Effect of instructional guidelines regarding Brucellosis on Improving Knowledge, Attitude and Practices among Smallholder Dairy Farmers in Damietta governorate

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Abstract

Background: Brucellosis is considered an emerging zoonotic disease and a community health concern, with a better understanding of the knowledge, attitude and practices KAP regarding it, farmers could increase the understanding the risk factors of brucellosis for cattle and humans. **The study aimed to** evaluate the effect of instructional guidelines regarding brucellosis on improving knowledge, attitude and practices among smallholder dairy farmers in Damietta governorate. **Design:** A quasi-experimental research design with a pre/post-test was utilized. **Sample**:- A cluster sampling technique was used to select 280 farmers in Damietta, Egypt. **Tools:**: Data were collected through; structure interview KAP questionnaire sheet and blood analysis of brucellosis. **Results:** 20 % were positively regarded the Brucella test. Prior implementation of the instructional guidelines, 95% had unsatisfactory total knowledge scores, 80.8% had a negative attitude, and 83 % had unsatisfactory total practice scores. After the implementation of the instructional guidelines, 81% had satisfactory total knowledge scores, 94.6% had a positive attitude and 90% had satisfactory total practice scores. There is a significant difference between mean scores of knowledge, attitude, and practices of the study group to brucellosis before and after program implementation. **Conclusion:** The instructional guidelines that were conducted in this area had a significant effect on the promotion of knowledge, attitude, and practices of farmers towards brucellosis. **Recommendations:** Farmers should be provided with health information related to brucellosis and well-informed continuous; instructional guidelines should be imparted to them.

Keywords: instructional guidelines, knowledge, practice and attitude, brucellosis, farmers.

Introduction

Brucellosis is one of the most prevalent zoonotic infections around the world, which is also known as Malta fever, Bang's disease, Undulant fever, and Mediterranean fever **(World health organization, 2014).** The small gram-negative Cocco-bacilli of the genus Brucella is responsible for the occurrence of brucellosis. Four species are recognized to cause disease in humans, each having their specified animal host: B. Canis (dog), B. Arbutus (cattle), B. Sis (pig), and Brucella. Melitensis (goat, sheep, and camel), presently, B. melitensis remains the primary reason for human Brucellosis globally **(Mohammed, 2014).**

The high percentage of cases is occurred in the Mediterranean countries including Egypt (**Aziz**, **2013).** Brucellosis' prevalence was determined to be as elevated as 8 %. Also, in another study conducted in Fayoum governorate, the actual human brucellosis cases was less than 6 % **(Hegazy et al., 2016).** Brucellosis is considered an occupational threat and airborne transmission has been reported among abattoir specialists and personnel working in laboratories. Unintended impregnation with live immunization such as (B. melitensis Rev. 1B, Andabortus Strain 19) can also occur. Cases of congenital and venereal infections are also identified to happen in people **(Obonyo and Gufu, 2015).**

Brucellosis is associated with clinical symptoms and signs such as complain from acute febrile illness character as elevated temperature, sweats, tiredness, malaise, loss of appetite, weight loss, headache, arthralgia and backache **(Workalemahu et al., 2017).** Brucellosis represents diverse obstacles in developing control programs and effectively

preventing them. This is commonly due to the symptomatic nature of the disease in people and animals, lack of laboratory affirmation, and varied incubation period **(Obonyo and Gufu, 2015)**. Brucellosis affecting the healthy life in humans and causes many complications as Osteoarticular disease Which lead to loss of work or income loss due to illness, and Disability Adjusted Life Year (DALY) burden and significant threat of spontaneous abortion and infant' intrauterine transmission throughout pregnancy **(Gurrappanaidu et al., 2016).** Brucellosis Diagnosis can only be confirmed by laboratory tests as ELISA **(Turgut, et al., 2015).**

Smallholder farmers are viewed as a person involved in farming a small piece of land, cultivating food crops, sometimes with small varieties of cash crops. In many localities, smallholder farmers practice mixed crop-livestock farming, whereby the number of large ruminants kept is around 3-5. Also, they are a group of dairy farmers and processing plants across the region to increase local milk production and gain access to higher-paying export markets **(Herrero et al., 2014**). There was knowledge deficiency about brucellosis among smallholder farmers and they are needed to improve their Knowledge, attitude and practice about brucellosis through instructional guidelines because they considered risk groups and need for the prevention of brucellosis **(Arif et al., 2017).**

Community health nurse (CHN) plays an important role in controlling and preventing of brucellosis among all people in the community **(Aziz, 2013) & (Warwick & Corning, 2013).** Nurses in this field often serve as leaders, educators, advocates and researchers by giving various instructional guidelines and programs to the public about; nature of the disease, causes, signs and symptoms, modes of transmission, vaccination, and ways of prevention and control **(El Hameed et al., 2012).**

