

# Herpes Zoster Epidemiological Model's Program: Its Effects on Elderly patients and Their Family Caregivers

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**Abstract** Herpes zoster strikes millions of older adults annually worldwide and disables a substantial number of them via postherpetic neuralgia. **Aim:** This study aimed to evaluate herpes zoster epidemiological model's program: Its effects on elderly patients and their family caregivers. **Research design:** A quasi-experimental design was used in this study. **Setting:** The study was conducted at the Out-patient Clinic of the Health Insurance Hospital in Helwan District. **Subjects:** A purposive sample was used to select 50 elderly patients and 50 of their family caregivers, who were included in this study. **Tools:** Used for data collection included an interviewing questioner, which consists of four parts: **I.** Socio-demographic characteristics of elderly patient and their family caregiver as age, gender, educational level, and occupation. **II.** Elderly patients and family caregiver's knowledge regarding herpes zoster as: meaning of the disease, causes, signs and symptoms, complications, and mode of transmission. **III.** An epidemiological model's information questionnaire that includes three aspects as; person, agent and environment. **IV.** Elderly patient's and family caregiver's practices regarding herpes zoster toward control and prevention as reported by them such as; patient isolation, using special equipment, using mask and gloves. **Results:** This study showed, statistically significant improvement of elderly patients' and family caregivers' knowledge, practices, and epidemiological model's information regarding herpes zoster ( $3.66 \pm 2.401$  to  $7.70 \pm 4.0082$ , and  $2.700 \pm 1.675$  to  $8.260 \pm 3.541$ ) ( $4.140 \pm 4.646$  to  $8.600 \pm 2.777$  and  $4.200 \pm 4.458$  to  $9.240 \pm 1.559$ ) ( $7.62 \pm 7.999$  to  $16.00 \pm 4.449$  and  $7.360 \pm 7.745$  to  $16.460 \pm 3.339$ ) respectively post program implementation. **Conclusion:** Highly statistically significant effect on knowledge and practices of the elderly patients and family caregivers post epidemiological model's program. **Recommendations:** Dissemination of the epidemiological model for patients and family caregivers of herpes zoster during follow-up visits. An illustrated booklet should be provided with a description of disease control and prevention. Further researches are needed in other areas especially rural areas to estimate the effect of epidemiological model in disease prevention and control.

**Keywords:** herpes zoster, epidemiological model, elderly patients, family caregivers

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## 1. Introduction

Herpes Zoster (HZ) is an acute viral disease initiated through reactivation of Varicella Zoster Virus (VZV). Nearly 1 out of 3 people will develop shingles during their lifetime in the United States. Greatest individuals who get shingles will have it only once. Although, it is likely to contract it a second or even third time. In Europe, among more than 95% of adults antibodies against VZV exist. Occurrence of HZ is parallel all over the world, correlated to the age of the populace: from 2-3/1000 persons/year in the age group 20 to 50 years to 5/1000 in the 60 years old, 6-7/1000 between 70 and 80 and up to 10/1000 in older than 80 [1].

In Egypt, it is predictable that about a third of people develop shingles at some point in their life. Whereas, more common among older people, children may also acquire the disease. The disease has been known since

ancient times. Mortality rates among attendants with HZ ranged from 0.017 to 0.465/100 000 persons/year. Most studies conveyed that the majority of deaths occurred in adult's  $\geq 60$  years of age [2].

Public health interventions that improve healthy ageing are progressively becoming more imperative, as the aging people are increasing quickly worldwide. Over the following half century, the percentage of people  $\geq 60$  years of age is predictable to double, attainment more than 20% of the total population in all regions of the world. Furthermore, the incidence of disability in the elderly populations is increasing through the world, so, it is crucial for healthcare specialists and health politicians to be knowledgeable by the best accessible and up-to-date evidence on the HZ burden of disease [3].

Varicella zoster virus primary contagion is known as varicella. The virus migrates from the skin lesions through nerve axons and, perhaps also by viremic extent, to spinal and cranial sensory ganglia, where it becomes latent. Advanced in life, in some persons, the virus is reactivated

to cause a secondary infection known as herpes zoster. Individuals with HZ can transfer VZV to their seronegative contacts; the domestic transmission rate of HZ is 15%, making it meaningfully less infectious than varicella but yet of consequence to at-risk contacts [4].

An epidemiological model is typically definite as a reasonable illustration of the epidemiology of disease transmission and its related processes, and it enables the appraisal of the effectiveness of the probable mechanism and provides estimations of the future magnitude, length and geographic extent of an outbreak given the application of specific control measures. It also affords structures that permit thoughts about the behavior of a particular system to be conceptualized and communicated [5].

