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Original article

Effectiveness of Health Education Intervention in Improving Knowledge, Attitude, and Practices Regarding Tuberculosis Among Nurses Working in Tuberculosis Centers in Libya

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ABSTRACT

Background and aims. *Nurses make up by far the largest group of healthcare workers in any part of the world, playing an important role in the direct management of tuberculosis (TB) patients and facing a high risk of infection. The aim of this study was to assess the impact of a health educational intervention on knowledge, attitude and practice of the nurses working in TB centres in Libya.* ***Methods.*** *A sample of 100 TB nurses was randomly allocated into intervention and control groups. The intervention group received health education regarding tuberculosis using a developed module over a period of 3 days at Tripoli Tuberculosis, while the control group did not receive any education. Knowledge and attitude scores for both groups were evaluated using a self-administered validated questionnaire at baseline, immediate after intervention, three, and six months. Practice score was assessed only at baseline, three, and six months.* ***Results****. The TB educational intervention program was found to be effective immediately after intervention, as the knowledge score improved by 40.08 (95% CI 41.77, 38.39) (p-value < 0.001) among the intervention group. The knowledge scores remained stable at 3-month and 6-month follow-up. Likewise, there was significant improvement in attitude score with a mean difference of 1.769 (95% CI 1.88, 1.65) (p < 0.001). The attitude scores remained stable at 3-month and 6-month follow-up. Similarly, there was improvement in practice score with a mean difference of 18.23 (95% CI 16.12, 0.17.43) (p < 0.001). The practice scores remained stable at 6-month follow-up.* ***Conclusions.*** *The educational intervention carried out was effective in improving the nurses' knowledge, attitude and practice towards TB over time. Therefore, tuberculosis education programme should become part of nursing development program and the regular activities undertaken by all nurses in colleges, institutes and hospitals in Libya.*

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INTRODUCTION

Tuberculosis (TB) is one of the major global health problems and is the ninth killer amongst infectious diseases for the past five years (2012–2016). It has reached epidemic proportions in many developing countries and has affected a third of the world's population. Globally in 2016 there were an estimated 10.4 million incident cases of TB (range, 8.8 million to 12.2 million), this number is equivalent to 140 cases per 100,000 populations. The Libyan national TB program has adopted the Directly Observed Treatment Short-course (DOTS) strategy since 1998 and by the year 2000, the strategy covered all governorates. The total notified cases in Libya according to World Health Organization report in 2016 were 1176. However, 60% of cases occur in the productive age group of 15–56 years. Moreover, according to the global

tuberculosis report released by World Health Organization, there were more than 1500 new notifications of TB including 80 children in 2016-2017[1].

In particular, health care workers and other medical staff are at high risk of TB infection because of their frequent exposure to patients with the infectious TB disease, either diagnosed or undiagnosed. With the global upsurge in TB, powered by HIV pandemic, and the increase in multidrug-resistant TB, the condition has become a serious occupational hazard for health care workers worldwide Nurses were the first occupational group who were identified to be at increased risk for TB and probably have the highest rate of infection and disease among the health care workers. This is not surprising in view of the prolonged and often close contact between hospital nurses and patients [2].

In Libya, although nurses play a central role in investigation, immunization, and administration of treatment of TB, there was a lack of empirical literature on the nurses' knowledge, attitude and practice. This is a follow-up to a study that we conducted in 2016 on TB knowledge, attitude and practice among nurses in Libya. In the study we found that majority of the nurses lacked knowledge on TB and showed low levels of attitude and practice towards TB. For this study, a health education program on TB was developed and was tested among a group of nurses in Libya. The purpose of this study was to assess the effectiveness of the health education intervention on improvement of the nurses' knowledge attitude and practice towards TB.

METHODS

Study design

The TB educational intervention study was conducted using two groups quasi experimental design with follow-up of six months.

