

Abstract: Primary *Toxoplasma gondii* infection in the first trimester of pregnancy may cause severe congenital anomalies or even fetal loss. This study aimed to evaluate Health Education Program for Pregnant Women about Toxoplasma Gondii Infection at Qena University Hospital. This study was conducted targeted women attending the antenatal outpatient clinic at Qena University Hospital during the period from February 2010-to September 2010. Data were collected from 140 women. Tool was developed by the researchers to collect data needed for the study. Tool was interview sheet (pretest and post test), it included two parts. The first part was concerned with personal and socio – demographic characteristics as age, residences, level of education, and duration of pregnancy and source of knowledge about toxoplasma to the pregnant women. The second part included simple questions regarding the general knowledge about toxoplasmosis, risk factors for getting infection, symptoms and prevention knowledge. Results of the study revealed that nearly one third (32.9 %) were highly educated and more than two thirds (67.1%) from urban areas. This study proved that a correlation between age of women and total score of knowledge is present; knowledge often decreases with age more than thirty. The result also showed highly statistical significant differences between pre and post test ($p < 0.000$) regarding general information, risk factors, signs and symptom, prevention and total score of knowledge. The study recommended examination or check up for toxoplasma in pregnant women in order to make sure that their pregnancy is normal, encouraging the women to make premarital examination to prevent infectious diseases and congenital anomalies, particularly by a qualified nurse, and training of the nurses should emphasize care and follow up. Conclusion: Toxoplasmosis still exists and considered one of the risk factors for pregnancy miscarriage. The knowledge of the study sample about toxoplasmosis was poor before the health education program, and it's improved after implementation of the program.

[Nadia Abdalla Mohamed and Hoda Diab Fahmy Ibrahim. Evaluate The Health Education Program For Pregnant Women About Toxoplasma Infection at Qena University Hospital. *J Am Sci* 2012;8(12):1306-1315]. (ISSN: 1545-1003). <http://www.jofamericanscience.org>. 176

Keywords: Abortion, toxoplasmosis, risk factors

1. Introduction

Congenital toxoplasmosis occurs early in pregnancy, which lead to severe damage or abortion (Field & Guerina 1997). Sporadic abortion is defined as the termination of pregnancy by any means before the fetus is sufficiently developed to survive. While habitual abortion is defined as three or more consecutive spontaneous abortions. Habitual abortion is one of the most distressing problems in obstetrics, particularly in those women who have no successful pregnancies [Nahed et al. 2009]. To our knowledge; there have been few researches on *T.gondii* conducted in Palestine. The sero-prevalence of *T. gondii* in pregnant women on worldwide scale varies from 7% to 52.3%; and in women with abnormal pregnancies and abortions the sero-prevalence varies from 17.5% to 53.3 % [Kumar, et al. 2004].

Primary infections acquired during pregnancy may cause, in a few cases, congenital toxoplasmosis (CT) with severe damage to the fetus. Manifestations of CT include mental and psychomotor retardation, micro-cephaly, hydrocephalus, seizures, blindness

and death. These manifestations may not become apparent until the second or the third decade of life. The overall risk of a maternal–fetal transmission of the parasite is estimated to be approximately 30% and there is an increasing risk for infection parallel to increasing time of gestation. Toxoplasmosis in pregnant women most often goes unrecognized. Thus, serologic tests are used to diagnose acute infection, but false-positive tests occur frequently (Jones et al., 2001; Remington et al., 2001; Gilbert and Peckham, 2002; SYROCOT, 2007; Montoya and Remington, 2008). Knowledge of the prevalence of *T. gondii* infection in pregnant women and the incidence of acute maternal infection in the various communities is useful in order to evaluate the socioeconomic costs of this infection and to decide whether or not a screening program is necessary to identify it (Swai and Schoonman, 2009). This is due to the fact that there is no definitive consensus concerning the potential benefits of antenatal or postnatal screening or prenatal anti-Toxoplasma treatment (Gilbert and Peckham, 2002; Pelloux et al., 2002; Gilbert et al., 2006; SYROCOT, 2007).

T. gondii infection in humans may occur vertically by tachyzoites that are passed to the fetus via the placenta, or horizontal transmission which may involve three life-cycle stages i.e. ingesting sporulated oocysts from cats or ingesting tissue cysts in raw or under cooked meat or tachyzoites in blood products or primary offal (viscera) of many different animals, tissue transplants and unpasteurized milk [Tenter, et al 2000].

In addition, toxoplasmosis is a widespread zoonosis caused by the obligate intracellular protozoan parasite *Toxoplasma gondii* which infects nearly one third of humanity. The infection is mainly acquired by ingestion of undercooked or raw meat containing viable tissue cysts or by ingestion of food and water that is contaminated with oocysts shed by cats or by blood transfusions and organ transplants (Tenter et al., 2000)

Acute infection with *Toxoplasma gondii* during pregnancy and its potentially tragic outcome for the fetus and the newborn continue to occur in the United States, as well as worldwide, despite the fact that it can be prevented. The infection can be acquired through ingestion of infected, undercooked meat or contaminated food or water. Transmission to the fetus occurs almost solely in women who acquire their primary infection during gestation and can result in visual and hearing loss, mental and psychomotor retardation, seizures, hematological abnormalities, hepatosplenomegaly, or death. Systematic education and serological screening of pregnant women are the most reliable and currently available strategies for prevention, diagnosis, and early treatment of infection in the offspring; this is largely because toxoplasmosis in pregnant women most often goes unrecognized. Treatment of infection in the fetus and infant during the first year of life has been demonstrated to significantly improve the clinical outcome of *Toxoplasma gondii* infection acquired by pregnant women during gestation and its transmission to the fetus continue to be the cause of tragic yet preventable disease in the offspring. (Montoya & Remington, 2008).