Herpes zoster is a very severe and common disease. Effect of herpes zoster on older patients is not fully noticeable by some physicians. Herpes zoster can sometimes have overwhelming significances on patient quality of life, mostly when postherpetic neuralgia develops. Herpes zoster prevalence has been strangely constant over time and all over the world that gives the severity of disease and the substantial lifetime risk, effective treatment of herpes zoster is important. Above the past 20 years, there has been improvement in reducing morbidity through improved diet, exercise, and healthcare. The other challenge will be to delay disability due to aging by using vaccination to prevent diseases. Prevention of herpes zoster and postherpetic neuralgia should be one, considered as for vital goal, for promoting healthy aging [6].

The Global Minimum Annual report appraised that, affected cases represent around 140 million, severe complications represent 4.2 million, and deaths around 4,200 million. Highest incidence, in late spring, are detected because it is very spreadable, in greatest populations, essentially all persons acquire varicella during their lifetime. Disease incubation period ranges from 10-21 days, and humans are considered the only reservoir of infection. Transmission can be from patients to another with varicella and herpes zoster predominantly through droplet infection next to infective viral particles from skin lesions, through direct contact [7].

In spite of the prevalence of this disease, early, rapid, diagnosis sometimes causes problem, because it primarily depends on the appearance of the typical rash. During the prodromal phase different diagnosis involves localized pain and other causes, such as, myocardial ischemia, trauma, dental pain, renal colic, pleurisy, and gallbladder disease. Treatment is often late because the nature of the symptoms is such that, and patients either wait to find treatment or stay underdiagnosed, while other conditions are ruled out. Antiviral drugs are partly active in reducing acute pain, quickening rash resolving and shortening the duration of pain. The treatment becomes most effective and tolerated when obtained early, but the diagnosis is frequently delayed further than the 72-hour [8].

Herpes zoster frequently begins with rashes and blisters that scab after 3 to 5 days, pain is the most commonly mentioned symptom, rashes and pain happen usually in a clustered, on one side of the human body, or on one side of the face. The rash generally disappears within 2 to 4 weeks, there is often pain, itching, or tingling in the area where the rash will develop. Fever, headache, chills, and upset stomach are considered from other symptoms of

shingles, also symptoms contain febrile pruritic rash with macules, developing to papules, vesicles and crusts. Lesions can start in varying stages of development and perseverance [9].

## 1.1. Significance of the Study

Herpes zoster is a significant international health burden that is predictable to increase as the population ages, affecting around 25% of people in their lifetime and subsequent in significant morbidity. The incidence increases sharply after 50 years of age and many working-age adults and elderly individuals are at increased risk. The HZ and its complications constitute important burden on the patients, caregivers, the healthcare economy and employers. Acute disease management does not suggestively prevent the most common long-term complications. Treatments for Postherpetic Neuralgia (PHN) afford higher levels of pain relief with less adverse effects are needed. Less common, but often severe, ophthalmic locations and related complications can have long-lasting harmful effects [10].

Nurses play a pivotal role to use epidemiological models for educating elderly patients and caregivers by knowledge, and through protective actions of health practices to compact with herpes zoster through providing information about the natural progression of herpes zoster and its possible complications. Elderly patients are virulent so, should be proficient to avoid contact with others and should be instructed that treatment should be started within 72 hours of onset if possible, not only to speed resolve of the shingle itself but also to avoid PHN. As soon as PHN begins, management is much more challenging and often unsuccessful. Patients should also be communicated not to scrape the lesions; doing so, may dispose them to secondary bacterial infections [11].

## 2. Aim of the Study

The study aimed to evaluate herpes zoster epidemiological model's program: Its effects on elderly patients and their family caregivers.

### 2.1. Research Hypothesis

- Elderly patients and their family caregivers who will receive the epidemiological model's program will have improved knowledge regarding herpes zoster control measures.
- Elderly patients and their family caregivers who will receive epidemiological model's program will have improved practices regarding herpes zoster control measures.

### 2.2. Subjects and Methods

#### Design:

A Quasi-experimental design utilized to conduct this study.

#### Setting:

The study was conducted at the Dermatology Clinic in the Out-patient clinics, of Health Insurance Hospital, Helwan District.

**Subjects:**

A purposive sample was used to select a total number of 100 participants (50 elderly patients diagnosed with herpes zoster disease and 50 of their family caregivers), representing 10 % of the attendants to the previously mentioned setting in the years 2015 – 2016. They were recruited according to the following inclusion criteria: age  $\leq$  60 years, free from any other medical health problems and agreed to participate in this study.