Study population, setting and period

A group of 50 randomly selected professional nurses for intervention from Tripoli Tuberculosis Center in Libya were in the study. As a control, another 50 nurses from Misurata TB center and Zeliten TB center were selected (Figure 1). The study was conducted in period from 16 February 2022 to 23 August 2022. TB-educational was delivered at multipurpose hall in Tripoli TB center over a period of 3 days, from 16 to 18 February 2022 among the treatment (intervention) group. Post three- months assessment was performed from 19-24 May, 2022. Three months later, the groups were post-tested gain from 18-23 August, 2022 as a at six month's assessment

Sampling and sample size

In Libya, from central region, 2 centers out of 3 were selected; while from western area 2 centers out of 5 were selected. The 4 selected TB centers were randomly assigned to intervention and control group (Figure1). There were 73 and 67 registered nurses in these intervention and control centers, respectively.

The target sample size was calculated according differences in mean scores between pre-test and post-test which obtained from similar published study [14]. The effect size was 0.165 and power of 0.95. PS power and sample size was used in the calculation process. The sample size calculated was 82. Because there will be two times follow up among the study groups, the adjustment with 15 % for anticipated drop out was done, therefore, the sample size was 95 and finally approximated to 100. Based on this sample size, 50 nurses were selected randomly for intervention and 50 nurses also randomly selected for control.

Data collection tool

The research questionnaire that was designed to assess the levels of knowledge, attitude and practice towards TB among Libyan nurses was initially developed in the English language. About 80% of the questions in the KAP parts of the questionnaire were extracted and adapted from questionnaires that had been used in previous studies related to TB KAP surveys. The knowledge questions were obtained from one study conducted in Turkey [3] and the World Health Organization (WHO)' KAP Guide [4]. The attitude questions were extracted from previous studies on attitudes towards TB [5, 6]. The practice questions were extracted from practice guidelines for the prevention of multidrug-resistant TB among hospitalized adult patients in Bangladesh [7]. In addition to the socio-demographic questions, a few questions in the KAP parts were formulated by the researcher. The knowledge-related items were framed using three possible answers (1 = yes, 2 = no, and 3 = I don't know). A score of (1) was given to each correct answer and a score of (0) was given to incorrect and 'I don't know' answers. A five-point Likert scale of agreement: (1 = strongly agree, 2 = agree, 3 = somewhat agree, 4 = disagree, 5 = strongly disagree) was used for attitude items. The questions on practice were framed using a three-option scale of performance (1 = never perform, 2 = sometimes perform, 3= always perform). Content and face validity were ascertained by a panel of six experts in the field. The final version of the questionnaire was translated into Arabic using standard translating measures.

Health education intervention

TB educational modules were formulated based on Center of Disease Control (CDC), USA self-study module on tuberculosis [8]. The three sessions of the health education program were conducted over a period of 3 days at Tripoli Tuberculosis Center to 50 nurses. The duration of the first and second sessions was 150 minutes each, while the third session lasted 240 minutes. The content of the module in the first session covered the history, transmission, pathogenesis and clinical features of TB. In the second session, a talk was delivered about the epidemiology, risk factors and diagnostic tests for TB. In the third and last session, the nurses were trained on treatment, delivering of drugs, the role of the nurse in the control of TB and the facts about the stigmatization of TB. Regarding practice, some videos were used to demonstrate the skills for the collection of sputum samples. In addition, the nurses were trained in how to complete the disease notification form and how to ask the patient relevant questions about their previous history of TB and previously used TB drugs. The lectures were of interactive type with specific time allotted for question and answer session. Medium of instruction was Arabic and PowerPoint slides along with charts were used as teaching aids. The talks were delivered by the researcher in his position as a public health specialist. The program was conducted at Tripoli Medical Center. Data were collected from respondents by the principal investigator. The knowledge and attitude scores of the participants were evaluated using a self-administered validated questionnaire before training (pre-test), after training (post-test), and at a 3-month and a 6-month follow-up session. However, practices score was assessed before training (pre-test), at a 3-month and a 6-month follow-up session. The assessment control group was asked to complete the same questionnaire at the same time.