T. gondii infection is acquired primarily through ingestion of cysts in infected, undercooked meat or oocysts that may contaminate soil, water, and food. Meat (primarily pork and lamb) is an important source of the infection in humans in the United States [Dubey et al, 2005]. However, the frequency at which the source is meat versus ingestion of oocysts among different populations and geographical areas in the United States is unknown. Recent studies have identified water as a potential source of infection in both humans and animals [Lin et al, 2008].

In addition, in the United States ocular toxoplasmosis affects an estimated 1.26 million

persons [Holland et al, 2003 & Jones et al, 2009]. 22.5% of the adolescent and adult population is infected with the organism [Jones et al, 2001], and 89% of women of childbearing age are susceptible to acute infection with *T. gondii* [Jones et al, 2007] and are at risk of transmitting the parasite to their offspring if they acquire a primary infection during gestation.

In rare cases, congenital transmission has occurred in chronically infected women whose infection was reactivated because of their immunocompromised state (e.g., from AIDs or treatment with corticosteroids for their underlying disease). Most pregnant women with acute acquired infection do not experience obvious symptoms or signs [Remington, et al, 2006 & Boyer et al, 2005].

More than 90% of pregnant women who acquire a primary infection during gestation are asymptomatic (Montoya & Rosso 2005). A minority may experience malaise, low-grade fever, and lymphadenopathy. Rarely, pregnant women presented with visual changes due to toxoplasmic chorioretinitis as a result of recently acquired infection or reactivation of a chronic infection. A recent study revealed that 52% of mothers who gave birth to congenitally infected offspring could not recall experiencing an infection-related illness during pregnancy or an identifiable epidemiological risk factor [Boyer et al, 2005]. In general, among all pregnant women who acquire an infection for the first time, 61% will not transmit it to the fetus: 26% of cases will present fetus with sub-clinical infection and 13% will present clinical infection (7% severe infection and 6% mild infection) (Dunn et al, 1999). Identifying the gestational age at primary infection is crucial for the clinical management of the pregnant women, since the severity of toxoplasmosis for the fetus decreases and the transmission rate increases with increasing gestational age (Beguetto et al, 2003). In the United State, rates of congenital toxoplasmosis have been estimated between one per 10,000 and 10 per 10,000 live births each year (Lopez et al, 2000). Toxoplasmosis is usually diagnosed based on the detection of specific IgG and IgM antibodies; therefore, laboratory diagnosis poses a challenge for health care professionals not only because of the complexity in the interpretation of these markers, but also because modern laboratory techniques are not always available in the national public health care system (Mozzatto & Procianoy 2003).

A study in Egypt; found that poor hand hygiene is the major risk factor for acquiring toxoplasmosis in pregnancy whereas consumption of undercooked meats was the most important route of transmission among women of reproductive age [Maged et al, 2004].

Toxoplasmosis can be transmitted to humans by three principle routes. First, humans can eat raw or inadequately cooked infected meat or eat uncooked foods that have come in contact with contaminated meat. Second, humans can inadvertently ingest oocysts that cats have passed in their faces, either in a cat litter box or outdoors in soil (e.g., soil from gardening or unwashed fruits or vegetables). Third, a woman can transmit the infection to her unborn fetus [Lopez et al, 2004]. In a study 23.5% of aborted women with toxoplasmosis were found to rear cats. The organism in humans produces either congenital or postnatal toxoplasmosis. Congenital toxoplasmosis develops only when non immune mothers are infected during pregnancy and is usually of great severity; postnatal toxoplasmosis is usually much less severe [Shamara et al, 1997]. Congenital infection may cause abortion or result in live-born infants with evidence of disease [Cunningham et al, 1997].

Prevention of *T. gondii* infection depends on avoidance of the organism in cat feces, soil, water, and food, including undercooked meat, milk, chicken, cheep, goats, eggs and all milky products [Lopez, et al 2000].

Primary prevention

Educational materials that contain messages on how to prevent pregnant women from becoming infected have resulted in reduced rates of sero-conversion [Foulon, et al 1988, Baril et al, 1999 & Gollub, et al 2008]

Significance of the study:

In Egypt, data on prevalence of *T. gondii* and associated risk factors in the general population are unavailable. Up till now, prenatal serological screening for toxoplasmosis is not a mandatory part of antenatal care. In consequence, there is limited data on prevalence of *T. gondii* or the proportion of women at risk of acquiring *Toxoplasma* infection during pregnancy [Ibrahim et al., 2009]. In view of paucity of reports on this issue, a study had done based on antenatal screening and prenatal diagnosis; and aimed to determine the rate of *T. gondii* infection and maternal–fetal transmission in pregnant women in Menoufia governorate, Egypt. The information obtained from this study would have important implications for planning appropriate future preventive strategies of this health problem.

another study to detect *Toxoplasma* infection among high risk women {pregnant women that had bad obstetric history and non pregnant women that aborted in different times (1st or 2nd trimester)} in relation to some risk factors e.g. age, contact animals, eating raw meat) in El-Fayoum, Tamyia and Senioris centers at El-Fayoum (Egypt) using ELISA and PCR. The sero-prevalence of *T. gondii* IgG among pregnant (47, 42.5 and 47.8 %) was higher than non

pregnant women (37.5, 40 and 45.5 %) at El-Fayoum (El Fayoum, Senioris and Tamyia centers, respectively). *Concluding*; the previous studies using serological tests and preventive strategic planning and to continue the overall picture, in our study we complete the remaining part of the frame work of toxoplasmosis; where the program was health education for pregnant women on how to prevent toxoplasmosis infection.

Aim of the Study:

This study aim was to evaluate The Health Education Program for Pregnant Women about *Toxoplasma Gondii* Infection at Qena University Hospital.

2. Subjects and Methods

Research design

Pre-test and post test evaluation questionnaire designed for conducting the study.

