

Original Article

The Impact of Tuberculosis Educational Program on Knowledge Among Nurses Working in Prison Clinics in Libya

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ABSTRACT

Background and aims. Nurses have become the key providers of healthcare in the prison setting in Libya, and those attending to tuberculosis patients face a high risk of infection themselves. The aim of this study was to assess the baseline knowledge of employed nurses at prison clinics about TB and to evaluate the impact of tuberculosis educational program on knowledge about tuberculosis. **Methods.** A sample of 102 nurses working at the six different prison clinics in Libya was used in the evaluation of this programme. At first, baseline knowledge was assessed using a validated self-administered pre-test questionnaire. The knowledge was assessed again at three weeks post-TB educational programme. **Results.** The overall baseline knowledge score on tuberculosis among the nurses was poor; only 32 (31.4%) of the nurses had a good level of knowledge. There was no significant association between the sociodemographic variables and knowledge level. A statistically significant improvement in knowledge was observed in the evaluation after the education programme (pre-test score = 9.6 ± 10 , post-test score 25 ± 8.51 , $P < 0.001$). The mean difference was 15.4 ± 13.12 (95% CI 13, 18); however, the knowledge about tuberculosis of all the nurses was improved after the education programme. **Conclusion.** The health education intervention was effective in improving knowledge about tuberculosis among the nurses in the programme.

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INTRODUCTION

TB among prisons is a major public health problem in many settings, particularly in countries with a high incidence of TB. Globally, the challenges are clear in two regions: Africa, where there is a high prevalence of HIV infection, and Eastern Europe. The TB notification rate in prisons ranges from 11 to 81 times higher than in the general population. The situation is exacerbated by the emergence and spread of drug-resistant TB, particularly multidrug-resistant (MDR) and extensively drug-resistant (XDR) TB. Prisoners constitute a group of people who are at high risk of TB, as they include people who inject drugs, as well as those who are homeless or mentally ill, those returning to prison and undocumented immigrants from areas with a high incidence of TB. In a prison setting, many factors may facilitate the transmission of TB; such factors as segregation criteria are based on crime features rather than on public health concerns, overcrowding, poor ventilation, late detection and inadequate treatment of infectious cases, as well as frequent transfers between prisons and poor airborne infection control measures [1].

The Libyan national TB programme has adopted the Directly Observed Treatment Short-course (DOTS) strategy since 1998, and, by 2000, the strategy covered all governorates. In 2008, 871 cases (621 nationals, 250 foreigners) of TB were notified to public facilities under the DOTS strategy. In 2007, WHO reported that the success rate of the DOTS treatment was 63.5% [2]. By 2011, the total new notified cases had reached 1498 according to the WHO report in 2012 [3]. Sabha is considered to be the biggest city in the south of Libya with the population being boosted by the unlawful entry of undocumented immigrants and smugglers from African nations who have to pass through it when they want to enter the country. In Sabha, over the last three years, 113 TB cases were reported among 743 African inmates in prisons for unlawful immigrants.

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. Nurses were the first occupational group to be identified as being at an 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. Nurses play a key role in ensuring the long-term implementation of the five components of the DOTS by undertaking TB case detection, treatment, and follow-up, as well as in educating patients and the public about tuberculosis [4].

Previous studies indicate knowledge deficits and a significant knowledge gap among health care providers, especially nurses, with respect to TB, as well as a negative attitude towards the disease and improper practice in handling TB patients [5-7]. In Libya, although nurses play a central role in the investigation, immunization, and administration of treatment of TB, there is a lack of empirical literature concerning the knowledge of nurses. The aim of this study was to assess the effectiveness of the health education intervention on improving the knowledge of the nurses. This is a follow-up to a study that we conducted in 2014 on TB knowledge among nurses in Misurata, Libya. In the study, we found that the majority of the nurses lacked knowledge about TB. For this study, a health education programme on TB was developed and tested among a group of nurses in Sabha, Libya.

METHODS

Study population and study setting

The study was conducted among 102 professional nurses working at randomly selected six different prison clinics in Middle, West and South of Libya in June 2022.