Ethical considerations

Ethical clearance was obtained from national center of disease control prevention (NCDC) of Libya where the research committee is attributing. Written permissions were obtained from the medical directors of the tuberculosis centers. In addition to the permission was obtained from medical ethics committee at University Malaya Medical Center (UMMC), Malaysia. However, written informed consents were obtained from the participant nurses.

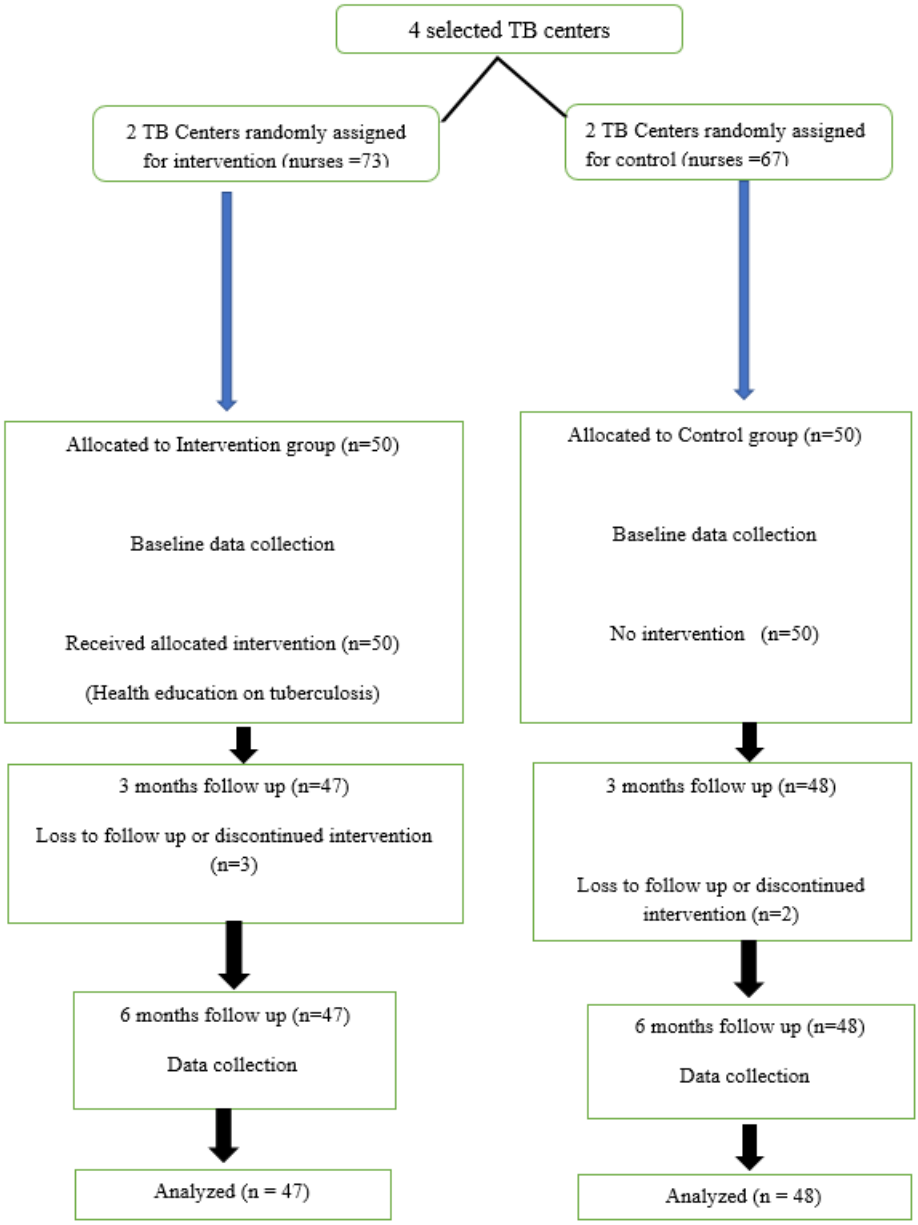

Figure 1. Flow chart of education intervention study among the selected nurses

Statistical analysis

An independent sample t-test was applied to compare the knowledge; attitude and practice of the two groups at pre-test. The effect of TB educational intervention on knowledge across time was assessed by two-way repeated measure analysis of variance (ANOVA). Bonferroni post hoc test was applied to compare the mean scores of knowledge, attitude and practice between the two groups and over time. SPSS version 20 software was used in data analysis and statistical significance was set as 0.05.

RESULTS

Socio-demographic characteristics by groups

At baseline 50 nurses attended the program. However, three nurses dropped out in the follow-up rounds, so 47 nurses were included in the analysis. Out of the 47 respondents, 13 (27.7%) were male and 34 (72.3%) were female. On other hand 50 nurses were included as control group, but because of two nurses dropped during follow-up, hence 48 nurses were included in the analysis. Table 1 shows the details of both groups.

