

Application of an Epidemiological Triangle Model on Prevalent Sexually Transmitted Diseases among Married Women

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Abstract

Sexually transmitted diseases one of the most serious public health issues in both developed and developing countries. **The aim** of this study was to evaluate the application of an epidemiological triangle model on prevalent sexually transmitted diseases among married women. **Research design:** A quasi experimental design was utilized in this study. **Setting:** This study was conducted at the Obstetrics & Gynecology Outpatient Clinics in Benha University Hospital and Benha Teaching Hospital in Benha City. **The sample:** Simple random sample of 25% of all women attended to previously mentioned settings which included 150 women. **Tools: A structured interviewing questionnaire which includes fourth parts:- a):** demographic characteristics **b):** history of the studied women's **c):** knowledge about prevalent sexually transmitted disease (chlamydia, gonorrhea, syphilis and trichomoniasis) according to an epidemiological triangle model **d):** women's reported practices for prevalent sexually transmitted disease (chlamydia, gonorrhoea, syphilis and trichomoniasis) according to an epidemiological triangle model. **Results:** 18.0% of the studied women had good total knowledge scores pre implementation of epidemiological model which increased to 72.7% post implementation of epidemiological model, 31.3% of the studied women had satisfactory total practices level pre implementation of epidemiological model and then this percentage increased to 81.3% post implementation of epidemiological model. There were positive statistically correlations between the studied women's total knowledge scores and total practices scores post implementation of epidemiological triangle model **Conclusion:** The epidemiological triangle model succeeded to improve knowledge, practices of the studied women regarding sexually transmitted diseases **Recommendations:** Provide continuous educational program to women in Outpatient Obstetrics Clinics and maternal and child health centers to increase knowledge about prevention of sexually transmitted diseases.

Key words: Epidemiological Triangle Model, Prevalent Sexually Transmitted Diseases, Married Women.

Introduction

Sexually Transmitted Diseases (STDs) pose serious risks to public health for people of all ages, particularly in low- and middle-income nations and especially for women. According to World Health Organization (WHO), the epidemic of STDs is a growing global problem. The prevalence and incidence of STDs are still high, even for the four curable STDs (chlamydia, gonorrhoea, trichomoniasis, and syphilis), with more than one million new infections being detected each day globally. The majority of new STD cases each year are among women between the ages of 15 and 24, who also have the highest STD prevalence rates (Matovu, et al., 2021; Cegolon, et al., 2022).

Men and women can both get STDs, although women are more prone to infections. Due to the vaginal mucosa is thin, sensitive, and easily penetrated by infectious agents, the female urogenital anatomy may be more exposed and susceptible to STDs than the male urogenital anatomy. The upper genital tract, which includes the uterus, endometrium, fallopian tubes, and ovaries, is reached through the cervix at the distal end of the vagina. Additionally, the vagina's wet environment makes it a perfect place for bacteria to flourish (Choi, et al., 2021; Van, et al., 2022).

Each person has the potential to contract these illnesses multiple times throughout lifetime because they do not produce immunity. Multiple sexual partners, beginning sexual activity at a young age, poverty, smoking, low knowledge, low literacy, depression, hazardous sexual behaviour, and a history of other STDs are risk factors for STDs. One of the key factors contributing to the spread of these diseases is unfavourable attitudes and ignorance. Misuse of recreational drugs and alcohol, which impairs judgement, as well as unsafe sexual encounters

and sharing of contaminated needles or syringes, are other risk factors (Tuddenham, et al., 2022; Garcia, et al., 2022).

In general, STDs have adverse effects on social, psychological, and physical aspects of daily life. Pelvic inflammatory diseases, ectopic pregnancy, infertility and persistent pelvic pain are some of the complication of STDs. Adults untreated syphilis develops cardiovascular and neurological disorders. Premature birth, newborn encephalitis, ocular infections, pneumonia, and fetal or neonatal death are among risks associated with STDs during pregnancy. The risk of acquiring and transmitting HIV is further increased by chlamydia, gonorrhoea, syphilis, and trichomoniasis (Hsieh, et al., 2022; Du, et al., 2022).