**Tools of data collection:**

An interviewing questionnaire that contains four parts:

- Part I: Socio-demographic characteristics for elderly and caregivers as; age, gender, marital status, educational level, sources of income, and monthly income; and type of relationship.
- Part II: Elderly patients' and their family caregivers' knowledge about herpes zoster such as; meaning of the disease, causes, signs and symptoms, complications; mode of transmission, incubation period, vaccine against herpes zoster, duration of treatment, and techniques of prevention. This part was used twice before and after implementation of the epidemiological model's program.

**Scoring system:**

A correct answer was given one score, while a wrong answer or absence of answer was given zero.

Knowledge answers were classified into three categories:

- Poor knowledge that represents  $< 50\%$  scored from (0 -  $<5$ ),
- Fair knowledge from 50-  $<75\%$  scored (5 - 6),
- Good knowledge 75% or more scored from ( $>6$  - 9).

√ Part III: An epidemiological model's information questionnaire that originally developed by [12] and modified by [13] including three aspects as follows:

- Person, such as: more risky to acquire disease from an infected person, high susceptibility disease occurrence when the human immunity decreases; healthy habits decreasing infection with diseases; bad habits increasing the infection risk; poor nutrition increasing infection with disease; exercise decreasing infection risk; and early detection aids in early treatment.
- Agent such as; herpes zoster disease occurs when facing microorganism, herpes zoster virus activates with low immunity, the risk of herpes zoster infection decreases by vaccine; incubation period from 48-72 hours; and the viral disease affects the reaction of varicella – zoster virus.
- Environment such as; herpes zoster is considered an epidemiological disease, the disease is transmitted from person to another person, herpes zoster is transmitted by direct and indirect contact with infected patient; home cleanliness decreases the infection; a crowding area increases infection; and good ventilation minimizes infection.

Scoring system:

The elderly patient's and caregiver's information regarding the epidemiological model's program was calculated as one score for a correct information,

while 0 for didn't know or wrong answer. The total score was evaluated as poor information if  $<50\%$ , while fair information if 50 -  $<75\%$ , and good information if 75% or more.

√ Part IV: Elderly patients and their caregivers reported practices toward control and prevention of herpes zoster's infection, as; patient isolation; using special equipment, using mask and gloves, using handkerchief, safety disposal of patient's waste, proper nutrition during disease period, regularity of taking medication, ventilation of the place, continuous follow-ups; and frequent hand washing. This part was used twice pre and post implementation of the program.

Scoring system:

The elderly and caregivers reported practices were calculated as: 2 scores for always practiced, while 1 scores for sometimes practiced and 0 for rarely practiced. The total practice scores were categorized as: Satisfactory practice 50% or more scored from 0- $<5$ , while unsatisfactory practice score  $<50\%$  scored from 5-10.

**2.3. Validity**

Tools were tested for content validity, by a Jury of 5 experts in the Community Health Nursing field and Dermatology specialty, to confirm the consequence and comprehensiveness of the tools.

**2.4. Reliability**

Reliability coefficients were calculated for the questionnaires of:

- Elderly patients' and their family caregivers' knowledge about herpes zoster, Cronbach's Alpha was 0.82.
- Information regarding the epidemiological model's program, Cronbach's Alpha = 0.86.
- Elderly patients' and caregivers' reported practices toward control and prevention of herpes zoster's infection, Cronbach's Alpha = 0.85.

**2.5. Pilot Study:**

A pilot study was applied for 10% of the sample 5 of herpes zoster elderly patients and 5 of their family caregivers to estimate the time needed to fill in the questionnaire. According to the pilot study, no modifications were applied on the studied tools; however the pilot study sample was excluded from the main studied sample.

**2.6. Ethical Considerations**

Official approvals were obtained from faculty of nursing then forwarded to hospital manager. The researchers explained the purpose and benefits of this study to the elderly patients and their family caregivers who agreed to participate in the study, then an oral consent was obtained before data collection start. Privacy was confirmed to the studied sample at all study process. The researchers assured participants that all data collected will be used only for research purpose, and will be treated confidentially. The researchers informed the studied sample that participation

in the study is voluntary and that they have the right to withdraw at any time from the study process without giving any reason.

## 2.7. Field Work

Preparation of data collection was carried out from the beginning of January 2017 to the end of August 2017. The time spent to fill in the questionnaire was 30 minutes. The researchers visited the study setting two days/week (Saturdays & Thursdays) from 10.00 a.m. to 2.00 p.m. The researchers implemented the program in a waiting area in the outpatient clinic and interviewed the studied samples individually.

Handouts about the program for herpes zoster were provided to the elderly patients and caregivers.

### - Epidemiological model program construction:

**Assessment phase:** At the beginning of the interview, the researchers greeted the elderly patients and their family caregivers, introduced themselves to each one included in the study. This phase covered interviewing the studied sample to collect baseline data. The pretest questionnaire was implemented to identify the elderly patients' and caregiver's knowledge and practices about herpes zoster to prevent and control infection.