Table 1. Demographic variables of the of intervention (n=47) and control group (n=48)

Variable	Level	Intervention n (%)	Control n (%)	χ2	p value
Gender	Male	13(52)	12(48)	.457	0.499
	Female	34(48.6)	36(51.4)		
Age	18-25ys	16(55.2)	13(44.8)	.480	0.787
	26-40ys	24(48)	26(52)		
	>40	7(43.8)	9(56.2)		
Education	Training certificate	14(50)	14(50)	.067	0.967
	Diploma	20(51)	19(49)		
	Bachelor	13(46.4)	15(53.6)		
Residence	Urban	29(47.5)	32(52.5)	.698	0.705
	Rural	18(53)	16(47)		
work experience	1-11months	11(47.8)	12(52.2)	0.06	0.971
	1y-5y	30(51.8)	28(49.2)		
	> 5years and <10 years	6(42.8)	8(57.2)		

The differences in the mean scores between the intervention and control groups for knowledge, attitude and practice at baseline were not significant (Table 2).

Mean knowledge scores

The difference in the mean score between the intervention and control groups for knowledge, at **baseline** was not significant. However, there was a clear difference in the knowledge scores between the intervention and control groups at immediate post-test, 3-month follow-up and 6-month follow-up. Moreover, the TB educational intervention was found to be effective as the knowledge mean score at pre-test was 31.60 ± 3.43, whereas at immediate post-test it was 71.68 ± 3.79; the mean difference was -40.085 (95% CI -41.773, -38.397) and p-value < 0.001. Thus, there was a significant change in the knowledge mean scores. On other hand, the knowledge scores remained stable at 3-month and 6-month follow-up as the mean scores were 69.64 ± 3.25 and 70.06 ± 3.06, respectively (Table 2).