Guidelines on STDs prevention and care are being developed by WHO in phases. These guidelines will include suggestions for primary prevention, management of asymptomatic STDs, updated treatment recommendations for specific STDs, partner management, monitoring and evaluation, and delivery of services, syphilis screening and treatment for pregnant women, and management of (WHO, 2022).

Epidemiology is the study of the frequency and causes of disease occurrence in various populations. Planning and assessing illness prevention plans as well as serving as a guideline for the treatment of patients in whom disease has already manifested employ epidemiological data. The epidemiological triangle model is a crucial tool for developing and implementing such preventive interventions as well as a model of illness causation. The epidemiological triangle model's main objectives are to better understand how a disease spreads, identify the factors that led to disease transmission, and provide guidance for

choosing an efficient disease control strategy (Wang, 2022& Thornton, 2022).

The "what," "who," and "where" in the epidemiological triangle model are the agent or germ that causes STDs, the host or organism that harbors STDs, and the environment or those external conditions that cause or permit STDs transmission. The epidemiological triangle model enables women to identify STDs causative agent, STDs-prone individuals, and environmental factors that influence disease occurrence. This enables women to pinpoint the sexually healthy behaviors that aid in STD prevention (Dhara & Nayak, 2023).

According to the epidemiological triangle model, community health nurses play a crucial role in helping women prevent and control STDs by promoting "safer sex" or sexual abstinence, trying to encourage testing and counseling for women who have a history of exposure to STDs or who are in high-risk groups, and providing referrals for follow-up for women who test positive for an STD. In order to priorities prevention of STDs over treatment, community health nurses assist women in modifying destructive behaviors (relating to personal hygiene, safe sex, and commitment to treatment) (WHO, 2021).

Aim of the study:

The study aimed to evaluate the application of an epidemiological triangle model on prevalent sexually transmitted diseases among married women.

Research hypothesis

Application of an epidemiological triangle model for married women have prevalent sexually transmitted disease will improve their knowledge and practices regarding sexual transmitted diseases.

Subject and methods

Research design:-

A quasi – experimental design was used in carrying out this study.

Setting:-

This study was conducted at the Obstetrics& Gynecology Outpatient Clinics in Benha University Hospital and Benha Teaching Hospital in Benha City.

Sampling type:-

Simple random sample of 25% of all women attended to previously mentioned settings which includes 100 women from 400 women attended to Benha University Hospital Outpatient Clinic at the last year (2020) and 50 women from 200 women attended to Teaching Hospital Outpatient Clinic at the last year, so the total sample included 150 women, they chosen according to certain criteria:

- Diagnosed with sexually transmitted disease (chlamydia, gonorrhoea, syphilis and trichomoniasis).
- Aged 18-45 years.
- Free from chronic and other obstetric disease.

Tools of data collection:

A structured interviewing questionnaire was developed by the researcher, It was written in simple clear Arabic language and includes fourth parts:-

The first part:-Was concerned with the demographic characteristics of women as (age, education level, occupation, residence and family type).

The second part: - Was concerned with history of the studied women, which cover the following two parts:-

A: - Was concerned with gynecological history of the studied women 7 items as (age at marriage/ years, previous abortion, regularity of menstrual cycle.....etc.)

B: Was concerned with present complain of the studied women 11 items as (abnormal vaginal discharge, itching in genital area, swelling in genital area, pain during intercourse.....etc.).

The third part: Was concerned with women knowledge about prevalent sexually transmitted disease, chlamydia, gonorrhea, syphilis and trichomoniasis (pre and post-test) according to an epidemiological triangle model which adapted from (**Rothman, 2002**). It include agent of sexually transmitted diseases 6 items, agent of chlamydia trachomatis 4 items, agent of gonorrhea 4 items, agent of syphilis 6 items, agent of trichomonas 5 items, host of sexually transmitted diseases 9 items and environment of sexually transmitted diseases 9 items.

Scoring system:

The scoring system for women knowledge was calculated as follows (2) score for correct and complete answer, while (1) score for correct and incomplete answer, and (0) for don't know. The score of the items was summed- up and the total divided by the number of the items, giving a mean score. These scores were converted into a percent score.