Significance of the study:

The human brucellosis' prevalence was determined to be 8 % in Egypt **(Hegazy et al., 2016).** The epidemiological situation of the disease is obscure and needs more cultivation and bio-typing of Brucella isolates for whole governors to monitor outbreaks and to adjust the control program (**Wareth et al., 2014)**. Also, most of the studies Africa, including Egypt and the entire world were descriptive only and did not provide any educational and preventive measures for farmers to promote their health and enhance their awareness and perceptions. So, the researchers intended to evaluate the effect of instructional guidelines relating to brucellosis on improving knowledge, attitude, and practices about brucellosis among farmers in Egypt through pre/post instructional guidelines.

Aim of the study:

The current study was aimed to evaluate the effect of instructional guidelines regarding brucellosis on improving knowledge, attitude and practices among smallholder dairy farmers in Damietta governorate.

Research Hypothesis

Farmers' knowledge, attitude and practices regarding brucellosis will be improved after receiving the instructional guidelines program

Subjects and Methods:

Research design:

A quasi-experimental research design (pre and post-test) was utilized in this study.

Settings:

The study was conducted at Damietta governorate which is a small province located in the extreme northeast of Egypt in the delta region. It is sparsely populated with slightly more than 1 million people. Damietta is divided into administrative sub-districts; Damietta Central, Faraskur Central, Zarqa Central, and KafrSaad Central. These 4 administrative centers altogether consist of ten cities, thirty-five local village units, fifty-nine villages, and nearly seven hundred sub-villages. The capital of the governorate is the historically famous Damietta city. Damietta covers an area of 1,029 km2. According to population estimation, in 2015 the plurality of dwellers in Damietta governorate lived in villages. Out of an estimated 1,330,843 people habiting in Damietta governorate, 815,244 people lived in rural areas.

Sample size and sampling technique:

The sample size was calculated using Open EPI Epidemiological measurements for public health software version 3.01, utilizing the following equation: Sample size n = [DEFF*N p (1-p)] / [(d2 /Z2 1-α/2* (N-1) +p* (1-p)], where n is the sample size; N is the overall number of individuals in the study; p is the estimated prevalence of individuals with brucellosis in Egypt(0.08 according to **Samaha et al., 2009)** , d is the precision or maximum acceptable error rate (0.05); α is the like hood of type I error ($p<0.05$); and z is 1.96 **(Sullivan et al., 2009)**.

In the first step Damietta governorate divided into districts namely Damietta Central, Faraskur Central, Zarqa Central, and KafrSaad Central. Then all villages located in each district were given numbers on small cards and one village from each district was chosen from a small box randomly without replacement. The choice of ranchers in each village was based on whether the family was at dwelling, the ownership of animals, and on the readiness of the households to engage in the study. One village was visited daily and numerous agriculturists as convincible were met. The choice of the households was done with the aid of focal farmers village commander/farmer representative) in every countryside. Notice that whilst a random picking of households from a village may be eligible, it was needful to work with the central ranchers within the choice of households to guarantee collaboration.

A cluster sampling technique was used. The Damietta district has 35 main villages. Our target population was all the (n = 815,244) in the 35 villages. The total number of participants was calculated using a 2015 census and individual sheep were the primary sampling units. The sample size was estimated using Win episcope 2.0 with an expected prevalence of 15 and a 5 % accepted error being 124 participants. We increased this sample size to 280. This number was divided equally across the main 35 villages. In each of the villages, the total desired sample of 8 participants was equally divided between the present villages.

Tools of data collection:-

Tool (I): A structured interview questionnaire was developed by the researchers based on reviewing related literature and written in the Arabic language. It comprised of two parts to assess the personal characteristics of the farmers and family history of brucellosis infection.

Tool (II): Smallholder dairy farmers' knowledge questionnaire sheet adopted from other researchers in Egypt **(Abdel-Fattah, 2014 and Mohammed et al., 2015)**, in Arabic language and modified by the researchers. It was designed to assess farmers' knowledge regarding brucellosis, which included eleven questions about the meaning of brucellosis, animals affected with brucellosis, clinical manifestation in human, clinical manifestation in animal, mode of transmission to human, mode of transmission to the animal, high-risk people, complications in human, complications in animal, prevention and sources of information.

The smallholder dairy farmers′ answers were compared with a model answer key, where (1) score was offered for accurate response, and (0) for the mistaken response. The scores of the points were summed-up and the overall divided by the number of the items, giving mean total scores, which was changed over into a percent score, means, and standard deviations and medians were computed. The study group´s knowledge was considered satisfactory if the percent score was ≥60%, while considered unsatisfactory if the percent score was less than 60%.

