Bulletin of High Institute of Public Health
Vol. 43 No. 1 [2013]

The Effect of Training of School Physicians on Their Knowledge Regarding Surveillance in Alexandria

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Abstract:
Background: Surveillance is important in schools. Training of school health physicians on surveillance is recommended in order to improve the disease surveillance system. The aim of the current study is to assess the effect of a training program on the knowledge of school physicians regarding surveillance. **Subjects and methods**: Seventy school health physicians from all Health Insurance Organization districts were included in the study. Assessment of their baseline knowledge regarding surveillance was done using a pre-designed self -administered structured questionnaire (pretest). Accordingly, an intervention program in the form of a workshop was prepared to raise their knowledge regarding surveillance. Within one week after the end of the intervention, assessment of the training program was done using the same data collection tool (post -test). **Results:** After the intervention, the percentage of physicians with poor and fair knowledge levels regarding surveillance decreased from 37.4% to 10.4% and from 50.7% to 40.3% respectively, while those with good knowledge level increased from 11.9% to 49.3%.The difference in the mean knowledge score before and after the intervention was statistically significant. In a multiple linear regression model, two factors significantly affected the school physicians' knowledge score after the intervention. These factors were the total knowledge score before the intervention and the physicians' age. **Conclusion**: Training of school physicians on disease surveillance affectstheir level of knowledge regarding surveillancewhich is essential for planning and evaluation of communicable diseases' prevention and control.

Key words: Intervention; school health physicians; surveillance; training

INTRODUCTION

Surveillance is the process of systematic collection, collation and analysis of data with prompt dissemination to those who need to know, for relevant action to be taken. A well-functioning disease surveillances stem provides information for planning, implementation, monitoring and evaluation of public health intervention programs.[1] Surveillance, when firmly designed and implemented, has many applications, including quantitative estimates of the magnitude of a health

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problem, portraying the natural history of a disease, detecting epidemics, in addition to documenting the distribution and spread of a health event. Moreover, it helps in identifying high-risk groups, facilitating epidemiological and laboratory research, testing hypotheses, as well as evaluating control and preventive measures. It also enables planning of health programs, detecting changes in health practice, monitoring both changes in infectious agents and isolation activities. Furthermore, it assists in increasing knowledge of vectors, animal reservoirs and the modes and dynamics of transmission of communicable diseases.[2-4] Without adequate surveillance, the true scope of existing health problems cannot be known and new diseases may not be recognized until many people have been affected. Surveillance data is also used to allocate staff and resources and to monitor and evaluate the effectiveness of prevention and control programs.[5] At the local level, the use of surveillance triggers basic public health investigations and implements specific control activities.[6]

Surveillance usually begins when a person with a reportable disease seeks care and the physician in an effort to determine the cause of the illness runs a laboratory test. The subsequent reports generated by such tests are often sent to the local health departments to check its completeness. Then, the contact health care professionals in turn collect the missing information or clarify unclear responses. Finally, the reports are forwarded to the state health agencies.[5]

For effective surveillance of any health event, there are core activities and functions that must be done. These activities are case detection, registration, epidemiological or laboratory confirmation, reporting, analysis, interpretation, response, feedback, evaluation and monitoring. These activities are made possible by a number of support functions which are setting standards, training,supervision, communications systems and providing resources.[7]

Schools inherently foster the transmission of infections from person to person because they are a group setting in which people are in close contact and share supplies and equipment. Transmission of infectious diseases among school children is frequent, probably inevitable and has concentric circles of repercussions for other students, teachers, parents, and educational achievement. Surveillance is important in schools and actions that can help control the spread of infections such as encouraging sick students and staff to stay home and seek medical attention for severe illness, facilitating hand hygiene, being vigilant about cleaning and disinfecting classroom materials and surfaces. Surveillance also provides messages in daily announcements about preventing infectious disease, adopting healthy practices such as safe handling of food and use of standard precautions when handling body fluids and excretions and encouraging students and emphasizing the importance of vaccinations are, therefore, vital to the health of students, teachers, and other adults and are the key to effective disease control within the community.[8]

School health physicians should play an important role in surveillance. Their training on data collection, analysis, reporting and importance of feedback is recommended in order to improve the disease surveillance system. The aim of the current study is to assess the effect of a training program on the knowledge of school physicians about surveillance. The purpose of evaluation is to improve the information provided and thereby help improve service delivery.