Setting

The study was conducted at antenatal clinic in Qena University Hospital, Egypt. This clinic starts at 9 a.m and ends at 1 p.m two days every week. This clinic was selected because it is attended by a large numbers of patients, it provides free services to the rural and urban population in the governorate of Qena and other nearest sites.

Subjects and sample:-

The total subjects of the study sample consisted of 140 pregnant women who attend the antenatal clinic with the inclusion criteria. A quota sample was used to collect the data of this study where cases are grouped in on Sunday and Monday of each week; on Tuesday we explain and apply the program to the same women that were interviewed in the Sunday and Monday in the same week, their number was range from 6 to 7 women.

Inclusion criteria:

The inclusion criteria were: pregnant women at (1->24 weeks) their age from 20-37 years.

And those women not previously affected by infection of toxoplasmosis. Excluding any causes of previous abortion.

Tools of data collection:-

A structured interview sheet was developed by the researchers to collect the relevant data. It was based on review of pertinent literature to elicit information about pregnant women. It consists of two parts: the first part was concerned with socio-demographic data such as name, age, education, address, source of knowledge e.g. books, magazine, radio , TV, friends and family , as well as their gestation age. The second part include (Pre and post test) about general information and knowledge about toxoplasma as have you ever read, heard or seen any information about toxoplasma ?, Have you ever been

tested for toxoplasmosis?, Is toxoplasma caused by an infection ?, Is toxoplasma caused by poison?, Is toxoplasma shed in feces of infected cats, Is toxoplasmosis sometimes found in raw or uncooked meat?, can people get toxoplasmosis by eating undercooked meat?, can people get toxoplasmosis by handling infected cats?, can people get toxoplasmosis by gardening without gloves?, can pregnant women develop serious complications after infection?, can toxoplasmosis cause fever to pregnant women and flu like?, can toxoplasmosis in pregnancy cause no symptoms and can toxoplasmosis cause repeated abortion?.

Methods of data collection:-

The necessary official permission was obtained from the chairman of obstetrics and Gynecology department to proceed with study and the purpose. Pilot study was carried out on few numbers of pregnant women who were excluded from the total study sample. The aim of pilot study is test the clarity of the tool and to estimate the time required to fill the sheet. Based on the result of the pilot study, the necessary modification in the sheet was done. Formal consent was obtained from women orally before being involved in the study after explanation of the nature and purpose of the study and there are no risks or cost in participation, and there are voluntary participation and confidentiality of each subject who agree to participate in the study. Each participant was allocated to the proper group according to the study profile. After filling the questionnaire, the researcher provided health education about prevention and screening methods of toxoplasmosis early then the immediate post test done after the health education session.

The average number of the participant in the program from 6-7 women per week for one day, the average number of interviews was 2 to 4 per day and the average time taken for completing each sheet was from 10 -15 minutes .Depending on the response of participant. After pretest; health education session were given to them and they did post test after the health education session. The period of data collection was about 5 month from the beginning of May to the end of September 2011. The program was evaluated by using scoring system: each right answer was given one degree. The total scores were (17). Those who obtained less than (50 %) were considered having unsatisfactory level. From (50% to 70 %) were considered having satisfactory level. While those who obtained above than (70 %) were considered having good level.

Statistical analysis:-

Data collected were coded, analyzed and tabulated. Descriptive statistics (i.e. frequencies and

percentage was done using computer program SPSS). Chi-square test was used to compare differences in the distribution of frequencies. It is considered significant when P value ($P < 0.05$).

3. Results

This study aimed to evaluate The Health Education Program for Pregnant Women about Toxoplasma Gondii Infection at Qena University Hospital.

The result will be presented under the following heading:

Table (1) shows the Socio - demographic characteristics, it was clear that 41.4 % of the pregnant women aged < 30 years. While more than two third of study participants reside at urban areas and about one third of them (32.9 %) had university level of education. On the other hand 12.9% were illiterate.

Table (1): Personal characteristics of the studied pregnant women

	No. (n= 140)	%
Age:		
< 30 years	58	41.4
30 - < 35 years	41	29.3
≥ 35 years	41	29.3
Mean ± SD (Range)	30.46 ± 6.63 (18 - 44)	
Residence:		
Urban	94	67.1
Rural	46	32.9
Level of education:		
University	46	32.9
Secondary education	43	30.7
Basic education	33	23.6
Illiterate	18	12.9

Table (2) shows that the more than one half (52.9 %) of pregnant women under the study had 14-24 weeks of gestation. With Mean and SD of pregnancy 22.4±7.6

Table (2): Duration of pregnancy by (weeks) among the study participants (n=140)

Duration of pregnancy	No.	%
1 - 13 weeks	33	23.6
14 - 24 weeks	74	52.9
> 24 weeks	33	23.6
Mean ± SD	22.4 ± 7.6	
Total	140	100.0

Figure (1) shows negative correlation between age of pregnant women under study and their total score of knowledge before the program. $r = 0.181$ and there is statistically significant difference as P value = 0.032. The figure shows that knowledge often decrease with increase of age.

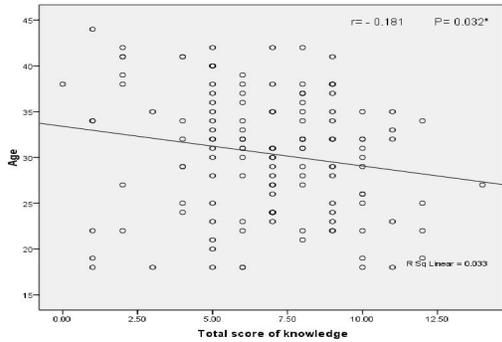


Fig. (1): Correlation between age and total score of knowledge before the program

Figure (2) shows the distribution of the source of medical information among pregnant women in the study ' according to more than two fifth of the sample (41.4 %) get information from newspapers and minority of the sample (27.2%) receive information from family and friends.