Tool (III): Smallholder dairy farmers' attitude questionnaire sheet this tool was adopted from other studies conducted in South Africa **(Cloete et al., 2015)**, Egypt (**Mohammed et al., 2015)**, and Ethiopia **(Seyoum et al., 2017)**, modified and translated into the Arabic language by the researcher. It was developed to assess the farmers' attitudes toward brucellosis, which included twelve questions about washing and cleaning measures, consumption and risks of raw milk, sources and susceptible persons to zoonotic diseases, fearing from acquiring brucellosis, wearing personal protective clothing, notification of suspected cases & follow up country measures.

The overall number of items is (12) and they are measured at three points Likert scale ranging from 3, 2 and 1 for responses: agree, disagree and don't know respectively, Score of items is summed up with total score divided by the number of items giving the mean score for the attitude. The attitude was considered positive if the score of total attitudes >75% and negative if it is<50%.

Tool (IV): Smallholder dairy farmers' practices questionnaire sheet. This tool was adapted from further studies in Jordan (**Musallam et al., 2015** & South Africa **(Cloete et al., 2015)**, modified and translated into the Arabic language by the researchers. It was developed to assess the farmers' practices toward brucellosis. It included 37 questions about preventive measures when milking, barn cleanliness measures, conditions of milk consumed and animal products, cattle owners' practices towards suspected or infected animal with brucellosis, livestock owners' practices when an animal bears, and livestock owners' practices when an animal miscarries.

Tool (IIV): Blood analysis of brucellosis among smallholder dairy farmers. This tool included the result of a blood analysis of brucellosis among the study group. Qualified medical personnel are using a sterile syringe and needle to collect 5 ml of blood. The blood was then transferred into sterile bottles (without anticoagulants), which were kept in a cool container with ice to keep it at a temperature of40º C. The blood samples were then taken immediately to the laboratory at the Damietta city for the serological tests. Sera were extracted immediately and tested for the presence of Brucella antibodies using Rose Bengal Plate Test (RBPT). The sera of seropositive individuals to RBPT antigen were then stored at -20º C to confirmed by Serum Agglutination Test (SAT) that used to detect Brucella antibodies, positive reaction was determined by observing agglutination at 1:160 or more. While a negative reaction is less than1: 160.

Validity and Reliability

Content validity of the tools was submitted to a panel of five experts in Community health nursing with more than ten years of experience in the field. Modifications of the tools was done according to the panel judgment on clarity of sentences, appropriateness of the content, sequence of items, and accuracy of scoring and recording of the items. Internal consistency, reliability demonstrated by the coefficient alpha of 0.83 for knowledge, 0.72 for attitude, and 0.78 for practices.

Ethical considerations:

The purpose of the study was explained to the farmers. The researchers informed the participants that, the study was voluntary, they were allowed to refuse to participate and they had the right to withdraw from the study at any time, without giving any reason. Moreover, they were assured that their information would be confidential and used for research purposes only.

Pilot study:

A pilot study was carried out to appreciate the achievability of the study, the appropriateness of the tools, and to appraise the time required for data collection. It was carried out with 10 % (28) of the entire members according to agreeing to the choice criteria. All farmers participated in the pilot study were excluded from the study sample. Based on the results of the pilot study and expert's opinion, alterations and omissions of some points were made, and after that set the final fieldwork agenda.

Fieldwork:

Data collection was from the 1st of May 2018 until the end of December 2018. This sheet was distributed to studied farmers three times; (1) pre-test to evaluate the effect of the health education regarding brucellosis on knowledge, attitude, and practices of the study group before the implementation of the instructional guidelines, and the sheet used again as post-test as immediate post program application and repeated follow up after one month to evaluate the effect instructional guidelines.

Administrative phase:

Formal consent to conduct the study from the responsible authorities was gotten. Before carrying out the study, an official letter clarifying the aim of the study was submitted

by the faculty of nursing's dean Port Said University to the chief of the veterinary health unites within the chosen villages to get their endorsement to carry out the study.

The instructional guidelines program

The study was presented through the following four stages; assessment, planning development, implementation, and evaluation.

Assessment stage: The researcher visited the study settings, met with the eligible agriculturalists, presented himself. The intervention was constructed based on the actual results that obtained from preprogram assessment using the interviewing questionnaire as well as literature review which aimed to improve the studied farmers deficit knowledge, attitude and practice regarding brucellosis.