Subjects and methods:

An intervention study (one group pre-test and post-test design) was carried out in January and February 2013 in

Alexandria, Egypt. Participants were eligible school health physicians from all Health Insurance Organization districts. Based on the assumption that the proportion of school health physicians with good knowledge levels before and after the intervention will be 40% and 75%, respectively, the minimum required sample size was 60 physicians at 5% alpha error and 80% power. The sample was increased to 70 physicians to compensate the follow-up losses. School health physicians from all Health Insurance Organization districts in Alexandria, Egypt were invited to participate. The study aimwas explained to each participant, and his or her verbal consent was obtained.

During the first phase of the study, knowledge assessment of the school health physicians regarding surveillance was done using a pre-designed self-administered structured questionnaire (pretest), which consisted of two sections. Section I included basic personal data such as the age, sex, years of experience, postgraduate studies and training on communicable diseases' surveillance. Section II consisted of ten queries, that was used to collect data about the physicians' knowledge regarding components and objectives of communicable diseases' surveillance, criteria of suspected and confirmed case definitions and their purpose, directions of reporting and feedback, cases to be reported and zero reporting. Two types of questions were used; single, and multiple response. A special scoring system was prepared and applied. The correct answer for each of the single response questions was scored by "one" point. Incorrect or do not know answers were scored by "zero" point. For multiple response questions, each correct response that was selected or each wrong response that was not selected was considered a right answer. The total knowledge score ranged from 0 – 23. It was calculated for each participant by summing the scores of all items.

The level of knowledge was classified into three categories according to the respondent's overall score; poor (below 11), fair (from 11 to 15), and good (more than 15).

Based on the results of the pretest, an intervention program in the form of a workshop was prepared to raise the knowledge of the school health physicians on surveillance. The workshop consisted of two sessions. It included lectures, discussions, applications and exercises. Power point presentations were used as audiovisual aids. The study participants were divided into four groups (15-20 physicians each) and one workshop was carried out for each group. Handouts were distributed at the end of each workshop. Within one week after the end of the intervention, evaluation of the program was done through reassessment of the physicians' knowledge using the same data-collection tool (post-test). The number of reassessed physicians was 67, while three could not be reached (drop-out rate = 4.3%).

Statistical analysis:

Data were entered and statistically analyzed using SPSS for Windows version 16.0 (SPSS Inc., Chicago, IL,USA). Quantitative data was described using mean and standard deviation and Pearson's correlation, while percent, Pearson's chi square (X^2) and Monte Carlo exact probability (MCP) were used to describe categorical data. Paired sample t-test was used to assess the significance of thepre, and post-tests mean knowledge score differences. Multiple regression analysis was carried out to identify factors affecting knowledge score of school health physicians regarding surveillance after intervention. All statistical analyses were done using two-tailed tests and p value < 0.05 was considered to be statistically significant.

RESULTS

Table 1 shows that after the intervention, the percentage of correct responses of the school health physicians regarding surveillance had increased. The percent improvements in physicians' responses ranged from 4.5% to 40.3%. The highest percent improvements were observed in the knowledge of the directions of reporting and feedback (40.3%), followed by the complete correct answers about the components of disease surveillance (37.3%). Knowledge of the basis of suspected case definition and of zero reports (if no recognized cases), were improved by 3.0% and 24.0%, respectively.The improvement regarding other surveillance knowledge items was minimal. The percentage improvement in the physicians' correct responses regarding the components of disease surveillance ranged from 13.4% to 35.9%, while that of the basis of a suspected case definition, the direction of reporting and feedback, and zero reports were 28.3%, 40.3%, 40.3%, and 24.0% respectively. The increase in the knowledge regarding other surveillance knowledge items was minimal.