Assessment of baseline knowledge

A self-administered questionnaire was used to obtain the nurses' knowledge scores on TB before (pre-test) and after (post-test) intervention. The questionnaire was developed following an extensive review of the literature and adapted from the ACSM KAP TB survey questionnaire and WHO's KAP Guide in 2008. The final version of the questionnaire was translated into Arabic using standard translating measures. Content and face validity were ascertained by a panel of three experts. Test-retest was conducted among 30 nurses as a pilot to assess the stability of the scores ($r=0.98$).

A total of 35 items on the questionnaire were used to assess the nurses' baseline knowledge about the causes, diagnosis, risk factors and the spread of TB, as well as treatment, treatment course duration, risk of incomplete treatment and prevention. There were three possible responses to each item on the questionnaire: 'Yes', 'No', 'I don't know', a score of 1 was given for each correct answer and a score of -1 was given for an incorrect answer. 'I don't know' was scored as zero. The maximum possible score was 35. A median score of 18 was used as the cut off for defining good or poor levels of knowledge. Participants who scored higher than the median of 18 were classified as having good knowledge and those who scored less than or equal to 18 were classified as having poor knowledge. The assessment of baseline knowledge was followed by a health education intervention. The pre-test was conducted at the nurses' workplace prior to conducting the education programme. Three weeks after the completion of the health education intervention, a post-test assessment was conducted among the same nurses using the same questionnaire.

Tuberculosis educational intervention

The teaching module was developed based on the Centre for Disease Control and Prevention (CDC), USA, self-study module on tuberculosis [8]. The teaching module was also reviewed by an expert panel. The health education programme was conducted over a period of three days. There were three sessions of 150 minutes each. The lectures were interactive with a specific time allotted for a question and answer session. The 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 programme was conducted at the Faculty of Health Sciences, Tripoli University.

Ethical Considerations

The study protocol was officially approved and institutional ethical clearance was obtained from the execution committee as well as the health information department of the Ministry of Health and NCDC section of the province of Sabha. Written permission was obtained from the approving authority of the prison at attributing police offices, as well as written consent from the nurses who agreed to participate in this study.

Method of data analysis

Pre-intervention and post-intervention knowledge scores of the nurses were compared using the paired t-test in SPSS version 20 software. Statistical significance was set as 0.05

RESULTS

Table 1 shows the demographic characteristics of the nurses. The overall baseline knowledge score on TB among the nurses was poor; only 32 (31.4%) nurses had a good level of knowledge.

Table 1. Demographic characteristics of nurses (n = 102)

Demographic characteristics	N (%)
Gender	
Male	40 (39.2%)
Female	62 (60.8%)
Age group (in years)	
<40 years	85 (83.3%)
≥40 years	17 (16.7%)
Education level	
Intermediate	44 (43.1%)
Higher	58 (56.9%)
Residence	
Urban	68 (66.7%)
Rural	34 (33.3%)
Length of experience in TB clinics in years	
<10 years	83 (81.4%)
≥10 years	19 (18.6%)

Table 2 shows the pre and post intervention knowledge scores changes, there was a significant improvement in the knowledge scores post TB educational intervention; the mean pre-test score was 9.6 ± 10 , the mean post-test score was 25 ± 8.5 . The mean difference was 15.4 (95% CI 13, 18). Based on the median cut-off point of 18 in the pre-test, only 32 (31.4%) nurses had a good level of knowledge compared to 84.4% in the post-test.

Table 2. Overall summary for knowledge scores among the participants (n=102)

Test	Mean \pm SD	Mean difference \pm SD (95% CI)	t	p-value
Pre-test	9.6 \pm 9.99	15.39 \pm 13.12 (13,18)	11.84	<0.001
Post-test	24.99 \pm 8.51			

Table 3 shows that there is no significant association of knowledge and selected socio-demographic variables as the p value for each was >0.05 . Next, item-wise comparisons were made for all 35 items in the questionnaire. The results are provided in Table 4. The improvements ranged from 15% to 44%. The minimum proportion of correct answers at the post-test was 57.8%.