Planning stage:

Objective of the instructional guidelines

To evaluate the effect of instructional guidelines regarding brucellosis on improving knowledge, attitude, and practices among smallholder dairy farmers in Egypt

Content of the instructional guidelines including the following

1. Introduction, definition, signs and symptoms of brucellosis.
2. History of brucellosis, the prevalence of brucellosis, incubation period of brucellosis, high-risk group of people and animals Mode of transmission, diagnostic evaluation and prevention of brucellosis as hand washing technique and guidelines for farmers before, during and after handling with animals.
3. Causative agents
4. Milk pasteurization.
5. How to treat with animal dung and disposing the dead and aborted animals (uses of protective measures).
5. Importance of animals' vaccination.

The researcher designed the instructional guidelines about brucellosis. Its main objectives were to improve the knowledge, attitude, and practices of farmers. A simple booklet was developed by the researcher in the Arabic language with different illustrated color pictures.

Implementation stage; the instructional guidelines were implemented in the headquarters of the veterinary units of each village with the help of veterinarians in the veterinary units as well as through the assistance of the local council in each village. The participating farmers were divided into seven groups; each group was containing 9 farmers for each village. The program was conducted through five sessions; each group obtained three sessions /week, each session took about a half-hour. The total allocated time for achieving the whole program was 70 hours (7 groups' × 2.5 hours) x 4 (total number of villages). At the beginning of the first session, identification for the study and the objectives of the program executed. Also, farmers were informed about the study phases and sessions of the program (duration, time, contents, and place). The researcher stressed on the importance of continuous attendance and active participation. Diverse learning and teaching styles were utilized throughout the sessions which involved; demonstration &re-demonstration, group discussion, interactive lecture, instructional media included data show & and printed handout.

Evaluation stage: Took place one month after the instructional guidelines, to examine the farmers' knowledge, attitude, and practice using the same pre- test questionnaire as (post-test) by them, to evaluate the improvement of the study group's knowledge, attitude, and practices regarding brucellosis.

Statistical Analysis:

The data obtained were reviewed, prepared for computer entry, coded, analyzed and tabulated. Data entry and analysis were done using SPSS 17.0 statistical software package. Data were expressed as mean, SD and number, percentage. Using Manwhitiny test to determine significant for numeric variable and using Chi Square to determine significance for non-parametric variable. Using paired T test for comparison between pre, post and follow up. Using person's correlation for numeric variable in the same group, $P > 0.05$ no significant, $P <$

0.05 significant, P < 0.01 moderate significant and P < 0.001 highly significant.

Results:

Table (1): showed that 60% of the study group aged between40- 60 years, 84.7 % were male, 34.29% cannot read and write, 79% were married, 72% worked in farming only, and 65% reported having not enough income. Eventually, the same table clarified that 68.7% of the study group had crowding index <3.

Concerning prevalence for brucellosis one fifth (20%) of the study group was positive for either the Brucella test **(Table, 2)**.

According to cattle characteristics of the studied group **table 3** illustrated that around three quarters (73 %), of the study group, keep mixed breed, 42 % have 5-10 cattle, 60% kept cattle since 20 years and more, 68% live in a shared place with cattle, and 52% get rid of cattle waste away from the house.

Table (4): revealed that there were statistically significant differences and improvement in all items at pre/ immediate post and after one month instructional guidelines implementation (P < 0.05).

Most (95%) of the study group had unsatisfactory total knowledge scores in the pre-test phase, while 81 % had total satisfactory knowledge scores after instructional guidelines implementation **(Figure, 1).**

Table (5) illustrated that, there was highly statistical significant difference between farmers' knowledge as pre/immediate post and after one month of discharge guide instructional guidelines implementation regarding to brucellosis (P=<0.000). It's clear from the above table that there was a highly statistical significant difference (p= <0.000) in the farmer's total knowledge mean scores as pre/immediate post and after one month of instructional guidelines implementation.

It's clear from **table (6)** that there was a highly statistical significant difference (p= <0.000) and improvement in the farmer's total attitude mean scores as pre/immediate post and after one month of instructional guidelines implementation.

Most (80.8%) of the study group had negative total attitude scores in the pre-test phase, while 94.6 % had total positive attitude scores after instructional guidelines implementation **(Figure, 2).**

It's clear from **table (7)** that there was a highly statistical significant difference (p= <0.000) and improvement in the farmer's total practices mean scores as pre/immediate post and after one month of instructional guidelines implementation.