The respondents' knowledge improvements regarding reasons of conducting disease surveillance were 4.5% and 16.4%. Knowledge regarding the basis of a confirmed case definition, cases to be reported, the purpose of developing and using case definition and the procedure(s) to be carried out if a case of a disease recognition improved by(5.9%, 3%, 5.9% and 9%).

Figure 1 illustrates the knowledge level of the school health physicians regarding surveillance, befor

e and after the intervention. It is obvious that before the intervention, 37.4% of the physicians had a poor knowledge level. This percent improved after the intervention (10.4%). Percentage physicians with good knowledge levels after intervention (49.3%) was higher than that before (11.9%). This means that percent physicians with poor and fair knowledge levels reduced, and those with good levels increased after the intervention.

Table 1: Distribution of school health physicians according to their correct responses regarding surveillance, before and after the intervention (Alexandria, 2013)

Items	Before the intervention (n=67) [b]	After the intervention (n=67) [b]	% improvement after intervention
	No. (%)	No. (%)	%
1- Components of disease surveillance [a]			
Data collection	52 (77.6)	61 (91.0)	13.4
Data analysis	46 (68.7)	56 (83.6)	14.9
Interpretation of data	41 (61.2)	55 (82.1)	20.9
Taking action	22 (32.8)	46 (68.7)	35.9
Complete correct answer	19 (28.4)	44 (65.7)	37.3
2- Reasons for conducting diseases surveillance [a]			
Disease control, elimination or eradication	41 (61.2)	44 (65.7)	4.5
Planning and evaluating control programs	44 (65.7)	55 (82.1)	16.4
3- Suspected case definition is based on the clinical picture	15 (22.4)	34 (50.7)	28.3
4- Confirmed case definition is based on the clinical picture and specific laboratory tests	4 (6.0)	8 (11.9)	5.9
5- Reporting is the movement of surveillance data from the lower to the higher surveillance levels	39 (58.2)	66 (98.5)	40.3
6- Feedback is the movement of surveillance data from the higher to the lower surveillance levels	37 (55.2)	64 (95.5)	40.3
7- Suspected cases are the ones to be reported	13 (19.4)	15 (22.4)	3.0
8- The purpose of developing and using a case definition is standardization	31 (46.3)	35 (52.2)	5.9
9- Procedure(s) to be carried out if a case of a disease is recognized [a]			
Register the case	27 (40.3)	36 (53.7)	13.4
Written reporting of the case	29 (43.3)	40 (59.7)	16.4
Case investigation and carrying out preventive measures	43 (64.2)	47 (70.1)	5.9
Complete correct answer	9 (13.4)	15 (22.4)	9.0
10- If no cases were recognized, zero reports should to be submitted	42 (62.7)	58 (86.6)	24.0

[a]Responses are not mutually exclusive [b] 3 physicians were excluded from the total sample