Table 3. Association between Knowledge Score and Selected Socio-Demographic Variables (n=102)

Variables	Demographic		Total	p-value
	Grading & percentage of knowledge score			
	Poor knowledge Score ≤18	Good knowledge Score >18		
Gender				
Male	29 (72.5%)	11 (27.5 %)	40 (100%)	0.49
Female	41(66.1%)	21 (33.9 %)	62 (100%)	
Age in years				
<40	62 (73%)	23 (27%)	85 (100%)	0.10
≥40	8(47.1%)	9 (52.9 %)	17 (100%)	
Education				
Intermediate	30 (68.2%)	14 (31.8%)	44(100%)	0.93
Higher	40 (69%)	18 (31%)	58(100%)	
Residence				
Urban	46(67.6 %)	22 (32.4%)	68(100%)	0.47
Rural	24 (70.6 %)	10 (29.4%)	34 (100%)	
Length of experience in TB clinics in years				
<10	60 (72.2%)	23 (27.8 %)	83 (100%)	0.19
≥10	10(52.6 %)	9 (47.3%)	19 (100%)	

Table 4. Change in knowledge from pre-test to post-test among the nurses (n=102)

Knowledge quires	Pre-test Correct (%)	Post-test correct (%)	Improvement (%)
1. Causes of TB	57 (55.9%)	87 (85.3%)	(29.4%)
TB-Symptoms			
2. Coughing up blood	51 (50%)	82 (80.4%)	(30.4%)
3. Cough for two weeks	43 (42.2%)	65 (63.7%)	(21.5 %)
4. Fever > two weeks	39 (38.2%)	72 (70.6%)	(32.4%)
5. Loss of appetite	35 (34.3%)	69 (67.6%)	(33.3%)
6. Night sweating	25 (24.5%)	65 (63.7%)	(39.2%)
7. Chest pain	41 (40.2%)	80 (78.4%)	(38.2%)
8. Total weakness	38 (37.5%)	69 (67.6%)	(30.3%)
9. Weight loss	33 (32.4%)	74 (72.5%)	(40.1%)
TB-Transmission			
10. TB is contagious	46 (45.1%)	80 (78.4%)	(33.3%)
11. Spread through air	47 (46.1%)	88 (86.3%)	(40.2%)
TB- Risk factors			
12. Aids (HIV)	50 (49.00 %)	78 (76.5%)	(27.5)
13. Poor nutritional status	29 (28.4%)	74(72.6%)	(44.1%)
14. Overcrowding	46 (45.1%)	82 (80.4%)	(35.3%)
15. Long hospital stay	39 (38.2 %)	59 (57.8%)	(19.6%)
16. Person with respiratory disorder	36 (35.5%)	71 (69.5%)	(34 %)
17. Smoker	52 (51%)	79 (77.5%)	(26.5%)
18. Homeless person	38 (37.3%)	73 (71.6%)	(34.3%)
19. Health care worker	38 (37.3%)	81 (79.4%)	(42.1%)
20. Farmer	26 (25.1%)	71 (69.6%)	(44.1%)
21. Prison inmate	45 (44.1%)	81 (79.4%)	(35.3%)
22. Child under 5 years	30 (29.4%)	64 (62.7%)	(33.4%)
23. Family members with confirmed case	54 (52.9%)	87 (85.3%)	(32.4%)
TB diagnostic test			
24. Sputum examination is diagnostic test	65 (63.7%)	95 (93.1%)	(29.4%)
TB treatment			
25. DOTS is the best treatment	52 (51%)	79 (77.5%)	(26.5%)