Majority (83 %) of the study group had unsatisfactory total practice scores in the pre-test phase, compared to 10 % after instructional guidelines implementation **(Figure, 3).**

Table (8): illustrated that there was a statistically significant relationship between the educational level of the study group and overall knowledge, attitude, and practices throughout the phases of the instructional guidelines at p<0.01**.**

Table (9): Revealed that there was a statistically significant correlation between total knowledge and attitude scores, total knowledge, and practice scores, total practices, and attitude at p<0.001**.**

Table (1): Frequency and percentage distribution of the study group according to their sociodemographic characteristics (n=280)

Personal characteristics	No.	%
Age (years)		
<20– 40	112	40.00
40 ≥ 60	168	60.00
Min. – Max.	19.0 – 60.0	
Mean ± SD.	33.26 ± 10.06	
Sex		
Male	237	84.7
Female	43	15.3
Educational level		
Cannot read and write	95	34.0
Basic education	87	31.0
Secondary/technical education	95	34.0
University	3	1.0
Marital status		
Married	221	79
Unmarried	59	21
Occupation		
Farming only	202	72.00
Working beside farming	78	28.00
Monthly income		
Enough	98	35
Not enough	182	65
Crowding index		
<3	192	68.7
3+	88	31.3

Table (2): Prevalence of brucellosis among the study group (n=280)

Prevalence of brucellosis	Frequency	Percent
Prevalence for brucellosis:		
Abortus	120	43
Melitensis	104	37
Either	56	20

Table (3): Frequency and percentage distribution of the study group according to their cattle characteristics (n=280).

Items	No.	%
Type of cattle		
Single breed	76	27
Mixed breed	204	73
Number of cattle owned by household		
<5	101	36
5-10	118	42
10+	61	22
Number of years they've kept cattle		
<10	36	13
10-20	76	27
20+	168	60
Live in a shared place with cattle		
Yes	190	68
No	90	32
Cattle waste disposal		
In front of / next to the house	134	48
Away from house	146	52

Table (4): Frequency and percentage distribution of the study group to their knowledge as pre/ immediate post and after one month instructional guidelines implementation (n=280).

Correct knowledge of Brucellosis:	Pre		Post				X2 test	p-value
			immediate		after one month			
	No.	%	No.	%	No.	%		
Meaning of brucellosis	12	4.4	259	92.5	231	82.5	88.87	<0.001*
Vulnerable persons	32	11.5	228	81.4	200	71.4	51.93	<0.001*
Vulnerable animals	88	31.4	272	97.2	256	92.2	65.83	<0.001*
Incubation period	11	4	152	54.4	124	44.4	30.46	<0.001*
Transmission (man)	8	2.8	236	84.2	208	74.2	75.37	<0.001*
Transmission (animal)	20	7.1	228	81.4	200	71.4	60.64	<0.001*
Symptoms/signs (man)	60	21.4	275	98.1	255	91.1	66.70	<0.001*
Symptoms/signs (animal)	14	5.1	212	75.9	184	65.9	59.05	<0.001*
Complications (man)	16	5.6	219	78.4	183	65.4	57.95	<0.001*
Complications (animal)	16	5.6	183	73.1	177	63.1	50.72	<0.001*
Prevention	20	7.1	252	89.9	243	86.9	89.89	<0.001*

(*) Statistically significant at p<0.05

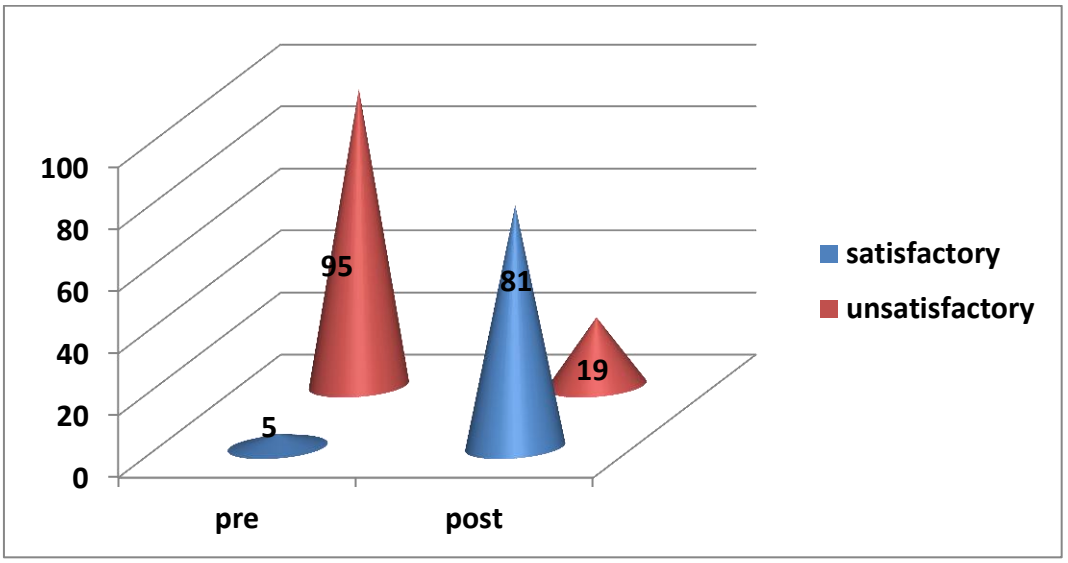

Figure (1): Total knowledge scores of the study group through pre/post instructional guidelines phases (n=280).