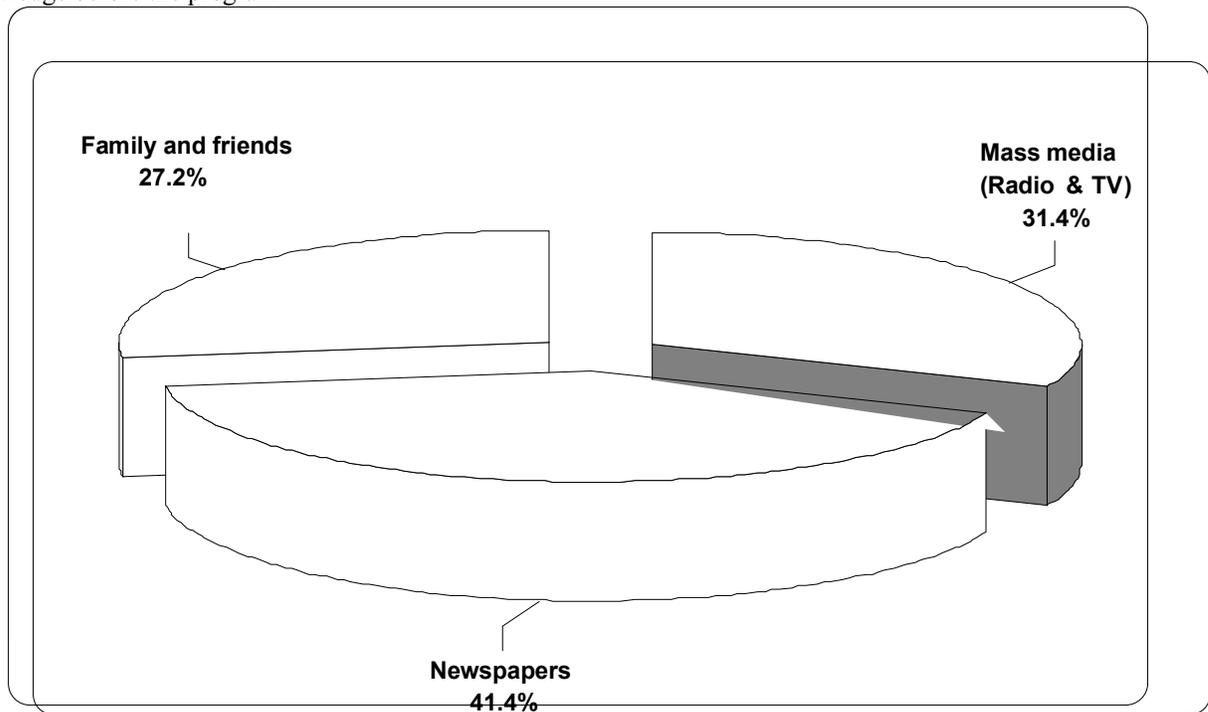


Figure (2): Source of medical information before the program

Table (3) shows the score of knowledge in pre and post assessment of the study sample. It was observed that there is improvement in study sample knowledge after the program and there are highly statistical significant differences between pre and post test $p = 0.000$ in all items of their knowledge.

Table (3): Score of knowledge in pre and post tests among study participants (n=140)

Items	Pre (n= 140)		Post (n= 140)		P-value
	No.	%	No.	%	
General information:					0.000*
Poor	50	35.7	10	7.1	
Satisfactory	38	27.1	24	17.1	
Good	52	37.1	106	75.7	
Risk factors:					0.000*

Poor	85	60.7	26	18.6	0.000*
Satisfactory	36	25.7	30	21.4	
Good	19	13.6	84	60.0	
Signs and symptoms:					0.000*
Poor	48	34.3	7	5.0	
Satisfactory	53	37.9	22	15.7	
Good	39	27.9	111	79.3	
Prevention:					0.000*
Poor	70	50.0	5	3.6	
Satisfactory	33	23.6	39	27.9	
Good	37	26.4	96	68.6	
Total score of knowledge:					0.000*
Poor	81	57.9	8	5.7	
Satisfactory	49	35.0	40	28.6	
Good	10	7.1	92	65.7	

*There are high statistic significant differences

The majority of all categories of age reported that they read; heard or seen information about toxoplasmosis. Also, high percent in all category of age reported that toxoplasmosis caused by infection as shown in table (4). Also, the table illustrated that nearly one third (32.8%) of pregnant women aged less than twenty years reported that toxoplasmosis found in raw meat, the percent increased to 43.9% in the pregnant women aged 20 to 30 years. On the other hand, more than one half (51.2%) of the sample aged thirty years or more reported that

toxoplasmosis not found in raw meat, chicken, milk and eggs .

Nearly three fifth (58.6%) of pregnant women aged less than twenty years reported that washing and or peeling of all fruits and vegetables prevent infection. The percent dropped to 46.3% of pregnant women aged 20 to 30 years .while more than two fifth (41.5%) of the sample aged thirty years or more reported that washing and or peeling of all fruits and vegetables don't prevent infection. with no significance difference between age and toxoplasmosis knowledge.