26. Treatment duration \geq6 months	29(28.4%)	67 (65.7%)	(37.3%)
<i>Risk of incomplete treatment</i>			
27. Worsening of symptoms & prolonged treatment	55(53.9%)	83 (81.4%)	(27.5%)
28. Development of drug resistance	43 (42.2%)	77 (75.5%)	(33.3%)
29. Death	40 (39.2%)	80 (78.4%)	(39.2%)
<i>TB-prevention</i>			
30. Avoidance of direct contact with patient without precautions	56 (54.9%)	86(84.3%)	(29.4%)
31. Healthy diet and physical activities	53 (52%)	89 (87.3%)	(35.3%)
32. Avoidance of alcohol and other drugs	62 (60.8%)	78 (76.5%)	(15.7%)
33. Using face mask as personal protective equipment	76 (74.5%)	99 (97.1%)	(22.6%)
34. Living in ventilated residences	59(57.8%)	88 (86.3%)	(28.5%)
35. Vaccination against the disease	70(68.6%)	91 (89.2%)	(20.6%)

DISCUSSION

Nurses are an integral part of any health care system. The expansion and strengthening of TB patient care requires sufficient and well-trained healthcare workers. Currently, the need for such an effective TB workforce outstrips the supply of trained personnel at all levels of service delivery.

The present study examined the effectiveness of an education intervention programme in improving the knowledge about TB among nurses working at prison clinics. This study is unique because it is the first of its kind in Libya. Nurses with a poor knowledge of TB are a grave concern as they are in the forefront of TB service delivery in Libya as in other parts of the world. Health education is a fundamental driver of the knowledge, attitude and practice change of healthcare providers. The nurses' development programme can be linked to both theory and practice and the resulting award benefits the nurses in clinical areas. It has been found that patient outcome positively correlated to the nurses' level of training [9, 10]. The training module used in this study is commendable as it is extracted from the Centre for Disease Control and Prevention's (CDC) guidelines and verified by content experts. The results from this study indicate that the education intervention programme is effective in improving knowledge about TB among the nurses in Libya. Similar effectiveness was found in other studies conducted in South Africa and Taiwan [11, 12].

In the current study, the pre-intervention results about the causes and diagnosis of TB exposed that 55% of the nurses were aware that TB is caused by bacteria and 63.7% of them indicated that sputum examination is an important diagnostic test. Only 28.4% of nurses knew that the minimum duration of the treatment course is 6 months (Table 4). Interruption of treatment after leaving the prisons usually occurs because the patient fails to fully understand the necessity and importance of continued and complete drug therapy; however, awareness regarding these items was much improved as the percentage of correct responses exceeded 75% after the health education intervention. The result of this study is consistent with a study that was conducted in Delhi, India, which showed that there was a general lack of knowledge among nurses regarding the causative agents of TB, the importance of sputum examination, and the duration of the DOTS programme [13].

In our study, less than half of the participants were aware of the symptoms of TB, particularly fever for more than two weeks, coughing up blood and cough for two weeks. If nurses are not observing any symptoms but suspect or know that a person has been exposed to TB, further action and precautionary measures can be taken immediately to protect themselves as well as others.

Regarding the importance of knowledge about the infectiousness and the modes of TB transmission, the assessment of baseline knowledge in this study exposed that less than half of the nurses knew that TB is contagious and transmitted through air droplets when the infected person coughs or sneezes. Three weeks after the teaching sessions, 78.4% of the participant nurses stated that TB is a communicable disease and 86.3% of them indicated that the TB is spread through air droplets. In terms of taking a risk with TB, nurses were identified as the first occupational group to be at an increased risk of TB, and, probably, had the highest rate of infection and disease among the health care workers (4). Only 37.3% of nurses were aware that healthcare workers were at high risk of contracting the disease and 44.1% of them stated that prison inmates were at high risk of TB. After the education intervention, a significant improvement was found, as 79.4% of the participants indicated that prison inmates and healthcare providers are at risk. However, post the course 76.5% of them stated that HIV patients are vulnerable to TB compared to 49% before attending the course.

Regarding TB preventive measures, and based on the pre-intervention findings of this study, only 54.9% of nurses indicated that avoidance of direct contact with TB patients without precautions could minimize the rate of TB

transmission; 74.5% of participants said that wearing a face mask is a protective measure against TB and 68.6% of them indicated that vaccination against the disease gives long-term prevention; while 21 days after TB education sessions, the nurses showed a significant improvement regarding these elements as the percentages of correct answers exceeded 84% for each (table 4).