The total knowledge score was considered good if the score of the total knowledge $\geq 75\%$ (64) point, while considered average if it $50 < 75\%$ (43-64) point, and considered poor if it $< 50\%$ less (43) point.

The fourth part: - Was concerned with women reported practices regarding prevalent sexually transmitted disease, chlamydia, gonorrhea, syphilis and trichomoniasis) (pre and post-test) according to an epidemiological triangle model includes reported practices about personal hygiene according to an epidemiological triangle model related agent 14 items, reported practices about increasing resistance to disease by improving immunity and adhering to healthy diet and follow-up and compliance with treatment according to an epidemiological triangle model related host 16 items and reported practices about safe sex according to an epidemiological triangle model related environment 9 items .

Scoring system:

The scoring system for women reported practices were calculated as follows (1) score for done and (0) for not done. The score of the items was summed- up and the total divided by the number of the items, giving a mean score. These scores were converted into a percent score.

The total reported practices scores was considered satisfactory if the score of the total practices $\geq 60\%$ (≥ 23) point, while considered unsatisfactory if it is $< 60\%$ (< 23) point.

Pilot study:

The pilot study was conducted on 10% (15) woman. The pilot study was aimed to test the content, clarity, applicability and simplicity of the tool using the interviewing questionnaire as a pre-test sheet. The estimation of the time needed to fill the questionnaire, time needed to fill each sheet consumed about 30-45 minutes. No modifications were done, so the pilot study sample was included in the total sample.

Ethical considerations:

All ethical issues were assured; informed consent has been obtained from each woman before conducting the interview and given them a brief orientation to the purpose of the study. Women were also reassured that all information gathered would be confidentially and used only for the purpose of the study. The woman had right to withdraw from the study at any time without giving any reasons.

Content validity of the tools:

Content validity of the tools was done by three of Faculty's Staff Nursing experts from the Community Health Nursing Specialties who reviewed the tools for clarity, relevance, comprehensiveness, and applicability and give their opinion.

Reliability of the tools:

Reliability of the tool was applied by the researcher for testing the internal consistency of the tool, by administration of the same tools to the same subjects under similar condition on one or more occasion. Answers from repeated testing were compared (test-retest reliability). The reliability was done by Cronbachs Alpha coefficient test which revealed that each of the three tools consisted of relatively homogenous items as indicated by the moderate to high reliability of each tool. The internal consistency of the knowledge was 0.88, while practices were 0.91.

Epidemiological Triangle Model development included four phases:

Based on the results obtained from the interviewing questionnaire, as well literature review, the Epidemiological Triangle Model developed by researcher. It was implemented immediately after pre-test. The researcher

implemented the Epidemiological Triangle Model through 4 phases as the following:

(I) Assessment phase: In this phase of the Epidemiological Triangle Model, assessed knowledge, practices of the studied women through collection and analysis of baseline data from the filled tools. In this phase the researcher did the pre- test.

(II) Planning phase: The researcher identified the important needs for target group, set priorities of needs, goals and objectives were developed.

(III) Implementation phase: In this phase the researcher implemented the epidemiological triangle model for the women at the suitable time for them.

Data were collected over 12 months from the start of March 2021 to end of the February 2022. The study was conducted by the researcher for the studied sample in the selected setting of the Obstetrics& Gynecology Outpatient Clinics in Benha University Hospital and Benha Teaching Hospital in Benha City. The researcher visited the Obstetrics& Gynecology Outpatient Clinics in Benha University Hospital two days per week (Saturday and Tuesday) from 9:00 am to 12:00 mid- day, and visited the Obstetrics& Gynecology Outpatient Clinics in Teaching Hospital at Sunday from each week. The average time needed for the sheet was around 30-45 minutes, the average number interviewed at the Obstetrics& Gynecology Outpatient Clinics were 3-4 women/week depending on the responses of the women, end program through 4 days for 3-4 women.