Table (4): Study sample knowledge about causes of toxoplasmosis and its relation to age (n=140)

Questions	Age in years						P-value
	≤ 20 (n= 58)		20 - 30 (n= 41)		≥ 30 (n= 41)		
	No.	%	No.	%	No.	%	
Have you ever read, heard or seen any information about toxoplasmosis							
Yes	46	79.3	32	78.0	30	73.2	0.408
No	10	17.2	9	22.0	11	26.8	
Not sure	2	3.4	0	0.0	0	0.0	
Is toxoplasmosis caused by infection							
Yes	39	67.2	25	61.0	24	58.5	0.872
No	13	22.4	11	26.8	13	31.7	
Not sure	6	10.3	5	12.2	4	9.8	
Is toxoplasmosis found in raw meat chicken, milk and eggs							
Yes	19	32.8	18	43.9	13	31.7	0.108
No	18	31.0	13	31.7	21	51.2	
Not sure	21	36.2	10	24.4	7	17.1	
Washing and or peeling of all fruits and vegetables prevent infection							
Yes	34	58.6	19	46.3	14	34.1	0.117
No	13	22.4	16	39.0	17	41.5	
Not sure	11	19.0	6	14.6	10	24.4	

The majority of all categories of education level reported that they read heard or seen information about toxoplasmosis; with higher percent of them reported that toxoplasmosis caused by infection as observed in table (5).

Nearly two fifth (39.1%) highly educated pregnant women also, more than two fifth (44.4%) illiterate pregnant women reported that toxoplasmosis found in raw meat, but (39.5%) of secondary

educated women and (45.5%) basic educated women reported that toxoplasmosis not found in raw meat.

About one half of pregnant women with higher education (54.3%) reported that washing and or peeling of all fruits and vegetables prevent infection, while more than one fifth illiterate pregnant women (27.8%) of the sample reported that washing and or peeling of all fruits and vegetables don't prevent infection. with no significance between level of education and toxoplasmosis knowledge.

Table (5) Study sample knowledge about causes of toxoplasmosis and its relation to level of education (n=140)

Questions	Level of education								P-value
	High education (n= 46)		Secondary education (n= 43)		Basic education (n= 33)		Illiterate (n= 18)		
	No.	%	No.	%	No.	%	No.	%	
Have you ever read, heard or seen any information about toxoplasmosis.									
Yes	40	87.0	33	76.7	25	75.8	10	55.6	0.116
No	5	10.9	10	23.3	8	24.2	7	38.9	
Not sure	1	2.2	0	0.0	0	0.0	1	5.6	
Is toxoplasmosis caused by infection?									
Yes	33	71.7	27	62.8	19	57.6	9	50.0	0.480
No	9	19.6	11	25.6	9	27.3	8	44.4	
Not sure	4	8.7	5	11.6	5	15.2	1	5.6	

Is toxoplasmosis found in raw meat chicken, milk and eggs?									0.765
Yes	18	39.1	15	34.9	9	27.3	8	44.4	
No	16	34.8	17	39.5	15	45.5	4	22.2	
Not sure	12	26.1	11	25.6	9	27.3	6	33.3	
Washing and or peeling of all fruits and vegetables prevent infection.									0.902
Yes	25	54.3	20	46.5	13	39.4	9	50.0	
No	14	30.4	14	32.6	13	39.4	5	27.8	
Not sure	7	15.2	9	20.9	7	21.2	4	22.2	

Table (6) shows the more than one half of all categories of the trimester of pregnancy reported that they read, heard or seen information about toxoplasmosis and it caused by infection.

More than one half (54.5%) of the pregnant women in the first trimester had reported that toxoplasmosis found in raw meat chicken, milk and eggs. Three fifth (60.6%) of the pregnant women in the first trimester reported that washing and or peeling of all fruits and vegetables prevent infection.

In the second trimester and the third trimester, nearly; two fifth (41.9%, 39.4%) of pregnant women had reported that toxoplasmosis found in raw meat chicken, milk and eggs. While, they stated by lesser percentages than first trimester (47.3% and 36.4% for the second and the third trimester respectively) that washing and or peeling of all fruits and vegetables don't prevent infection. There are no statistical differences between the pregnancy trimester and knowledge of pregnant women about toxoplasmosis.

Table (6) Study sample knowledge about causes of toxoplasmosis and its relation to trimester of pregnancy

Questions	Trimester of pregnancy.						P-value
	1 st (n= 33)		2 nd (n= 74)		3 rd (n= 33)		
	No.	%	No.	%	No.	%	
Have you ever read, heard or seen any information about toxoplasmosis							0.709
Yes	27	81.8	58	78.4	23	69.7	
No	6	18.2	15	20.3	9	27.3	
Not sure	0	0.0	1	1.4	1	3.0	
Is toxoplasmosis caused by infection							0.592
Yes	21	63.6	49	66.2	18	54.5	
No	10	30.3	16	21.6	11	33.3	
Not sure	2	6.1	9	12.2	4	12.1	
Is toxoplasmosis found in raw meat chicken, milk and eggs							0.120
Yes	6	54.5	31	41.9	13	39.4	
No	18	18.2	23	31.1	11	33.3	
Not sure	9	27.3	20	27.0	9	27.3	
Washing and or peeling of all fruits and vegetables prevent infection							0.074
Yes	20	60.6	35	47.3	12	36.4	
No	6	18.2	29	39.2	11	33.3	
Not sure	7	21.2	10	13.5	10	30.3	

3. Discussions:

This study aims is to evaluate the Health Education Program about Toxoplasmosis Infection for Pregnant Women at Qena University Hospital.

Our study about toxoplasmosis documents level of knowledge about the disease, symptoms and how to prevent infection before and after health education program. Pregnant women who acquire infection from *Toxoplasma gondii* usually remain asymptomatic, although they can still transmit the infection to their fetuses with severe consequences. Given the asymptomatic nature of most *Toxoplasma* infections, primary prevention in pregnant women may lower the risk of congenital toxoplasmosis. Both consumption of undercooked meat, chicken, milk eggs and unprotected contact with soil are independent risk factors for *T. gondii* sero-conversion during pregnancy, while contact

with cat litter may pose a risk in certain situations. However, many pregnant women lack knowledge of these risk factors.