Table (5): Comparison of the study group' level of knowledge related to brucellosis as pre/immediate post and after one month instructional guidelines implementation

Items	n=280 100%						
	Pre-program		Immediate-post program		After one month program		P-value
	No.	%	No.	%	No.	%	
Satisfactory≥60%	14	5	249	89	227	81.0	<0.000
Unsatisfactory less than 60%	266	95	31	11	53	19	<0.000

Table (6): Comparison mean scores of the study group' attitude related to brucellosis as pre/immediate post and after one month program implementation

Items	Pre-program	Immediate-post program	After one month program	X2	P-value
Positive ≥ 60%	14.68±0.49	25.17±3.1	30.04±1.64	17.48	<0.000
Negative less than 60%	26.68±1.49	10.17±3.1	7.04±1.64		

(*) Statistically significant at p<0.05

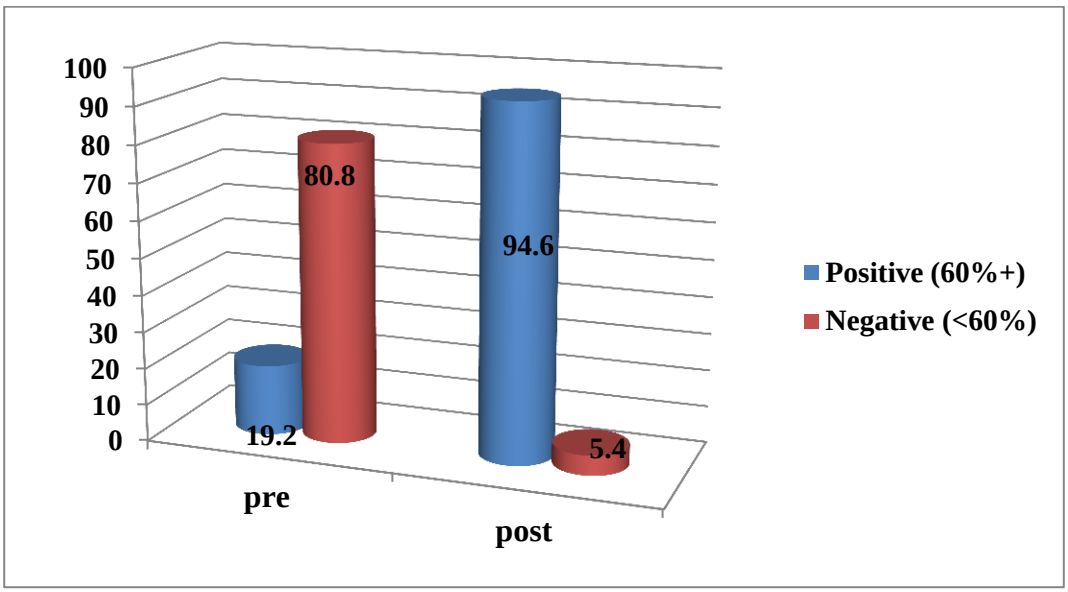

Figure (2): Total attitude scores of the study group through pre/post instructional guidelines phases (n=280).

Table (7): Comparison mean scores of the study group' practices levels related to brucellosis as pre/immediate post and after one month instructional guidelines implementation

	Pre-program		Immediate-post program		After one month program		P-value	X2
	No	%	No	%	No	%		
Satisfactory≥60%	48	17	246	88	235	84	<0.000	60.066
Unsatisfactory less than 60%	232	83	34	12	45	16		
Total practice	**13.17±1.60**		**30.06±2.73**		**27.84±2.12**			