**Planning and implementation phase:** The intervention program was implemented for prevention and control of herpes zoster using epidemiological model. The content of program included:

Knowledge about herpes zoster related to epidemiological model as: meaning of the disease, causes, signs and symptoms, complications; mode of transmission, incubation period, vaccine against herpes zoster; duration of treatment; and techniques of prevention.

Elderly patients and family caregivers reported practices toward potential control measures to prevent infection and decrease the disease as: patient isolation; using special equipment, using mask and gloves, using handkerchief, safety disposal of patient's waste, proper nutrition during diseases period, regularity of taking medication, ventilation of the place, continuous follow-ups, and frequent hand washing.

An epidemiological model instruction which involves three parts:

**Person** as more risk of disease when contact with infected person, increase the disease occurrence when the human immunity decreases, poor nutrition increases infection with disease, bad habits increase the risk by infection ...etc.

**Agent** as the disease occurs when facing microorganism, herpes zoster virus activates with low immunity, the viral disease affects the reactivity of varicella – zoster virus ...etc.

**Environment** as herpes zoster is considered an epidemiological disease, this disease is transmitted from person to another person, Herpes zoster is transmitted by direct and indirect contact with infected patient, home cleanliness decreases the infection, crowding areas increase infection and good ventilation minimize infection

**Implementation** of the program took over a period of 6 months; in 5 sessions. The duration of each session ranged from 20-25 minutes. At the beginning of each session, the researchers started by a summary about what was given through the previous one, and cleared the objectives of the new session, taking into consideration using simple and

clear language to suit all studied sample's levels of education.

Different teaching methods were used including small group discussion, brain storming, demonstration and re-demonstration. The researchers were using brochures, colored posters and a laptop screen for data show. A handbook was distributed to all studied samples. At the end of each session the studied samples determined with the researchers the next session content and time.

**Evaluation phase:** Evaluating the epidemiological model program was done two weeks later after its implementation by using the same preprogramming tools.

## 2.8. Statistical Design

The data were collected, presented and statistically examined using the Statistical Package for Social Sciences (SPSS), version 20, (SPSS Inc. Chicago, IL, USA). For quantitative data, the range, mean and standard deviation were deliberate. For qualitative data, which define a categorical established of data by frequency, percentage or proportion of each category? Comparison between two groups and more was done using Chi-square test ( $\chi^2$ ). Correlation between variables was estimated using Pearson's correlation coefficient (r). Significance was adopted at  $p < 0.05$  for interpretation of results of tests of significance [14].

## 2.9. Results

**Table 1:** shows the elderly patients socio-demographic data. As for age 70% of them were 60 - < 65 years old, more than one quarters were females and the great majority of them had insufficient income.

**Table 1 Frequency Distribution of Elderly Patient's Socio-Demographic Data, (no =50).**

Socio-demographic data	No.	%
<b>Age</b>		
60- < 65	35	70
65 - 70	15	30
<b>Mean <math>\pm</math>SD</b>	<b>62.246</b>	<b>6.29</b>
<b>Gender</b>		
Male	11	22
Female	39	78
<b>Marital status</b>		
Single	5	10
Married	33	66
Widowed or divorced	12	24
<b>Educational level</b>		
Illiterate or read and write	12	24
Basic education	18	36
Secondary or diploma	15	30
University and postgraduate	5	10
<b>Sources of income</b>		
Social affairs	7	14
Revenue	5	10
Retirement	38	76
<b>Monthly income</b>		
Sufficient	5	10
Insufficient	45	90

**Table 2. Frequency Distribution of Studied Caregivers' Socio-Demographic Data, (n=50)**

Items	No.	%
<b>Age groups (in years)</b>		
20-	5	10
30-	10	20
40 or more	35	70
<b>Mean ±SD</b>	<b>33.70±7.03</b>	
<b>Caregiver's educational level</b>		
Illiterate or read and write	5	10
Basic education	7	14
Secondary or diploma	33	66
University and postgraduate	5	10
<b>Caregiver's occupation</b>		
Working	34	68
Not working	16	32
<b>Family number</b>		
< 5	33	66
5+	17	34
<b>Family income</b>		
Sufficient	5	10
Insufficient	45	90
<b>Type of relationship</b>		
Husband or wife	37	74
Daughter or son	13	26

Table 2: presents the caregivers' socio-demographic data. It was noticed that 70% of them were aged 40 years or more, while more than two thirds of them (68%) were working, and (66%) considering type of relation, husband or wife represented 74% had secondary educational level. According to research hypothesis elderly patients and family caregivers who will receive epidemiological

model's program will improve knowledge and practices regarding herpes zoster control measures as proved in Table 3, Table 4, Table 5, Table 6, Table 7, Table 8, and Table 9 and Figure 1.