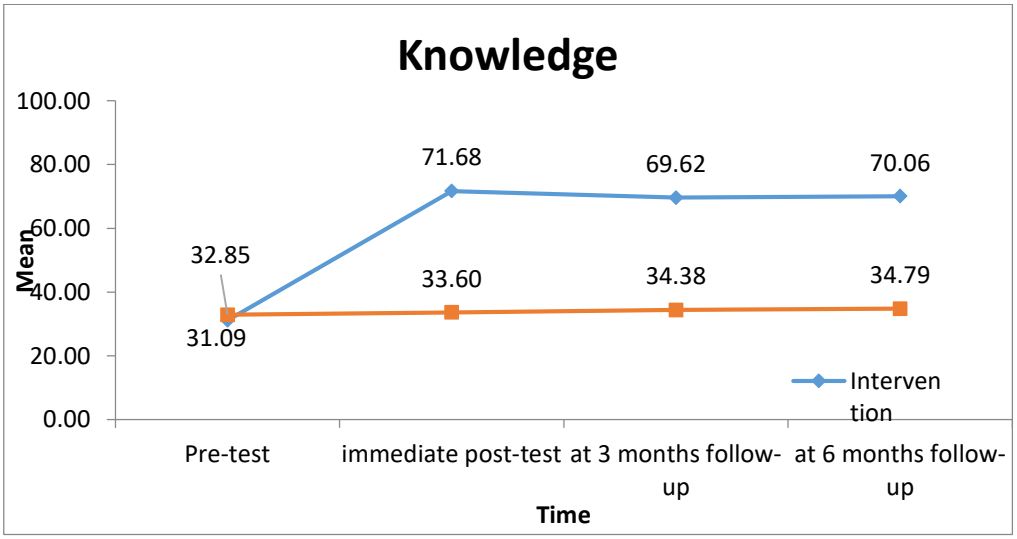

Figure 2. Mean plot of knowledge mean score in groups across the time

Figure 2 shows the plot of the mean scores for total knowledge of the intervention and control groups over time. It is very clear that in the intervention group the knowledge mean score increased at immediate post-test, then slightly decreased at 3-month follow-up and became stationary at 6-month follow-up, whereas it was constant in the control group over time.

Mean attitude scores

The difference in the mean score between the intervention and control groups for attitude at baseline was not significant. The attitude mean score for the intervention group at pre-test was 2.16 ± 0.12, whereas at post-test it was 3.93 ± 0.31; the mean difference was -1.769 (95% CI -1.886, -1.651) and $p < 0.001$. The attitude means scores for the intervention group remained stable at 3-month and 6-month follow-up as the mean scores were 4.01 ± 0.29 and 3.91 ± 0.26, respectively. There were significant differences in the attitude mean scores between the intervention and control groups at post-test, 3-month follow-up and 6-month follow-up ($p < 0.05$) (Table 2).

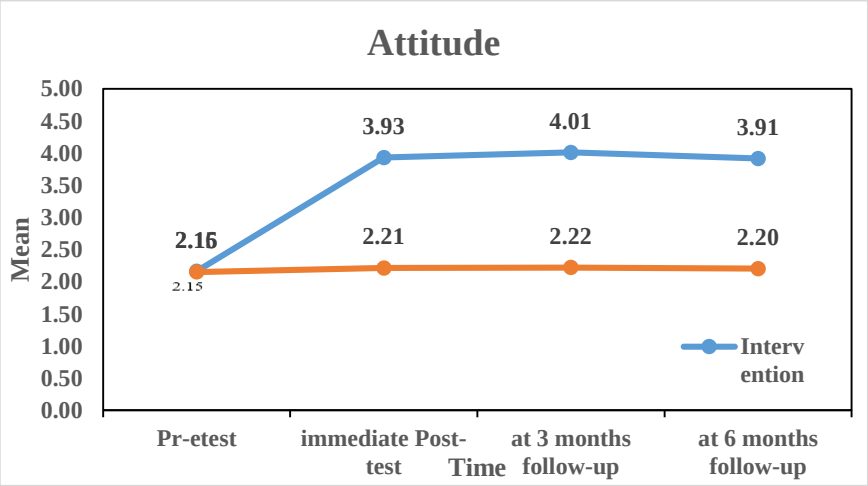

Figure 3. Mean plot of attitude mean score in groups across the time

Figure 3 shows the plot of the mean for total attitude score of the control and intervention groups over time. It is very obvious that in the case of the intervention group the attitude mean score increased at post-test, then became stationary at 3-month follow-up and at 6-month follow-up, whereas it was constant in the control group over time

Mean practice scores

The difference in the mean score between the intervention and control groups for practice at baseline was not significant. At pre-test the mean of total practice score for intervention group was 39.09 ± 4.33 while for control group was 39.54 ±3.93. Three months later, the mean of total practice score for intervention group was improved as it reached 57.32 ± 2.70 and for control group was 40.65 ± 3.27. At 6-month follow-up, the mean of total practice for intervention group became 54.36 ±3.41 while for the control group remained constant as it was in 3-months follow-up 40.42 ±3.23. Thus, among the intervention group there were significant improvement of practice at 3- month follow-up and these improvements remained stable at 6-month follow-up. On other hand, there were no significant changes in the mean of total practice score across the time among the control group (Table 2).