To insure that they were exposed to the same learning experience The researcher

implemented the epidemiological triangle model through eight sessions of 5.5 hours (6 theoretical sessions and 2 practical sessions, each session lasted 30 – 45 minutes including periods of discussion and the average number of implementation the epidemiological triangle model were 3-4 women /week and immediately did the post-test.

First session: At the beginning of the first session, the researcher welcomed and introduced herself to the women, an orientation to the intervention and its process were presented, included meaning of sexually transmitted diseases and explain mode of transmission of sexually transmitted diseases, taking into consideration use of simple language according to the educational level.

Second session: Covered mention people high risk for sexually transmitted diseases, recognize factors contributing to the occurrence of sexually transmitted diseases and enumerate causes of Sexually Transmitted Diseases (agent).

Third session: Covered meaning of chlamydia infection, list causes, signs and symptoms, complication and methods of treatment of chlamydia infection.

Fourth session: Covered meaning of gonorrhea infection, list causes, signs and symptoms, complication and methods of treatment of gonorrhea infection.

Fifth session: Covered meaning of syphilis infection, list causes, signs and symptoms, complication and methods of treatment of syphilis infection.

Six sessions: Covered meaning of trichomoniasis infection, list causes, signs and symptoms, complication and methods of treatment of trichomoniasis infection and

explain ways to prevent sexually transmitted disease.

Seven sessions: Demonstrate personal hygiene and illustrate safe sex.

Eight sessions: Construct healthy diet and demonstrate follow up and compliance for treatment.

Each session started by summary about the previous session and objectives of new topics. Direct reinforcement in the form, a copy of the intervention was given as a gift for each women to use it as future reference. All the participants were cooperative with the researcher.

(IV): Evaluation phase:

Evaluation of the implementation was done by using the post-test questionnaire which was the same formats of pre - test in order to compare the change in the patients` knowledge, practices after implementation of the Epidemiological Triangle Model.

Statistical analysis:

All data collected were organized, tabulated and analyzed using appropriate statistical test. The data were analyzed by using the Statistical Package for Social Science (SPSS) version 21 which was applied to calculate frequencies and percentage, mean and standard deviation, as well as test statistical significance and associations by using Chi-square test (χ^2) and linear correlation coefficient (r), and **matrix correlation** to detect the relation between the variables (P value).

Results

Table (1): Shows that; 47.3% of the studied women their age were 18 to 28 years with mean age was 28.65 ± 5.21 years and 65.3% of them had secondary education. Regarding occupation

60.0% of the studied women were housewife. 62.7% of the studied women were lived in rural areas and 67.3% of them lived in extended family.

Table (2): Shows that; 60.7% of the studied women married between 18-25 years old, 61.3% of them didn't have pervious abortion. 64.7% of studied women had irregular menstruation and 55.3% of them had medium amount of blood during menstruation. 27.3% of the studied women used intrauterine device as contraceptive method, and 36.0% of them delivered twice.

Table (3): Shows that; 96.7%, 86.7% and 82.7% of the studied women had abnormal vaginal discharge, swelling in genital area and itching in genital area respectively and 79.3%, 76.0% and 74,0% of them had lower abdominal pain, pain during intercourse and recurring STDs respectively.

Table (4): Shows that; there were positive statistically correlations between the studied

women` total knowledge scores and total practices scores post implementation of epidemiological triangle model ($P = > 0.05$). While there were no significant correlations between the studied women total knowledge level and total practices scores pre implementation of epidemiological triangle model.

Figure (1): Illustrates that; 18.0% of studied women had good total knowledge level pre implementation of epidemiological model which increased to 72.7% post implementation of epidemiological model, while 57.3% of them had poor total knowledge level at pre implementation of epidemiological model, and then this percentage decreased to 10.0% post implementation of epidemiological model.

Figure (2): Illustrates that; 31.3% of the studied women had satisfactory total practices level pre implementation of epidemiological model and then this percentage increased to 81.3% post implementation of epidemiological model.

Table (1): Frequency distribution of the studied women regarding their demographic characteristics (n=150).