Table 3: reveals that statistically significant improvements in the studied samples correct knowledge in the post/program than pre/program (P < 0.001).

Table 4: indicated statistically significant improvements in total knowledge score of the studied sample (elderly patients and family caregivers), regarding herpes zoster infection in the post –program than preprogram, (P < 0.001).

Figure 1: illustrates that more than half (58%) of studied elderly patients' had poor knowledge level that decreased to 14% of them had poor knowledge level post epidemiological model's program, while good knowledge level increased for the majority (80%) of them.

Table 5: shows statistically significant improvements in the reported practices by the studied samples post program, (P < 0.001).

Table 6: shows statistically significant improvement in total practice scores as reported among the studied elderly patients and family caregivers regarding herpes zoster in the posttest than that of the preprogram, (P < 0.001).

Table 7: reveals highly statistically significant positive correlation between patient and family caregivers total knowledge scores and total practice score (p < 0.001).

Table 8: presents statistically significant improvement of elderly patients' and their family caregiver's epidemiological information about herpes zoster according to the epidemiological model in the post–test than that of the pre–test (P < 0.001).

Table 9: shows highly statistically significant differences in the correlations between patients and family caregivers total score knowledge, practices and epidemiological model post program (P < 0.001).

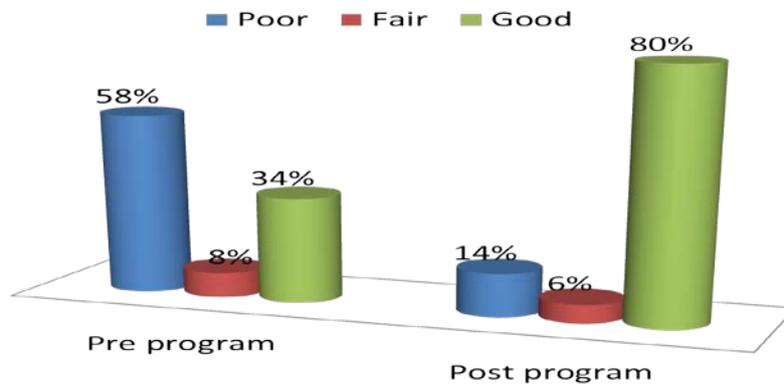
**Table 3. Frequency Distribution of Elderly Patients' and their Family Caregivers' Correct Knowledge Regarding Herpes Zoster Pre / Post Program implementation (n =100)**

Correct knowledge items	Elderly patients No. =50			Family caregivers No. =50		
	Pre	Post	$\chi^2$ P	pre	Post	$\chi^2$ P
	%	%		%	%	
Meaning of herpes zoster	33.0	100.0	92.308 0.0001*	22.0	100.0	85.185 0.001*
Causes of herpes zoster	44.0	86.0	75.439 0.0001*	20.0	90.0	75.227 0.001*
Signs and symptoms	50.0	78.0	46.916 0.0001*	44.0	84.0	51.923 0.001*
Complications	43.0	92.0	85.185 0.0001*	22.0	96.0	67.919 0.001*
Mode of transmission	33.0	80.0	49.980 0.0001*	30.0	96.0	60.894 0.001*
Incubation period	34.0	88.0	64.935 0.0001*	20.0	98.1	59.278 0.001*
Vaccine against herpes zoster	27.0	66.0	39.063 0.0001*	50.0	90.0	54.958 0.001*
Duration of treatment	55.0	84.0	58.132 0.0001*	40.0	98.0	71.014 0.001*
Techniques of prevention	42.0	96.0	74.707 0.0001*	22.0	74.0	58.730 0.001*

**Table 4. Total Knowledge Score Among the Studied Samples Regarding Herpes Zoster's Infection Pre / Post Program implementation (N=100)**

Total knowledge	Total knowledge of the studied subjects pre and post program (No. =50)										$\chi^2$ P (elderly patients & family caregivers)	
	Elderly patients (n=50)					Family caregivers (n=50)					Pre	Post
	Pre		Post		$\chi^2$ P	Pre		Post		$\chi^2$ P		
	No.	%	No.	%		No.	%	No.	%			
<b>Total knowledge levels:</b>					32.782 0.0001*					17.568 0.016	168.198 0.001*	168.571 0.001*
Poor (<50%)	29	58	7	14		39	78	2	4			
Fair (50-75%)	4	8	3	6		1	2	3	6			
Good (>75%)	17	34	40	80	10	20	45	90				
<b>Total knowledge scores:</b>	0-9		0-9			1-9		1-9			Paired t-test P	
Range (0-9) Mean±SD	3.66±2.401		7.70±4.0082			2.700±1.675		8.260±3.541			3.832 0.001*	4.169 0.001*
Paired t-test P	8.205 0.001*					11.710 0.001*						

\*Significant (P<0.05).