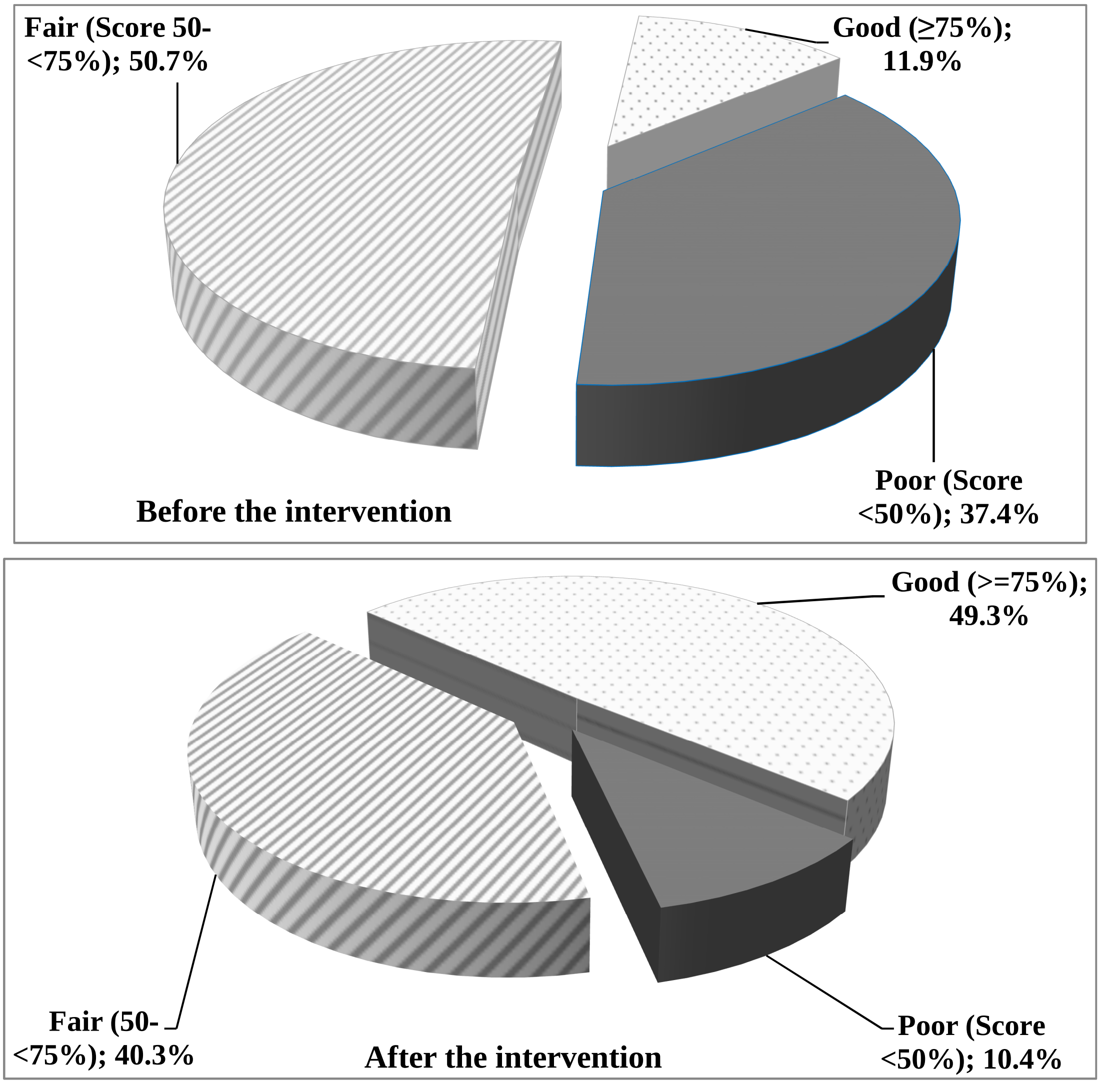

Figure 1: Knowledge Levels of school health physicians regarding surveillance before and after the intervention (Alexandria, 2013)

Paired sample t-test indicated that the mean knowledge score after the intervention (14.6 ± 2.58) was significantly (p-value <0.05 at 95% C.I) higher than that after (11.5 ± 3.39) as obvious in table 2.

The physicians' age ranged from37 to70 years with a mean age of 54.16 ± 7.31 years. A significant inverse correlation between the physicians' age and their level of knowledge before and after the intervention was detected(Pearson's correlation = -0.27, *p*= 0.035 and -0.43, *p*=0.000, respectively).Before the intervention, 46.7% of males and 29.7% of females had a poor level of knowledge, while only 10% of males and 13.5% of females had a good level of knowledge.After the intervention, 20% of males and 2.7% of females had a poor level of knowledge, while 43.3% of males and 54.1% of females had a good level of knowledge. However, these differences were not statistically significant.