<i>Demographic characteristics</i>	No.	%
Age/years		
18-28	71	47.3
29-38	50	33.4
39-45	29	19.3
Mean \pm SD	28.65 \pm 5.21	
Education level		
Don't read and write	17	11.3
Basic education	14	9.3
Secondary education	98	65.3
University education and more	21	14.1
Occupation		
Working	60	40.0
Housewife	90	60.0
Residence		
Urban	56	37.3
Rural	94	62.7
Family type		
Single family	7	4.7
Nuclear family	42	28.0
Extended family	101	67.3

Table (2): Frequency distribution of the studied women regarding their gynecological history (n=150).

Items	No	%
Age at marriage/years		
18-25	91	60.7
26-33	36	24.0
34-41	23	15.3
Pervious abortion		
Yes	58	38.7
No	92	61.3
Regularity of menstrual cycle		
Regular	53	35.3
Irregular	97	64.7
Amount of blood during menstruation		
Low	21	14.0
Medium	83	55.3
Much	46	30.7
Method of contraception		
Tablets	23	15.3
Intrauterine device	41	27.3
Injections	31	20.7
Natural method as breastfeeding	22	14.7
Male condom	2	1.3
Female septum	2	1.3
External ejaculation	1	.7
Do not using	28	18.7
Gravid		
None	20	13.3
Once	53	33.3
Twice	53	37.3
Three or More	24	16.0
Para		
None	33	22.0
Once	49	32.7
Twice	54	36.0
Three or More	14	9.3

Table (3): Frequency distribution of the studied women regarding their present complain (n=150).

Items	Yes		No	
	No	%	No	%
Abnormal vaginal discharge	145	96.7	5	3.3
Itching in genital area	124	82.7	26	17.3
Swelling in genital area	130	86.7	20	13.3
Pain during intercourse	114	76.0	36	24.0
Severe pain during menstruation	105	70.0	45	30.0
Lower abdominal pain	119	79.3	31	20.7
Pain during urination	109	72.7	41	27.3
Sores or blisters on genital area	45	30.0	105	70.0
Vaginal bleeding	41	27.3	109	72.7
Recurring STDs	111	74.0	39	26.0
Husband suffers from STDS	32	21.3	118	78.7

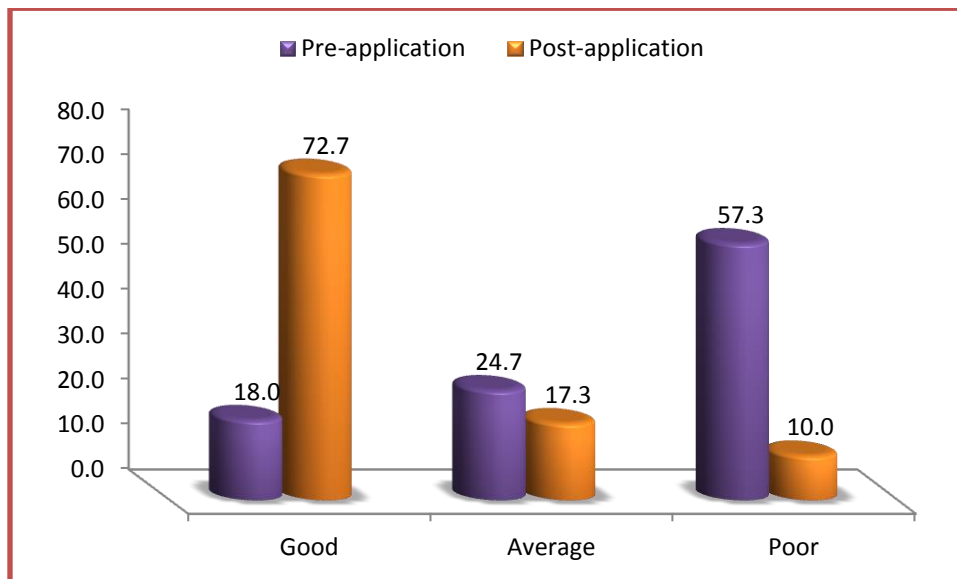


Figure (1): Percentage distribution of the studied women regarding their total knowledge level pre and post implementation of epidemiological model for sexually transmitted diseases (n=150).