The investigated women at El-Fayoum; were data collected by questionnaire and laboratory results showed positively for those women eating undercooked sheep or goat meat, drinking raw sheep or goat milk and preparation of raw sheep or goat meat were the risk factor that had the strongest influence on acquiring toxoplasmosis by. While any raw meat exposure or drinking of any raw milk of different animals (cow or buffalo milk) had less influence followed by own exposure to cats. In this respect, it was found that *T.gondii* infection is positively correlated with eating raw meat [Han et al 2008 & Fallah et al, 2008].

In Jordan, it was found that increase of infection with *Toxoplasma*, is due to consumption of lamb

greater than that of beef and these animals are reared outdoors which put them at greater risk of environmental exposure than animals reared indoors [Lalia, 2004]. However, Han et al. 2008 reported that *T. gondii* infection is not associated with a history of raising a cat. It was concluded that the high prevalence of toxoplasmosis among the investigated high risk women at El-Fayoum is due to many risk factors including age, contact with host animals (small ruminants), eating undercooked meat, drinking raw sheep or goat milk, preparation of raw sheep or goat meat and own exposure to cats.

In Egypt, stray cats are widely spread as in El-Fayoum which is in favor of a higher prevalence of oocysts in humid environment and farming animal rearing are also common. Avelino et al. 2004 mentioned that pregnant women living with host animals or vehicles of oocysts transmission had approximately increase risk two times of being infected for each risk factor.

In El-Fayoum study, the sample revealed that majority of pregnant women in second trimester were ranged from (18-less than 30 years) with high or secondary education and lived in urban area. Most of the participants (59.0%) had secondary education level. Animal breeding was reported for 33.3% of the aborted women. The age groups of 23-28 years old were at great risk of toxoplasma infection (25.5%) than other groups. In this study also higher percentage of pregnant women with higher or secondary education; both 63.6% and 67.1% live in urban areas.

The finding of this study illustrate that knowledge about toxoplasma often decrease less frequency with increase of age. In El-Fayoum study, the total sero-prevalence of *T. gondii* IgG and IgM among pregnant (66.6 and 50%, respectively) and number pregnant women of the age group 35-45 years were the highest (62.5 and 50.0%, respectively). Valcavi et al., 1995 determined the prevalence of IgG antibodies to *T. gondii* in Italy by ELISA; being 48.5% with correlation of infection with age; it showed a significant increase of positivity until 30-40 approximately years. Hung et al. 2007 mentioned that older age group of 35 years had a significantly higher sero-prevalence than that of the younger age group of 15-25 years. Also, Fallah et al. 2008 reported that increasing age was statistically significantly associated with higher infection rates. From above, it obvious that increasing age of pregnant women associated with low knowledge of toxoplasmosis infection and higher infection rate.

The findings of this study indicate that newspapers play an important role in informing women about toxoplasmosis. Of these women who heard about toxoplasmosis, 31.4% had heard about it from a mass media as radio and TV. TV is simple and easy method to learn methods of infection and prevention, so we

must give good care of this tool. The findings of this study are in disagreement with the study done by (Maged et al., 2004) in Mansoura, Egypt who indicated that health professionals play an important role in informing women about toxoplasmosis. Of these women who heard about toxoplasmosis, over half had heard about it from a medical staff.

This study portrayed that a highly statistical significance differences between pre and post test in general information, risk factors, signs and symptoms, prevention and total score of knowledge.

This study portrayed that there weren't statistically significance differences between age, residence, level of education, duration of pregnancy and source of medical information and level of knowledge. However, there wasn't statistical significance differences but this result revealed that decreasing the level of education associated with decreasing the level of knowledge; and hence; more liable to infection. The findings of this study are in the same line with other studies done by Lopez et al (2004) and Avelino et al. (2004) in Brazil who mentioned that pregnant women with a low education level had greater risk of infection with *T.gondii*. Another study done by Liu et al. (2009) included 235 pregnant women in Chang- chun, China, and found that a low education level was a risk factor for toxoplasmosis. This was similar to our results where women who bread cats in their houses and of low knowledge of how toxoplasmsis transmitted were more infected with toxoplasmosis. Other studies were found that educational level, touching cats, handling raw meat and farming not associated with toxoplasma infection (Hussein et al., 2009). In Hussein study 47.7% of the women were educated but no association between education level and infection by *Toxoplasma* was found.

Decrease of gestational age associated with increase of knowledge however, there wasn't statistically significance found. The findings of this study are in disagreement with the study done by (Maged et al., 2004) in Mansoura, Egypt who proved that it is interesting that knowledge about toxoplasmosis did not vary greatly by trimester of pregnancy.

Regarding the effect of health education program, the level of knowledge of pregnant women's regarding general information, risk factors, signs and symptoms and prevention of toxoplasmosis increased to double. There was a low level of knowledge about raw or uncooked meat, chicken, milk, milk produced and eggs for toxoplasmosis; in pre counseling was 35.7%. While in post test counseling become doable 70.0 %. These results are in concordance with the study done by Dubey et al (2008) in USA who identified a number of risk factors that have been associated with *T. gondii* infection, such as eating undercooked meat. Other studies from south Brazil by Avelino et al., 2004

suggested that consumption of undercooked beef and working in a garden were risk factors. In Avelino nearly, half of the sample study (47.9%) of pregnant women reported that toxoplasmosis can be prevented by thoroughly washing and or peeling all fruits and vegetables before eating them in per counseling, while it increased to more than three quarter of the total sample in post educational program is (84.3 %). Our findings are in agreement with those reported by Avelino et al. (2004) for pregnant women from Brazil. Other study from south Brazil mentioned that other factors are associated with the occurrence of toxoplasmosis infection, including, cultural behavior and hygienic standards. On the other hand, Our findings are in agreement with those reported by Tamer et al., 2009 that primary prevention of toxoplasmosis in the sero-negative pregnant mother can be achieved through education to practice precautionary measures, which include washing the hands frequently, washing all vegetables and fruits and, most importantly, avoidance of eating raw meat.