**Figure 1.** Total knowledge score of the studied elderly patients regarding herpes zoster pre/post implementation of epidemiological model's program, no. = 50.

**Table 5. Percentage Distribution of Elderly Patients and Family Caregivers Regarding Reported Practices for Herpes Zoster Pre/Post Epidemiological Program (No. =100)**

Elderly patients' and caregivers' practices	Elderly patients N=50		Family caregivers N=50		$\chi^2$ P
	Pre	Post	Pre	Post	
	%	%	%	%	
Patient isolation	40.0	80.0	50.0	100.0	1.010 0.315
Using especial equipment	47.0	94.0	50.0	100.0	2.040 0.153
Using mask and gloves	40.0	80.0	47.0	94.0	4.163 0.041
Using handkerchief	44.0	88.0	50.0	100.0	1.010 0.315
Safety disposal of patient's waste	47.0	94.0	47.0	94.0	4.163 0.041
Proper nutrition during diseases period	34.0	68.0	34.0	68.0	1.010 0.315
Regularity of taking medication	43.0	92.0	33.0	84.0	51.923 0.0001*
Ventilation of the place	42.0	96.0	40.0	98.0	71.014 0.0001*
Continuous follow-ups	55.0	84.0	50.0	90.0	54.958 0.0001*
Frequent hand washing	33.0	84.0	22.0	96.0	64.942 0.0001*

\*Significant (P<0.05)

**Table 6. Total Practice Scores among the Studied Samples Regarding Herpes Zoster Pre/Post Epidemiological Model's Program implementation (N =50).**

Total practices	Total Practice of the studied subjects pre and post program (n=50)										$\chi^2$ P (elderly patients & family caregivers)	
	Elderly patients (No. =50)					Family caregivers (No. =50)					Pre	Post
	Pre		Post		$\chi^2$ P	Pre		Post		$\chi^2$ P		
	No.	%	No.	%		No.	%	No.	%			
<b>Total Practice levels:</b>												
Satisfactory (<50%) (0 - <5)	21	42	44	88	27.621 0.001*	23	46	48	96	23.529 0.001*	223.00	229.167
Unsatisfactory (50%) (5- 10)	29	58	6	12		27	54	2	4		0.001*	0.001*
<b>Total knowledge scores:</b>	0-10		1-10			0-10		1-10			<b>t-test P</b>	
Range (0-10) Mean±SD	4.140 ±4.6467		8.600±2.777			4.200 ±4.458		9.240 ±1.559				
Paired t-test P	7.544 0.001*					8.967 0.001*					0.401 0.0690	3.386 0.001*

\*Significant (P<0.05).

**Table 7. Correlations between Total Knowledge Score and Total Practices Score of the Studied Samples Regarding Herpes Zoster Pre/Post Epidemiological Model's Program implementation (N=100).**

Variables	Total practice of the studied subjects pre and post-intervention			
	Pre		Post	
	r	P	r	P
Total knowledge scores	0.971	0.0001*	0.990	0.0001*

\*Significant (P<0.05)  
r= Pearson Correlation Coefficient.

**Table 8. Total Epidemiological Information Sub Items Scores of The Studied Samples about Herpes Zoster Pre/Post Epidemiological Model's Program (N=100)**

Epidemiological knowledge sub items	Total Epidemiological knowledge of the studied subjects pre and post program (No.=50)										Paired t-test P (elderly patients & family caregivers)	
	Elderly patients No.=50					Family caregivers No.=50					Pre	Post
	Pre		Post		$\chi^2$ P	Pre		Post		$\chi^2$ P		
	No.	%	No.	%		No.	%	No.	%			
<b>Person</b>												
Poor (<50%) (0 - <4)	29	58	7	14	29.947 0.001*	28	56	5	10	23.529 0.001*	-8.756 0.001*	0.423 0674
Fair (50-75%) (4- 6)	4	8	1	2		7	14	10	20			
Good (>75%) (>6-7)	17	34	42	84		15	30	35	70			
Range (0-7) Mean ± SD	0-7 2.820±1.873		0-7 6.04±3.114			0-7 2.74±1.829		0-7 6.000±3.29				
<b>Agent</b>												
Poor (<50%) (0 - <3)	31	62	6	12	11.538 0.006	25	50	1	2	2.083 0.231	-10.448 0.0001*	-3.110 0.003
Fair (50-75%) (3- 4)	2	4	2	4		14	28	0	0			
Good (>75%) (>4-5)	17	34	42	84		11	22	49	98			
Range (0-5) Mean±SD	0-5 1.920±1.385		0-5 4.400±2.165			0-5 1.920±0.444		2-5 4.920±2.058				
<b>Environment</b>												
Poor (<50%) (0 - <3)	26	52	3	6	12.121 0.016	25	50	3	6	12.121 0.011	-7.801 0.0001*	0.330 0.743
Fair (50-75%) (3- 5)	3	6	1	2		5	10	2	4			
Good (>75%) (>5-6)	21	42	46	92		20	40	45	90			
Range (0-6) Mean±SD	0-6 2.880±1.327		0-6 5.560±2.8258			0-6 2.700±2.749		0-6 5.540±1.265				
Total Mean ± SD of epidemiological model	pre 7.62±7.999		post 16.00±4.449			pre 7.360±7.745		post 16.460±3.339		Paired t- test / p 8.736 0.0001*		