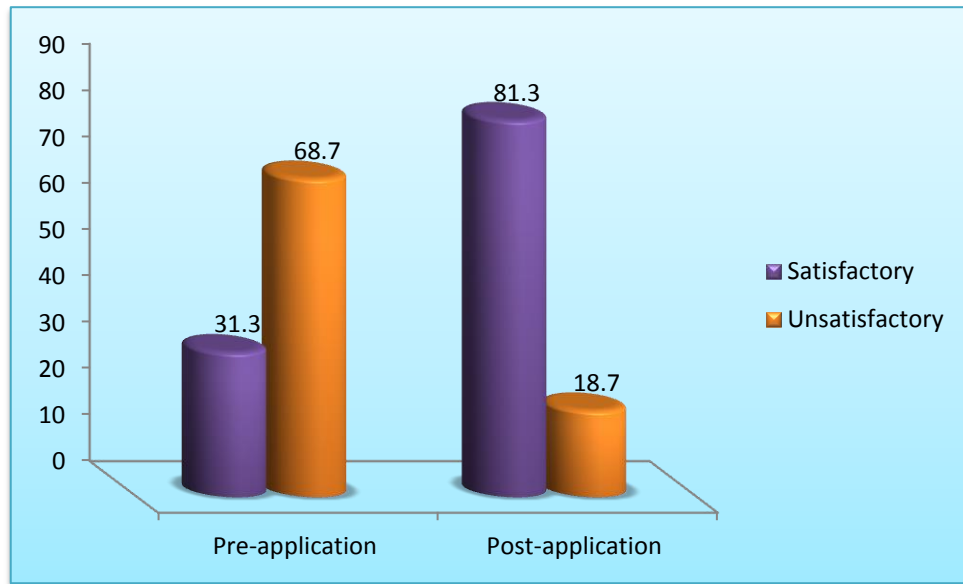


Figure (2): Percentage distribution of the studied women regarding their total reported practices level according to an epidemiological triangle model regarding agent, host and environment (n=150).

Table (4): Statistically correlation between the studied women total knowledge scores and their total practices scores pre and post implementation of epidemiological model

Items	Total knowledge scores			
	Pre implementation of epidemiological model		Post implementation of epidemiological model	
	R	p-value	R	p-value
Total practices scores	.144	.079	.894	.011*

* Statistically significant difference ($P < 0.05$)

Discussion

Globally, it is acknowledged that STDs pose a serious health burden. They have been associated with severe side effects such as infertility, neurological decline, severe immunodeficiency, and chronic hepatitis with its potentially fatal sequel. Although there is a known knowledge gap about STDs and corresponding behaviors, STDs are largely preventable, mostly treatable, and occasionally curable. The success of positive results also depends on advances in preventative medicine and public awareness (**Smolarczyk, et al., 2021**).

Regarding to demographic characteristics of the studied women, this study showed that; approximately less than half of the studied women were aged from 18 to 28 years with mean age 28.65 ± 5.21 years, almost two third of the studied women were secondary education, three fifth of them was housewife, more than three fifth of the studied women were rural resident and more than two third of them lived in extended family.

As regards medical history of the studied women, the current study revealed that; three fifths of the studied women married between 18-25 years old. This finding was in the same line with **El-Moselhy, et al., (2020)**. Who studied Sexually Transmitted Infections: Risk-Factors among Married Female Patients' in Assiut, Egypt (n=100) and reported that 57% of the studied women married between 18-27 years old. This might be due to risk of STDs increase in women who started sexual contact early.

The current study revealed that; more than three fifth of the studied women didn't have pervious abortion. This finding agreed with **Priya et al., (2018)** who studied Prevalence of Reproductive Tract Infections among Married Women of the Reproductive

Age Group in Urban Chidambaram-A Cross Sectional Study (n=350) and reported that 70.9% didn't have abortion.