It is also clear from the table that before the intervention, 8.3% of physicians with master degrees had apoor level of knowledge, 58.3% had a fair level of knowledge, and 33.3% had a good level of knowledge, while half the physicians who had no post graduate studies had a poor level of knowledge, 40.9% had a fair level of knowledge and only 9.1% had a good level of knowledge. After the intervention, about 67% of physicians with master degrees had the good level of knowledge compared to 45.5% of physicians who did not have post graduate studies. The difference between the postgraduate studies and the level of knowledge was statistically significant (MCP = 9.24, *p*=0.041) before the intervention, while it was not significant after the intervention. The table also shows that before and after the intervention, physicians previously trained on surveillance had lower levels of good knowledge (7.1% and 35.7%, respectively), compared to the untrained ones (13.2% and 52.8% respectively). However, this difference was not statistically significant. The table finally shows that the mean years of experience of the school health physicians ranged between 2 and 46 years (mean =

27.14 ± 8.98 years). It could be noticed that before and after the intervention, the correlation between the years of experience and the physicians' knowledge score was weak, non-significant, and inverse. This means that the lower the physicians' years of experience, the higher their knowledge score was.

Table 2: Distribution of school health physicians according to their level of knowledge regarding surveillance and certain factors, before and after the intervention (Alexandria, 2013)

	Level of knowledge before the intervention			Level of knowledge after the intervention		
	Poor (n=25) No. (%)	Fair (n=34) No. (%)	Good(n=8) No. (%)	Poor (n=7) No. (%)	Fair(n=27) No. (%)	Good(n=33) No. (%)
Mean ± SD	11.5 ± 3.39			14.6 ± 2.58		
Range	2-18			7-19		
Paired t-test	7.78* (*p*=0.000)					
1- Age in years						
Mean ± SD (range)	54.16 ± 7.31 (37-70)					
Pearson's correlation coefficient	- 0.27*(*p*=0.035)			- 0.43*(*p*=0.000)		
2- Sex						
Male	14 (46.7)	13 (43.3)	3 (10.0)	6 (20.0)	11 (36.7)	13 (43.3)
Female	11 (29.7)	21 (56.8)	5 (13.5)	1 (2.7)	16 (43.2)	20 (54.1)
MCP**	2.03 (*p*=0.35)			5.1 (*p*=0.81)		
3-Postgraduate studies						
No	11 (50)	9 (40.9)	2 (9.1)	2 (9.1)	10 (45.5)	10 (45.5)
Diploma	13 (39.4)	18 (54.5)	2 (6.1)	5 (15.2)	13 (39.4)	15 (45.5)
Master	1 (8.3)	7 (58.3)	4 (33.3)	0 (0.0)	4 (33.3)	8 (66.7)
MCP	9.24* (*p*=0.041)			2.76 (*p*=0.61)		
4-Trainingon surveillance						
Yes	5 (35.7)	8 (57.1)	1 (7.1)	2 (14.3)	7 (50.0)	5 (35.7)
No	20 (37.7)	26 (49.1)	7 (13.2)	5 (9.4)	20 (37.7)	28 (52.8)
X^2***	0.49 (*p*=0.78)			1.32 (*p*=0.52)		
5-Yearsof experience						
Mean ± SD (range)	27.14 ± 8.98 (2-46)					
Pearson correlation	- 0.15 (*p*=0.25)			-0.24 (*p*=0.54)		

***** Significant (*p* value <0.05 at 95% C.I.);
** MCP, Monte Carlo Exact Probability
*** Chi-Square test

In a multiple linear regression model, including the set of the variables in table 3, only two factors were found to be significantly affecting the school physicians' knowledge score after the intervention. The total knowledge score before the intervention ranked as the first variable predicting the knowledge score after the intervention, and it could explain 11.42% of the variation of the score. Age was also a significant predictor for the score and could explain 5.19% of the variations. About 31% of the variability which occurred in the school physicians' knowledge score after the intervention were attributed to those two factors (adjusted R^2 of the model= 0.316).

The probability of acquiring knowledge after the intervention program was 67.2%. It was nearly the same for those with poor and fair knowledge scores (68.0% and 66.7% respectively). Cox proportional hazard model revealed that there was a non-significant predicting variable for that change in knowledge score.