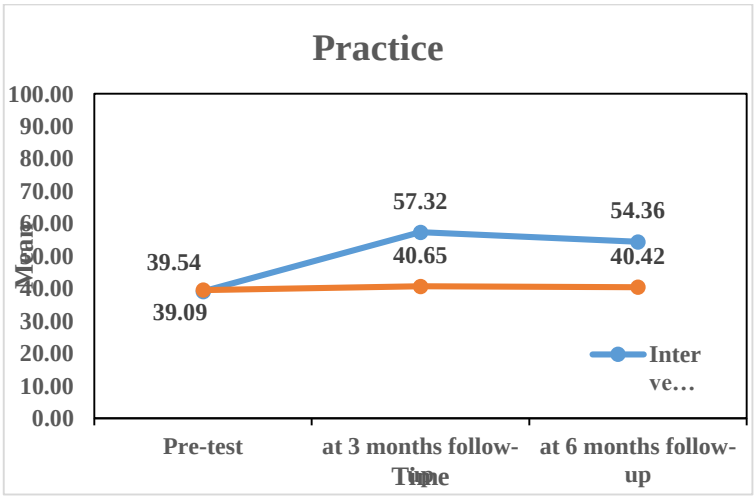

Figure 4. Mean plot of practice mean score in groups across the time

Figure 4 shows the plot of the mean of total practice score for both the control and intervention groups over time. It is clear that in the case of the intervention group the mean of total practice score increased at 3-month from the time of the TB intervention and then slightly declined at 6-month follow-up. However, the score was constant in the control group over time

Table 2. Main effect of intervention on mean knowledge, attitude and practice scores regarding tuberculosis at baseline to follow-up

Outcome measure	Test	Groups		MD	P- value	95% CI		η^2
		Intervention n=47	Control n=48			Lower Bound	Upper Bound	
		M±SD	M±SD					
knowledge	Pre-test	31.09 ±3.33	32.85 ±3.68	-1.154	0.117	-2.60	0.29	0.026
	*Post-test	71.68 ±3.79	33.60 ±4.22	38.077*	<0.001	36.44	39.71	0.958
	3 months	69.62 ±3.25	34.38 ±4.27	35.263*	<0.001	33.71	36.81	0.957
	6 months	70.06 ±3.06	34.79 ±4.32	35.272*	<0.001	33.74	36.8	0.958
Attitude	Pre-test	2.16 ± 0.17	2.15 ± 0.17	0.01	0.745	-0.05	0.07	0.001
	Post-test	3.93 ± 0.31	2.21 ± 0.28	1.717*	<0.001	1.59	1.83	0.895
	3 months	4.01 ± 0.29	2.22 ± 0.21	1.789*	<0.001	1.68	1.89	0.928
	6 months	3.91 ± 0.26	2.20 ± 0.23	1.712*	<0.001	1.61	1.81	0.926
Practice	Pre-test	39.09 ±4.33	39.54 ±3.93	-0.45	0.392	-0.261	0.452	0.123
	3 months	57.32 ±2.70	40.65 ±3.27	16.67	<0.001	14.43	18.52	0.958
	6 months	54.36 ±3.41	40.42 ±3.23	13.94	<0.001	11.75	14.82	0.937