Besides clinical duties, the nurses' services can be used for health education and counselling at any healthcare service delivery. Trained nurses can also be used for the Directly Observed Treatment Short-course (DOTS). A study done in Spain has shown that a significant improvement in compliance with chemoprophylaxis can be achieved if health education is provided by trained nurses. Trained nurses could not only help in improving case detection and case holding, but could also help in passing on the required health education to the patients [14]. Patients have many queries about the disease during their hospital stay, such as its mode of spread, prevention methods, and ways to protect family members. These questions are often directed at nurses as they are more readily available than physicians, and, hence, would lead to fewer defaults and failures as well as improved cure rates.

Improving TB control in prisons can benefit society at large. Prisons act as a reservoir for TB, driving the disease into the civilian community through staff, visitors and incompletely treated former inmates. Delays in the detection and treatment of TB infected prisoners must be minimised. In addition, a reduction in the overcrowding and improvement of living conditions for all prisoners should be implemented to reduce the transmission of TB. Dealing with TB in prisons, therefore, must be an integral part of any public health policy aimed at controlling and ultimately eradicating the disease.

CONCLUSION

In the present study, the baseline knowledge about tuberculosis among nurses working in prison clinics was poor. The difference between mean knowledge scores before and after the health education intervention was found to be highly significant. This shows that the health education intervention was effective. This tuberculosis education programme should be a part of the regular activities of all the nurses in colleges, hospitals and prisons in Libya.

Limitations

The study was conducted in three geographical regions of the country. Generalizing these results to all the Libyan nurses is not wise. A nationwide survey is hereby recommended to obtain a better insight of the TB knowledge among the nurses in Libya.

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Disclosure

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أثر البرنامج التعليمي لمرض السل على المعرفة بين الممرضات العاملات في عيادات السجنون في ليبيا

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المستخلص

الخلفية والأهداف: أصبحت الممرضات هم المقدمون الرئيسيون للرعاية الصحية في السجنون في ليبيا، وأولئك الذين يعتنون بمرضى السل يواجهون مخاطر عالية للإصابة بالعدوى بأنفسهم. كان الهدف من هذه الدراسة هو تقييم المعرفة الأساسية للممرضات العاملات في عيادات السجنون حول مرض السل وتقييم تأثير البرنامج التعليمي لمرض السل على المعرفة حول مرض السل. **طرق الدراسة:** تم استخدام عينة من 102 ممرضًا يعملون في ست عيادات سجون مختلفة في ليبيا في تقييم هذا البرنامج. في البداية، تم تقييم المعرفة الأساسية باستخدام استبيان اختبار مسبق تم التحقق منه ذاتيًا. تم تقييم المعرفة مرة أخرى في ثلاثة أسابيع برنامج تعليمي بعد السل. **النتائج:** كانت النتيجة الإجمالية للمعرفة الأساسية حول مرض السل بين الممرضات ضعيفة؛ فقط 32 (31.4%) من الممرضات يتمتعن بمستوى جيد من المعرفة. لم يكن هناك ارتباط كبير بين المتغيرات الاجتماعية والديموغرافية ومستوى المعرفة. لوحظ تحسن معتد به إحصائيًا في المعرفة في التقييم بعد برنامج التعليم (درجة ما قبل الاختبار = 9.6 ± 10 ، درجة ما بعد الاختبار 25 ± 8.51 ، $P < 0.001$). متوسط الفرق 15.4 ± 13.12 (95% CI 13، 18)؛ ومع ذلك، تم تحسين المعرفة حول مرض السل لجميع الممرضات بعد برنامج التعليم. **الخاتمة:** كان تدخل التنقيف الصحي فعالاً في تحسين المعرفة حول مرض السل بين الممرضات في البرنامج.

مفاتيح الكلمات: ممرضات، سجون، ليبيا، مرض السل، معرفة، تأثير، مرض السل، برنامج تعليمي.