Table 3: Multiple regression analysis of the knowledge score of school health physicians regarding surveillance after intervention (Alexandria, 2013)

Independent Variable	B	Beta	*p* value	Part (r)	Part (r^2)%
Total knowledge score before the intervention	0.287	0.377	0.002*	0.338	11.42
Age	-0.145	-0.408	0.034*	-0.228	5.19
Sex	0.985	0.188	0.119	0.167	2.79
Postgraduate education	-0.054	-0.014	0.899	-0.013	0.0016
Training on surveillance	0.100	0.016	0.885	0.015	0.022
Years of experience	0.056	0.192	0.286	0.113	0.113
Constant	**16.035**		**0.000**		
Adjusted R^2= 0.316 F=5.769 *p*=0.000***					

* Significant ($p<0.05$)
** Coefficient of determination of the model

DISCUSSION

The present study provides information concerning the knowledge of school health Physicians regarding surveillance. Physicians play a very important role in disease surveillance. They receive the earliest information as they work on the front line of diagnosis. Only when the physicians have the ability of case reporting as soon as they diagnose a case; information can then be analyzed, and immediate action can be taken to control and minimize the impact on the public. To a further extent, the level of efficiency and effectiveness of a surveillance system is decided by the knowledge, attitudes and practices of physicians.

The results of the presentwork revealed that school health physicians had poor level of knowledge on many important factors related to surveillance. The data also suggested that surveillance can be improved through training. Physicians need to understand their reporting responsibilities as well as the reporting system used by their institution. Reporting of cases of infectious disease is a critical element in planning and evaluation of disease prevention and control programs. Several studies have evaluated the completeness of reporting for particular diseases in various areas over a certain period of time. Despite the mandatory reporting by laws, the incompleteness of notifiable infectious disease reporting is well-documented in many countries for differentdiseases.[9]

A study done in USA in 2010, revealed that there were gaps in the awareness of both physicians and nurses about Washington State's notifiable infectious disease reporting requirements, their re-porting role in the medical center where they worked, and their facility's procedures for reporting to public health authorities. However, those physicians and nurses who reported receiving training from their em-ployer had a higher likelihood of reporting awareness of their medical center's reporting system and the diseases they are required to report.[10,11] Their reporting awareness was higher than the reporting awareness of the school physicians in the current study. This may be explained by the fact that most school physicians did not attend any previous trainings on surveillance and its requirements.

A study conducted in Saudi Arabiato assess health facilities' performance and health workers' knowledge of surveillance activities for childhood vaccine-preventable diseases revealed that there were deficiencies in some surveillance items. Only one-quarter of health workers had a satisfactory knowledge score in the 6 months preceding the study.The current study revealed a better level of knowledge asabout half of school physicians had good level of knowledge before intervention. This difference may be attributed to the fact that the study done in Saudi Arabia did not only include physicians but different health workers with different levels of education.[(12)]

Health workers need to be trained, retrained and updated on the principles and practice of disease surveillance and notification. In Nigeria, a study designed to assess the knowledge of health workers about disease surveillance recommended training and retraining of health workers responsible for data generation, collection and forwarding in health facilities on disease notification, regular feedback on diseases reported and provision of forms in order to improve the disease surveillance system. [(13)]Another study done in Nigeria on the effect of training on the reporting of notifiable diseases among health workers showed that training had a positive effect on health personnel knowledge, reporting requirement and the timeliness and completeness of the disease surveillance and notification system.[(14)]These two studies were in accordance with the results of the current study which highlighted the effect of training of school physicians which improved their level of knowledge regarding disease surveillance.

In conclusion, training of school physicians on disease surveillance has an effect on their level of knowledge regarding surveillance which is essential for planning and evaluation of communicable diseases prevention and control.

It is therefore recommended to provide training to all school physicians on disease surveillance with special emphasis on data collection, analysis, reporting and importance of feedback in order to improve the efficiency and effectiveness of disease surveillance system which is essential for planning and evaluation of disease prevention and control programs especially those concerning communicable diseases.

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