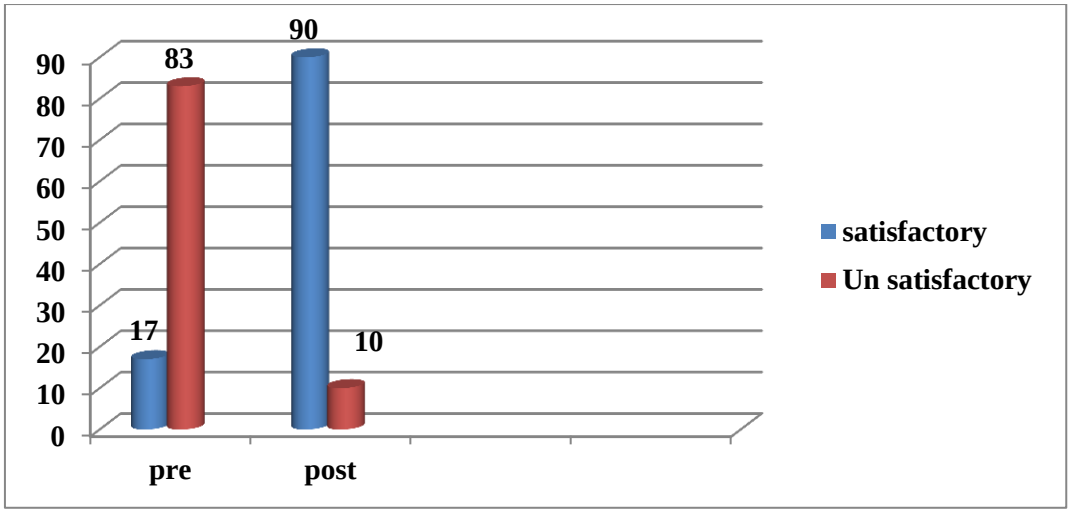

Figure (3): Total practice scores of the study group through pre/post instructional guidelines (n=280).

TABLE (8): Correlations between farmers' knowledge, attitude, practices, toward brucellosis and sciodemographic characteristics (n=280).

Scores	Spearman's rank correlation coefficient (r)		
	Knowledge	Attitude	Practices
Pre-intervention			
Age	-.137	.015	.067
Education	.136	.048	.197
Income	-.102	-.102	-.162
Crowding index	.063	.027	-.088
Post-intervention			
Age	-.203	-.006	-.253*
Education	.305**	.005	.354**
Income	-.137	.057	-.042
Crowding index	.087	.051	-.005
Overall			
Age	-.091	-.002	-.091
Education	.178*	.342**	.198*
Income	-.072	-.026	-.079
Crowding index	.027	.044	-.048

(*) Statistically significant at p<0.05
(**) statistically significant at p<0.01

Table (9): Correlation matrix of total knowledge, attitude, and practices scores (n=280)

Items	Pre-test		Post-test	
	r	p	r	p
Knowledge VS practice	0.374**	<0.001*	0.307 **	<0.001*
Knowledge VS attitude	0.345*	0.005*	.706**	<0.001*
Practice VS attitude	.442**	<0.001*	604**	<0.001*

(*) Statistically significant at p<0.05
(**) statistically significant at p<0.01

Discussion:

Brucellosis can be considered to be a disease of animals, where humans are accidental hosts. The disease in humans results from ingestion or inhalation of the pathogen, or direct entrance via skin abrasions. Humans can get the disease through consumption of raw milk and raw milk products from infected animals and via direct handling with contaminated materials from infected animals, specifically in aborted foetuses, foetal membranes and vaginal secretions (**Dasari et al., 2013).** This study aimed to evaluate the effect of health education relating to brucellosis on improving knowledge, attitude, and practices in smallholder dairy farmers in Egypt.

The present study revealed that more than three quarters of farmers were married. These results is supported with a study conducted by **Bamaiyi et al., (2017)** about Seroprevalence of Brucellosis among Farmers and Veterinary Technical Staff in the Central States of Peninsular Malaysia and found that 77.80% of the respondents were married.

Concerning prevalence for brucellosis one fifth of the study group was positive for either the Brucella test. This may be attributed to poor preventive and hygienic measures of the study group when contact with animals. This finding is similar to other studies conducted in Egypt by **(Abdel-Fattah, 2014 and Abdelbaset et al., 2018),** they revealed that one-fifth of the sample having a mixed infection of both Br. Abortus and Br. Melitensis. Also, another study conducted in Malaysia by (**Bamaiyi et al., 2017)**, who observed that the minority of farmers had positive results for the Brucella test.

Most of the study group had unsatisfactory total knowledge scores in the pre-test phase, while majority of them had total satisfactory knowledge scores after program implementation**.** The low awareness about human brucellosis in the present study may be attributed to the low health education and the low proportion of farmers to receive formal education. it could be a result of the low level of education, the absence of the clear role of the veterinary units in the villages, the lack of interest in the health of farmers, and the lack of awareness programs and campaigns provided to them, whether by veterinarians or through social media, poor extension services, insufficient health-related facilities, little training on the handling and rearing of animals. This is indicated the importance and effectiveness of the health educational program. This result is in the same line with **Marin et al., (2017)**, who found that overall knowledge of respondents was low in South Sudan under title Knowledge, Attitude and Practices of Brucellosis among Slaughterhouse and Community Animal Health Workers.