\*Significant (P<0.05).

**Table 9. Correlations between Elderly Patients' and Family Caregivers' Total Knowledge, Practice and Epidemiological Model Post Program, (No. =50)**

Item		Epidemiological model			
		Elderly patients N =50		Family caregivers N =50	
		Paired t-test	P-value	Paired t-test	P-value
Total knowledge score	Elderly patients N = 50	10.564	0.0001*	---	
	Family caregivers N = 50	--		14.368	0.0001*
Total practice score	Elderly patients N = 50	9.078	0.0001*	--	
	Family caregivers N = 50	--		10.2728	0.0001*

\*Significant (P<0.05).

### 3. Discussion

The herpes zoster is one of the most devastating and assaults millions among older population worldwide. Complications of HZ contains but are not limited to major pain, ophthalmicus, neuralgia post herpetic, bacterial infection, and pigmentation impairment. In immunosuppression individuals such as the elderly and patients with human immune virus, malignant, and/or organ transplants, HZ can cause more hostile disease and possibly death [15].

The current study was implemented to evaluate the effect of herpes zoster epidemiological model's program for prevention and control among elderly population and their families' caregivers. As for elderly patients characteristics, the researchers found that, more than two thirds of the studied patients aged from 60 to less than 65 years; more than three quarters are female; more than one third have basic education; slightly more than three quarters are retired that is the source of their monthly income, which is insufficient for the great majority of them. Regarding to studied caregivers characteristics, more than two thirds among them aged forty years and more; around two thirds had secondary education and are working; the great majority had insufficient income, and almost three quarters had a husband or wife relationship. These results agree with [16], who studied "Impact of herpes zoster and post-herpetic neuralgia on health-related quality of life in Japanese adults aged 60 years or older and reported that 60% of the studied sample were female.

Regarding patients and their caregivers' knowledge preprogram, the current study results revealed that more than half and more than three quarter of patients and caregivers had poor knowledge level, while post the epidemiological model program, the majority and most of them had good knowledge level respectively.

Regarding patients and caregivers' practices the current study showed that more than half of patients and caregivers had unsatisfactory level of practices preprogram as reported by them, which become satisfactory for both of them post program. These findings may be related to unfamiliarity of the disease information among Egyptian elderly population and insufficient knowledge regarding herpes zoster transmission, prevention and control among this age group.

These previous results agree with [17], who carried out a study in Bangkok, Thailand, Southeast Asian, entitled

"Willingness to pay, quality of life, and knowledge on herpes zoster among their patients prior zoster vaccine era" and reported that more than half of the patients had poor knowledge about the pathophysiology, mode of transmission, clinical manifestation, prognosis, and treatment.

In this respect, [18], who conducted a study in southeastern United States, mentioned that only 30% of patients were aware that the herpes zoster vaccine was recommended, and 70% had never heard about herpes zoster. In a similar study, [19], who studied "Awareness, knowledge, and vaccine acceptability of herpes zoster in Korea: a multicenter survey of 607 patients" revealed that the participants had a high awareness of HZ (85.4%) but a comparatively low knowledge about HZ and its vaccine (42.3%).

Similarly [20], who studied "Providers' lack of knowledge about herpes zoster in HIV-infected patients is among barriers to herpes zoster vaccination" and found that participants' quantify knowledge of HZ, as well as immunization perceptions and practices were poor.

In this context, [21], in Japan, who studied "Relationship between prior knowledge about herpes zoster and the period from onset of the eruption to consultation in patients with herpes zoster", who reported that nearly half knew that it is a disease with acute pain, 39.4% knew that it is a blistering disease, and lack of knowledge regarding HZ was supposed to be at the source of these responses toward vaccination.