Regarding the present complains of the studied women; the current study revealed that; the most of the studied women had abnormal vaginal discharge. This result agreed with **Doley et al. (2021)**. Who studied Knowledge, health seeking behavior and barriers for treatment of reproductive tract infections among married women of reproductive age in Delhi in India (n=270), and reported that the most commonly reported symptom was vaginal discharge (91.3%). on the other side, this finding disagree with **Chauhan, et al., (2020)** who studied Clinico-Etiological Study of Reproductive Tract Infections in Sexually Active Women in Rural Area, in Dhamsi, Mashobara Block, District Shimla (n=203) and reported that vaginal discharge (62.5%) was most common symptom. This finding might be due to STDs causes change in characteristic of vaginal discharge as increase in amount and change in color and odor.

Regarding total knowledge level pre and post implementation of epidemiological model for sexually transmitted diseases, the current study revealed that; less than one fifth of the studied women had good knowledge level pre implementation of epidemiological model then improved to slightly less than three quarters post implementation of epidemiological model. This finding agreed with **Kazemi et al. (2021)**, who studied A mobile-based educational intervention on STI-related preventive behavior among Iranian women in Iran (n=76), and reported that significant group differences were found at different times (pre and post mobile-based educational program) in STD knowledge. In the same line this study finding agreed with **Amin et al. (2021)**, who studied The Effect of

Educational Intervention on Knowledge and Attitudes toward Sexually Transmitted Infections on a Sample of Egyptian Women at Primary Care Level in Giza (n=200), and reported that there significant improvement of the women total knowledge level from 4.6 ± 6.0 (median of 1) in the pre-intervention to 17.1 ± 3.3 (median of 17), of more than 3.7 folds in the post-test ($p = 0.001$). From the researcher point of view this might be related to uses of epidemiological triangle model which helping to promote clear understanding of the STDs and increase women knowledge.

Regarding total reported practices pre and post implementation of epidemiological triangle model regarding agent, host and environment, the current study revealed that; less than third of the studied women had satisfactory total practices pre implementation of epidemiological model and improved to majority of them had satisfactory total practices post implementation of epidemiological model. This finding supported with **Elsayied, et al. (2014)**, who studied Nursing Intervention for Women Suffering from Common Sexually Transmitted Diseases by Applying an Epidemiological Model in Egypt (n= 83), and showed that there were highly significant improvement in women's practice regarding personal hygiene, hand washing, perineum care, safer sex and compliance to treatment, pre and post nursing intervention program. This might be due to uses of epidemiological triangle model which help to simplify the information given to the women and encourage him to apply this information into practices to prevent recurrences of STDs symptoms.

Concerning correlation between total knowledge scores and total practices scores pre and post implementation of an epidemiological model, the present study revealed that there were positive statistically correlations between

the studied women total knowledge scores and total practices scores pre and post implementation of epidemiological triangle model ($P = > 0.05$). This finding agreed with **Elsayied et al., (2014)**, who reported that there were positive relation between women's practices and their selected knowledge related triangle epidemiological model ($P < 0.001$). This finding might be due to attributed to the fact that the knowledge was the baseline of the practices and affect positively on their practices and when the knowledge increase about women health, the women practice should be changed to better than before.

Conclusion

The epidemiological triangle model succeeded to improve knowledge, practices of the studied women. Regarding total knowledge level of the studied women pre and post implementation of epidemiological model for sexually transmitted diseases, less than one fifths of the studied women had good total knowledge level pre implementation of epidemiological model then increased to more than two third post implementation of epidemiological model, regarding total reported practices level of the studied women according to an epidemiological triangle model less than third of the studied women had satisfactory total practices pre implementation of epidemiological model and improved to majority of them had satisfactory total practices post implementation of epidemiological model.

Recommendations

- 1- Provide continuous educational program to women in Outpatient Obstetrics Clinics and maternal and child health centers to increase knowledge about prevention of STDs.
- 2- Involving spouses in the study to promote healthy sexual behavior in married women.
- 3- Increase couple and public awareness about STDs throughout mass media.

4-Regular training of the healthcare personnel, especially female ones, to become counselor at each health facility to discuss the STDs among women.

5-Encourage premarital screenings to reduce risk of STDs.

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