Similarly, the study conducted in Pakistan by **Arif et al., (2017)** who concluded that a poor comprehension of brucellosis and a high level of perilous practices across several regions and incorrect attitudes towards the management of such disease. Another study carried out in Tajikistan by **(Lindahl et al., 2015);** and found out that the knowledge of brucellosis is poorly among the farmers in the urban and sub-urban areas of Tajikistan. In contrast to this finding, a study in Uganda **(Kansiime et al., 2014)**, showed a high realization of brucellosis among the participants in the community. Parallel findings have been viewed in Egypt, where the plurality of the farmers was knowledgeable about brucellosis **(Hegazy et al., 2016 and Holt et al., 2011)** after the accomplishment of the health education program.

The present study revealed that there was highly statistical significant difference between

farmers' knowledge as pre/immediate post and after one month of instructional guidelines implementation regarding to brucellosis (P=<0.000). This could be due to the effectiveness of the conducted educational program about avoiding the disease occurrence and transmission. Also, it may be due to the usage of videos, re-demonstration, and the distributed hand out to the study group.

The present study revealed that more than three quarters of the study group had negative total attitude scores in the pre-test phase, while most 94.6 % had total positive attitude scores after instructional guidelines implementation. These findings were in the same line with the study conducted by **Obonyo and Gufu, (2015)** in Kenya and detected that unfavorable attitude towards brucellosis.

The present study revealed that there was a highly statistical significant difference (p= <0.000) and improvement in the farmer's total practices mean scores as pre/immediate post and after one month of instructional guidelines implementation. These findings were in the same line with the study conducted in Iran by **(Aminshokravi et al., 2013)** who observed that the intervention has had a positive effect on knowledge, attitude, and behavior of the rustic inhabitance of Gilan-e Gharb. Also, another researcher in Iran by **(Esmaili et al., 2014)** concluded that there are statistically significant differences between mean scores of attitude, knowledge, and behavior control and intervention groups to brucellosis before and after the intervention. Therefore, instructional guidelines that were conducted in this area had a significant effect on the promotion of knowledge, performance, and attitude of stockbreeders towards brucellosis. Also, these results are consistent with the findings of other studies (**Khanian et al., 2013 and Rouji et al., 2012).**

The present study revealed that there was a statistically significant relationship between the educational level of the study group and overall knowledge, attitude, and practices throughout the phases of the instructional guidelines at p<0.01**.** This finding is in accordance with the results conducted by **Marin et al., (2017)** who reported that knowledge of brucellosis was significantly associated with education.

The present study revealed that there was a statistically significant correlation between total knowledge and attitude scores, total knowledge, and practice scores, total practices, and attitude at p<0.001**.** This finding is in agreement with the study conducted by **(Esmaili et al., 2014)** in Iran and reported that there is a significant difference between total scores of behaviors, attitude, and knowledge in control and intervention groups, which reflected the importance of educational level in promoting health and preventing illness among the most vulnerable groups in the community which are the farmers.

Moreover, in a study in Egypt conducted by **Mohammed et al., (2015)** mentioned that lack of information concerning the transmission of brucellosis causing high-risk practices as aiding in parturition without protective equipment, throwing aborted substances in water canals, and unwillingness to separate aborted animals from the herd. In another word, these studies confirmed that there was a highly statistically significant correlation between total knowledge and both total practices and total attitudes of the studied sample related to brucellosis. This is reflected the high effect of the instructional guidelines.

Conclusion:

The farmers' knowledge, attitude and practices were poor while after implementation of the instructional guidelines a significant improvement was achieved in the farmers' knowledge and practice. Moreover, there were highly statistically significant differences between pre/ post instructional guidelines implementation. Hence the instructional guidelines implementation was very effective in achieving its goals and objectives regarding improving the knowledge, attitude, and practices of the study group.

Recommendations:

1. Instructional guidelines about brucellosis should be given to farmers related to brucellosis.
2. Targeted, processed priceless information and awareness campaigns seem to address

the community's high-risk practices by enhancing their knowledge through using their positive attitudes and heeding the request for the priceless information.

3. Existing contact sessions between government veterinary administrations and cattle guardians can be utilized optimally to make mindfulness of brucellosis and to supply pertinent data on the creature and human wellbeing and malady avoidance.
4. Teaching, counseling, and preventive campaigns in all communities through mass media, TV, radio, and internet to limit the disease borders.
5. It would be of advantage in case-specific consideration that might be paid to progressing information of the community on brucellosis is a zoonotic disease and to ensure that healthcare practitioners are equipped to identify and treat the disease.
6. Similar KAP studies can be utilized for the full nations to decide the pattern of KAP for distinctive communities before conducting awareness and education campaigns to adapt the approach and content thereof to optimize proficient and successful data exchange.

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