Conclusion

The knowledge of the study sample about toxoplasmosis was poor before the health education program, and improved after implementation of the program.

Recommendation

Based on the result of the study, the researchers come up with the following recommendations:

1. Encourage the couple to make premarital examination to prevent toxoplasmosis.
2. Educational measures should be in written form (e.g., books, magazines, or simple handouts), available in Arabic language, and integrated into existing prenatal care, visits, and classes. Health education is the responsibility of health care policy makers, nurses and physicians to educate both pregnant women and women who are considering becoming pregnant, with regard to preventive measures of toxoplasmosis.
3. Periodic examination or check-up for pregnant women.
4. Training for midwife to emphasize prevention of toxoplasmosis.

Reference

- 1- Field, L.; Guerina, G. (1997) Toxoplasmosis. Paediatrics in Review. 99-107.
- 2-Avelino, M.M., D.J. Campos, J.B. Parada and A.M. Castro, 2004. Risk factors for *Toxoplasma gondii* infection in women of childbearing age. Braz J. Infect. Dis., 8: 164-174.
- 3-Gilbert, R., Tan, H.K., Cliffe, S., Guy, E., Stanford, M., 2006. Symptomatic toxoplasma infection due to congenital and post-natal acquired infection. Archives of Disease in Childhood 91, 495–498.
- 4-Kumar, A.; Arora, V.; Mathur, M.(2004) *Toxoplasma* Antibody Levels in Females with Habitual or Sporadic Abortions and in Normal Pregnancies. Indian J Microbiol; 22(4):276-7.
- 5- Ibrahim, H.M., Huang, P., Salem, T.A., Talaat, R.M., Nasr, M.I., Xuan, X., Nishikawa, Y., 2009. Prevalence of Neospora caninum and Toxoplasma gondii antibodies in Northern Egypt. American Journal of Tropical Medicine and Hygiene 80,263–267.
- 6-Nahed H. Ghoneim, 2S.I. Shalaby, 3Nawal A. Hassanain, 4G.S.G. Zeedan, 5Y.A. Soliman and 4Abeer M. Abdalhamed Global Veterinaria 3 (5): 395-400, 2009 ISSN 1992-6197 © IDOSI Publications, 2009.
- 7- Shamara, P.; Gupra, I.; Ganguly, K.; Mahajan, E.; Maila, N. (1997) Increasing Toxoplasma Sero-positivity in Women With Bad Obstetric History and in Newborns. NatlMed J. 10:65-66.
- 8- Lopez, A.; Dietz, J.; Wilson, M.; Navin, T.; Jones, J. (2004) Preventing Congenital Toxoplasmosis. NCID 2000/49(RR02):57-75.
- 9-Cunningham, F.; MacDonald, C.; Gant, F.; Leveno, J.; Gilstrap, C.; Hankins, V.; Clark, L. (1997) Williams Obstetrics. 20th edit. PRENTICE-HALL3.
- 10-Gilbert, R.E., Peckham, C.S., 2002. Congenital toxoplasmosis in the United Kingdom: to screen or not to screen? Journal of Medical Screening 9, 135–141.
- 11-Jones, J.L., Lopez, A., Wilson, M., Schulkin, J., Gibbs, R., 2001. Congenital toxoplasmosis: a review. Obstetrical and Gynecological Survey 56, 296–305.
- 12-Pelloux, H., Fricker-Hidalgo, H., Pons, J.C., Bost-Bru, C., Brenier-Pinchart, M.P., Jouk, P.S., Ambroise-Thomas, P., 2002. Congenital toxoplasmosis: prevention in the pregnant woman and management of the neonate. Archives de Pediatrie 9,206–212.
- 13-Remington, J.S., McLeod, R., Thulliez, P., Desmonts, G., 2001. Toxoplasmosis. In: Remington, J.S., Klein, J.O. (Eds.), Infectious Diseases in the Fetus and Newborn Infant., 5th ed. W.B. Saunders, Philadelphia, p. 205–346.
- 14-Swai, E.S., Schoonman, L., 2009. Sero-prevalence of Toxoplasma gondii infection amongst residents of Tanga District in north-east Tanzania, Tanzan. Journal of Health Research 11, 205–209.
- 15-SYROCOT (Systematic Review on Congenital Toxoplasmosis) study group, 2007. Effectiveness of prenatal treatment for congenital toxoplasmosis: a meta-analysis of individual patients' data. Lancet 369, 115–122.
- 16-Montoya, J.G., Remington, J.S., 2008. Management of Toxoplasma gondii infection during pregnancy. Clinical Infectious Diseases 47, 554–566.
- 17-Tenter, A.M., A .R. Heckerth and L.M. Weiss, 2000. *Toxoplasma gondii*: from animals to humans. Int. J. Parasitol., 30: 1217-1258.
- 18-Dubey JP, Hill DE, Jones JL, et al. Prevalence of viable Toxoplasma gondii in beef, chicken, and pork from retail meat stores in the United States: risk