**Post-test= immediately post-test; MD (Mean Difference)*

Magnitude of effects of intervention on knowledge, attitude, and practice

The results showed that the overall effect of time on knowledge was statistically significant ($F = 1772.6$, $p < 0.001$, $\eta2 = 0.950$). The main effect of group was also statistically significant ($F = 1680.9$, $p < 0.001$, $\eta2 = 0.948$). The result also revealed that the interaction between group and time was statistically significant ($F = 1524.4$, $p < 0.001$, $\eta2 = 0.943$), which means that the groups had a different pattern for knowledge over time. The findings showed that the overall effect of time on attitude was statistically significant ($F = 548.563$, $p < 0.001$, $\eta2 = 0.855$) and that the main effect of group was also statistically significant ($F = 1267.27$, $p < 0.001$, $\eta2 = 0.932$). The results also showed that the interaction between group and time was statistically significant ($F = 477.43$, $p < 0.001$, $\eta2 = 0.837$), which means groups had a different pattern for attitude over time. Similarly, the overall effect of time on practice was statistically significant ($F = 442.115$, $p < 0.001$, $\eta2 = 0.826$). The main effect of group was statistically significant ($F = 281.24$, $p < 0.001$, $\eta2 = 0.751$). The results also indicated that the interaction between group and time was statistically significant ($F = 348.405$, $p < 0.001$, $\eta2 = 0.789$), which means that the two groups had a different pattern for practice over time (Table 3).

Table 3. Summary of mixed design ANOVA for tuberculosis knowledge, attitude and practice scores (between and within subject effects)

Measure outcome	Source	MS	F	P -value	η^2
Knowledge	Time	20544.3	1772.6	<0.001	0.950
	Group	68553.9	1680.9	<0.001	0.948
	Time * Group	17667.7	1524.4	<0.001	0.943
Attitude	Time	22.288	548.563	<0.001	0.855
	Group	162.36	1267.27	<0.001	0.932
	Time * Group	19.398	477.43	<0.001	0.837

Practice	Time	9.929	442.115	<0.001	0.826
	Group	16.33	281.24	<0.001	0.751
	Time * Group	7.824	348.405	<0.001	0.789

DISCUSSION

An intervention program utilising structured modules on tuberculosis was delivered as a strategy to improve knowledge, attitude and practice regarding TB, among nurses working in TB centres in Libya. The results of this study provide evidence that significant improvement in knowledge, attitude, and practice regarding TB among such nurses can be achieved through a designed health education intervention.

We believe that the observed changes in the study the results of the intervention delivered. However, studies that evaluated the effects of health education intervention, on the levels of knowledge in TB and the attitude, and practice towards TB among healthcare workers, are scarce. Hence, we find limited number of investigations on nurses or healthcare workers with which to compare the results of our study.

Effectiveness of intervention on knowledge

In our study, at baseline, there was no significant difference in mean knowledge scores between the intervention and the control groups (mean = 31.09 ± 3.337 vs. 32.85 ± 3.687, p = 0.17). However, significantly higher mean knowledge scores were found in the intervention group compared to the control group, indicating that there was improvement in knowledge among participants that received the intervention; at immediate post-test, 3-month and the 6-month follow-up, (71.68 ± 3.79 vs. 33.60 ± 4.22, p< 0.001, 69.62 ± 3.25 vs. 34.38 ± 4.27, p < 0.001 and 70.06 ± 3.06 ± vs. 34.79 ± 4.32, p <0.001), respectively, this finding is consistent with the findings of other studies [9-13].

In contrast, in one study, nurses were the least group of healthcare worker which showed improvements in the levels of knowledge from TB post education intervention [14]. The knowledge scores were not affected by the sociodemographic variables and work experiences among the nurses in our study. In our study, the group * time interaction was significant (p<0.001), which was similar to the finding of another study [12]. However, in our study, significant improvement was observed in the entire knowledge components across time, except of knowledge on TB causation and prevention. This finding could be contributed to the good basic knowledge of nurses regarding the causes and prevention of TB. The result of our KAP survey also revealed that the nurses had good levels of knowledge regarding the causes and prevention of TB. Moreover, in our study, the improvements of knowledge, attitude and practice were stable at three months and six-month follow-up. In comparison, finding of other study revealed that the impaction of health education intervention on knowledge, attitude and practice was declined over the time [15].