As well, [22], in a recurrent study carried out in Hong Kong, entitled "A cross-sectional study of the knowledge, attitude, and practice of patients aged 50 years or above towards herpes zoster in an out-patient setting" they conveyed that responses to numerous questions showed a great number of misconceptions about the disease. Over half supposed they had an insufficient understanding of HZ. Almost two thirds were inadequate channels to learn more about the disease and its prevention.

In contrast, the previous results [23], who carried out a "Survey on public awareness, attitudes, and barriers for herpes zoster vaccination in South Korea", reported that most participants were aware of herpes zoster, and knowledgeable about the disease. Previously [24], in Houston, Texas, studied "Herpes zoster vaccine awareness among people  $\geq$  50 years of age and its implications on immunization" and mentioned that 26.1% were aware of

herpes zoster recently approval, for adults  $\geq 50$  years of age and lack of awareness surely appears to play a role in the low vaccination rate.

Concerning correlation between total scores of knowledge and total score practices of the studied sample regarding herpes zoster, the present study displayed that positive correlation were detected between total score knowledge and practices pre/post intervention and this result was corresponding with those of [16], who studied "Impact of herpes zoster and post-herpetic neuralgia on health-related quality of life in Japanese adults aged 60 years or older: results from a prospective, observational cohort study" who reported that if the total scores of knowledge improved, the total score practice going in the same direction of improvement. From the researcher's point of view, it means that patient should be oriented by the nature of illness to improve their practices for prevention and control of the diseases.

Regarding the effect of the program implementation, the current study results revealed that, statistically significant improvements in patients and caregivers' knowledge, practices and information regarding the epidemiological model post program ( $P < 0.001$ ), that justifies the research hypothesis. From the researchers' point of view, it may be referred to epidemiological triad model effectiveness to use control and prevention measures, which concentrated in an epidemiological triangle (person, agent & environment), against infectious diseases such as herpes zoster, also the effectiveness of program sessions that focused on patients and their caregivers improved knowledge and practices toward the disease. these results were in agreement with those of [25], in Tennessee, who studied "The effect of pharmacist intervention on herpes zoster vaccination in community pharmacies" and reported that vaccination rates significantly increased after applying the pharmacist-driven interventions ( $P < 0.001$ ).

In this respect, [26], who studied "Factors associated with herpes zoster vaccination status and acceptance of vaccine recommendation in community pharmacies" mentioned that, after the educational program, the majority of unvaccinated patients were attracted in speaking with physician about acceptance of Zostavax ( $p < 0.001$ ). in a similar study, [27], who studied "Prevention of herpes zoster and its painful and debilitating complications" highlighted that, prevention seems to be the greatest decision. Herpes zoster vaccine significantly reduced the liability, occurrence and incidence of herpes zoster ( $p < 0.001$ ).

Similarly [28], who studied "Patient vaccination education program through an introductory pharmacy practice experience" and found that information enhanced significantly after program implementation ( $p < 0.001$ ) and clarified that the program was very beneficial in patient's care. In a very recent study, [29], conducted a study entitled: "Evaluation of the effect of the herpes zoster vaccination programme 3 years after its introduction in England: A population-based study", they reported that the herpes zoster vaccination programme had impact in the first 3 years of the programme comparable to about 17.000 fewer incidents of herpes zoster and 3.300 fewer episodes of postherpetic neuralgia.

As well, [30], who studied "Patient education for self-referral and on-demand treatment for herpes zoster in

lymphoma patients", identified, that patients who recalled the information, visited the physicians, promptly compared with those who did not remember, and this obviously displayed that, providing information to specific individuals can affect suitable consultation with physicians.

Regarding to epidemiological triad, [31] reported that the epidemiological triad provides knowledge for patients to improve their practice and cut the infectious process, so that the epidemiology seeks to describe all information around the agent, not only about the agent but also safety environment to avoid agent growing. Personal immunity and life style play essential role in infectious disease control and prevention. In this study the knowledge and practices of the elderly patients and their caregivers were improved after applying the epidemiological model's program, which agrees with [32], in Tuskegee City, whose study entitled "Applying the epidemiologic problem oriented approach (EPOA) methodology in developing a knowledge and practices base for the modeling of HIV/AIDS", their study revealed improvement in the knowledge and practice s of their studied sample after apply the epidemiological triad model.

## 4. Conclusion

Herpes Zoster epidemiological model's program improved the elderly patients and their family caregivers' knowledge and practices regarding control herpes zoster and increase awareness toward epidemiological model. The study results also revealed a highly statistically significant positive correlation of knowledge and practices of the elderly patients and their family caregivers after program implementation.

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