- assessment to consumers. *J Parasitol* 2005; 91:1082-93.
- 19-Beguetto E, Buffolano W, Spadoni A, Del Pezzo M, Di Cristina M, Minenkova O, Petersen E, Felici F, Gargano N 2003. Use of an Immunoglobulin G Avidity Assay based on recombinant antigens for diagnosis of primary *Toxoplasma gondii* infection during pregnancy. *J Clin Microbiol* 41: 5414-5418.
- 20-Dunn D, Wallon M, Peyron F, Petersen E, Peckhan C, Gilbert R 1999. Mother-to-child transmission of toxoplasmosis: risk estimates for clinical counseling. *Lancet* 353: 1829-1833.
- 21-Boyer KM, Holfels E, Roizen N, et al. Risk factors for *Toxoplasma gondii* infection in mothers of infants with congenital toxoplasmosis: implications for prenatal management and screening. *Am J Obstet Gynecol* 2005; 192:564-71. Downloaded from <http://cid.oxfordjournals.org/> on May 8, 2012.
- 22-Jones JL, Kruszon-Moran D, Sanders-Lewis K, Wilson M. *Toxoplasma gondii* infection in the United States, 1999-2004, decline from the prior decade. *Am J Trop Med Hyg* 2007; 77:405-10.
- 23-Jones JL, Kruszon-Moran D, Wilson M, McQuillan G, Navin T, McAuley JB. *Toxoplasma gondii* infection in the United States: sero-prevalence and risk factors. *Am J Epidemiol* 2009; 154:357-65.
- 24-Maged R. Elshamy, Osama M. Warda, HM Youssef, Elsaid Abdel-Hady, Basem S Eldeek. K A Study of Pregnant Women About *Toxoplasma* Infection at Mansoura University Hospital Obstetrics and Gynecology Department; and Community Medicine Department; Faculty of Medicine, Mansoura University.2004.
- 25-Montoya JG, Rosso F 2005. Diagnosis and management of Toxoplasmosis. *Clin Perinatol* 32: 705-726.
- 26-Lopez A, Dietz VJ, Wilson M, Navin TR, Jones JL 2000. Preventing congenital toxoplasmosis. *MMWR Recomm Rep* 49: 59-68.
- 27-Remington JS, McLeod R, Thuilliez P, Desmots G. Toxoplasmosis. In: Remington JS, Klein JO, Wilson CB, Baker C, eds. *Infectious diseases of the fetus and newborn infant*. 6th ed. Philadelphia: Elsevier Saunders, 2006:947-1091.
- 28-Holland GM. Ocular toxoplasmosis: a global reassessment. I. Epidemiology and course of disease. *Am J Ophthalmol* 2003; 136:973-88.
- 29-Baril L, Ancelle T, Goulet V, Thuilliez P, Tirard-Fleury V, Carme B. Risk factors for *Toxoplasma* infection in pregnancy: a case-control study in France. *Scand J Infect Dis* 1999; 31:305-9.
- 30-Foulon W, Naessens A, Lauwers S, De Meuter F, Amy JJ. Impact of primary prevention on the incidence of toxoplasmosis during pregnancy. *Obstet Gynecol* 1988; 72:363-6.
- 31-Gollub EL, Leroy V, Gilbert R, Chene G, Wallon M. Effectiveness of health education on *Toxoplasma*-related knowledge, behavior, and risk of sero-conversion in pregnancy. *Eur J Obstet Gynecol Reprod Biol* 2008; 136:137-45.
- 32-Mozzatto L, Procianoy RS 2003. Incidence of congenital toxoplasmosis in Southern Brazil: a prospective study. *Rev Inst Med Trop Sao Paulo* 45: 147-151.
- 33-Lin, Y., Liao, Y., Long-Ren, L., Chen, F., Kuo, H., He, S., 2008. Sero-prevalence and sources of *Toxoplasma* infection among indigenous and immigrant pregnant women in Taiwan. *Parasitology Research* 103, 67-74.
- 34-Dubey JP, Jones JL. *Toxoplasma gondii* infection in humans and animals in the United States. *Int J Parasitol* 2008; 38:1257-78.
- 35-Liu Q, Wei F, Gao S, Jiang L, Lian H, Yuan B, Yuan Z, Xia Z, Liu B, Xu X, Zhu XQ. *Toxoplasma gondii* infection in pregnant women in China. 2009. *Trans R Soc Trop Med Hyg* 103: 162-166.
- 36-Tamer G, Dundar D, Caliskan E. Sero-prevalence of *Toxoplasma gondii*, rubella and cytomegalovirus among pregnant women in western region of Turkey. *Clin Invest Med* 2009; 32 (1): E43-E47.
- 37-Fallah, M., S. Rabiee, M. Matini and H. Taherkhani, 2008. Sero-epidemiology of toxoplasmosis in primigravida women in Hamadan, Islamic Republic Iran, 2004. *East Mediterr. Health. J.*, 14: 163-171.
- 38-Han, K., D.W. Shin, T.Y. Lee and Y.H. Lee, 2008. Sero-prevalence of *Toxoplasma gondii* infection and risk factors associated with sero-positive of pregnant women in Korea. *J. Parasitol.*, 94: 963-965.
- 39-Valcavi, P.P., A. Natali, L. Soliani, S. Montali G. Dettori and C. Cheezi, 1995. Prevalence of anti-*Toxoplasma gondii* antibodies in the population of the area of Parma (Italy). *Eur. J. Epidemiol.*, 11: 333-337.
- 40-Hung, C.C., C.K. Fan, K.E. Su, F.C. Sung, H.Y. Chiou and V. Gil, M. da Conceicao dos Reis Ferreira, J.M. de Carvalho, C. Cruz, Y.K. Lin, L.F. Tseng, K.Y. Sao, W.C. Chang, H.S. Lan and S.H. Chou, 2007. Serological screening and toxoplasmosis exposure factors among pregnant women in the Democratic Republic of Sao Tome and Principe. 2. *Trans R. Soc Trop. Med. Hyg.*, 101: 134-139.
- 41-Laila, N., P. Herve and E.L. layla, 2004. Detection Of *Toxoplasma gondii* and specific antibodies in high-risk pregnant women. *Am. J. Trop. Med. Hyg.*, 71: 831-835.
- 42-Hussein L, Al-Hindi A, Sero-pervalence of Toxoplasmosis among Palestinian Aborted Women in Gaza . *PALESTINE Annals of Alquds medicine* (2009) Issue 5 : 39-47.

12-20-2012