Effectiveness of intervention on attitude

We were able to investigate whether tuberculosis education intervention was effective in working against TB stigmatisation and phobia, and whether there were statistically significant differences in the scores between pre-test, immediate post-test, 3-month and 6-month follow-up. Before education intervention, there was no difference in the mean attitude scores between intervention and control groups (2.16 ± 0.17 vs 2.15 ± 0.17, P = 0.725).

In general, the result of our study revealed that there was a reduction in phobia and stigmatisation of TB among nurses in the intervention group compared to the control group, at immediate post-test, 3-month and the 6-month follow-up, (3.93 ± 0.31vs. 2.21 ± 0.28, p< 0.001, 4.01 ± 0.29 vs. 2.22 ± 0.21, p < 0.001 and 3.91 ± 0.26 ± vs. 2.20 ± 0.23, p <0.001), respectively. Our finding indicated that education intervention had improved the attitude score toward TB, similar to the findings reported in other studies [1-12]. On other hand, the attitude scores were not affected despite the intensive educational tuberculosis educational program [15]. In our study, sociodemographic variables and work experiences were found to have no effects on the attitude of nurses across the time. The results of our study revealed that the group across time interaction was significant (p<0.001), which corresponded to the findings another intervention study [12]. Attempts at improving the levels of attitude among frontline healthcare providers, such as nurses, toward tuberculosis; will ultimately have a positive impact on their performance, and ensure optimal care of patients as well as adherence to appropriate TB infection control measures.

Effectiveness of intervention on practice

There was no difference in the mean practical scores between intervention and control groups (39.09 ± 4.33vs 39.54 ± 3.93, P = 0.392). This finding was similar to that at baseline assessment cores of knowledge and attitude. It was unreliable to assess the practice score immediately post-test. Hence a period of six months was given to give them an adequate opportunity to increase their practice scores from the knowledge gained in the TB educational programme.

Our educational intervention showed significant improvements in the mean practice scores among the intervention group compared to control group at 3- month and at 6-month follow-up (57.32 ± 2.70 vs. 40.65 ±3.27, p< 0.001, 54.36 ±3.41vs. 40.42 ±3.23, p< 0.001), respectively. In agreement with our findings, other studies [9, 12] also reported the effectiveness of health education intervention in improving practices regarding tuberculosis. Another study which showed the effectiveness of education program in improving prevention practices regarding TB [16]. However, the level of practice was not affected by sociodemographic variables and work experiences of nurses across time [13]. Our effect on the level of practice was higher than the large effect of Cohen ($\eta 2 = 0.14$) [17]. Moreover, in our study, the group across time interaction was significant (p<0.001), which corresponded to the finding of another study [12].
In our study, no contamination of KAP' results were detected across time, as there were no significant changes observed among the control group. This finding could be due to the fact that the intervention and control groups were from different cities. In comparison, such contamination has been reported in other studies where the control groups showed some improvement in knowledge and practical scores, despite separation [12, 18]. This kind of contamination might decrease the internal validity of the study. With respect to the importance of effective practice in tuberculosis prevention and control, the need for information, training, and positive attitudinal change towards the disease are vital.

CONCLUSION

This study has shown that the educational intervention was effective in improving of knowledge, attitude and practice regarding tuberculosis among TB nurses and these improvements became stable over time. The module developed is recommended to be included as a strategy in the National tuberculosis control guidelines in the training and prevention at TB healthcare facility level in Libya.

Limitations

The study was conducted in middle and west region of the country. Generalizing these results to the entire Libyan nurses is not wise. A nationwide survey is hereby recommended to get a better insight of TB situation in Libya.

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Disclosure

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