Attitudes, knowledge, and practices of hospital employees on tuberculosis
A structured questionnaire survey

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ABSTRACT. AIMS: To assess the knowledge and practices of hospital employees on TB in Northwestern Greece. **METHODS:** A structured questionnaire was administered to employees in Ioannina University Hospital. Questions were related to knowledge on TB transmission route, infectious types, preventive measures adopted during the management of a suspected case, and suggested placement for a patient with active TB. **RESULTS:** Questionnaires were completed by 789 employees including 192 physicians, 436 nurses, 67 technicians, 72 assistants, and 22 administrators. Most employees recognized respiratory droplets as transmission route (86.1%), and pulmonary TB as infectious (88.6%); however, only 25% acknowledged that TB is an airborne disease. Additionally, few (18.6%) recognized laryngeal TB as infectious. Among 491 who had managed a suspected case, 75.8% used regular masks, 8.8% high protection masks, while 15.4% did not wear masks. For newly diagnosed patients, 63.6% of employees supported care in special infectious disease units, while 31.7% supported care in a regular hospital ward, in isolation. **CONCLUSIONS:** Hospital employees may lack specific knowledge on less common routes of transmission of TB and often fail to practice certain guidelines for suspected TB cases. *Pneumon 2014, 27(4):323-331.*

INTRODUCTION

Effective strategies for identification and treatment of all tuberculosis (TB) cases are substantial for TB control. The success of these strategies depends on several factors among the population as well as caregivers. Measuring and addressing patient factors affecting health-seeking behavior has been acknowledged as important features in effective TB-control.[1] The importance of appropriate TB management by the health care employees is increasingly being acknowledged.[2-5]

WHO has published and updated international TB treatment guidelines[6] aiming to provide national TB programs and health care with evidence-based,

practical guidance on effective TB case management. Many countries, including Greece, have included these recommendations in their own national TB guidelines.[7] However, previous studies have shown poor knowledge of and compliance with guidelines for TB management among physicians.[8,9]

Survey research can help identify key barriers to timely diagnosis of cases, or possible factors that may influence prevention strategies or treatment guidelines implementation. Knowledge, attitude and practice studies usually measure either the extent of knowledge about TB management among healthcare workers, or the healthcare workers' intended behavior.[10] Their results may help ensure that strategies promoted by national TB programs are evidence-based, developed from meticulous assessment of the obstacles to engaging in desirable behaviors and of motivating factors that can be used in the interventions for maximum impact on the target population. However, there is no single indicator that can be reliably used across contexts to understand the factors influencing the level of knowledge or compliance with TB management guidelines among health care professionals. It is therefore necessary to determine this information within a local context in order to identify country-specific weaknesses in TB knowledge, cultural beliefs and clinical practices affecting prompt diagnosis and appropriate care of TB patients.[11]

In the present study, we assessed TB-related attitudes, knowledge, and practices on tuberculosis among health care workers in a university hospital in Northwestern Greece. We also investigated their potential association with profession type and years of work in the hospital environment.

METHODS

Structured questionnaire

The topics of interest included in the structured questionnaire were carefully planned by a group including two physicians (SHC, AKK) who are experts on the field of pulmonary medicine /tuberculosis and one health visitor (AC) who is an expert on education and public health issues. All three were also members of the University Hospital staff in Ioannina.

Each questionnaire included fields that required information on demographic characteristics, i.e., type of professional group, gender, age, and number of work years in the hospital. In our effort to reduce social desirability bias, no personal identifying information was collected on the questionnaire at any time. We also requested information on whether employees were asked to submit a health certificate including a chest X-ray at their appointment; whether they were submitted to Tuberculin Skin Test (TST) at their appointment, and, if yes, whether the results were considered positive; and whether they had ever received medication, either as treatment or as prophylaxis, for tuberculosis.

In addition, the questionnaire included 8 closed questions with a range of pre-coded responses available for each query. There were two questions related with employees' attitudes towards the possibility of their being infected by TB, and on the perceived frequency they contact TB infected patients. Two additional questions were related to employees' knowledge on transmission route, and on infectious types of tuberculosis. Three closed questions were related to whether employees might have managed patients potentially infected with TB and the precautions they had taken, if any. The last question was related on the appropriate setting for a patient to start treatment after initial diagnosis with active TB. The questionnaire is presented as supplementary material (See Appendix at the last page of the article).

To minimize information bias, the questionnaire was pretested on 30 University Hospital employees for refinement of the questions in order to minimize leading or confusing questions. The procedure, which was followed during the pilot process, was the same as the one used in the main survey.

Sampling and data collection

Interviews with Ioannina University Hospital employees in Northwestern Greece were held from September 2010 to September 2012. Face-to-face interviews with employees were conducted by the same health visitor (AC). The health visitor asked each of the respondents a series of questions included in the structured questionnaire in the same order and noted their responses. To ensure the highest response rate, convenience sampling was used to recruit hospital employees. The health visitor approached and requested participation in the survey from the employees who were available in each department during his visit. The investigator visited each hospital department every day for two consecutive weeks to ensure that employees from different shifts would have been approached for participation. We considered a response rate of 75% or more as acceptable for the survey. Ethical approval was granted by the University Hospital of Ioannina.

Statistical Analysis

Data were presented as absolute numbers and percentages for binary and categorical variables and as mean with standard deviation (SD) for continuous variables. Hospital employees were categorized to the following professional groups: physicians, nurses, technicians, assistants, and administrative staff. For analysis purposes, we also transformed the variable describing the number of years that an employee has been working at the hospital from continuous to categorical including the following groups: up to 5 years, 6 to 10 years, 11 to 15 years, 16 to 19 years, and at least 20 years.

Comparisons between professional groups and groups based on work years were performed with Mann Whitney or Kruskal Wallis test as appropriate. Statistical analyses were performed using the statistical package SPSS, version 21.0 (SPSS Inc). All p-values < 0.05 were considered statistically significant.

RESULTS

Characteristics of the respondents (Table 1)

Questionnaires were administered and completed by 789 (response rate 100%) of the 1,658 hospital employees who work in posts where they may have contacted patients infected with TB. The sample included 192 (24.3%) physicians, 436 (55.3%) nurses, 67 (8.5%) technicians, 72 (9.1%) assistants, and 22 (2.8%) workers in the administration. The proportion of respondents for each professional group in the hospital included 192/510 (38%) physicians, 436/811 (54%) nurses, 67/142 (47%) technicians, 72/172 (42%) assistants, and 22/23 (96%) administrative staff. There were 567 (71.9%) women. Mean age was 41.3±7.8 years. Mean work years was 14.5±8.1.

Six hundred nineteen (78.5%) employees were requested to submit a health certificate on their appointment including a chest X-ray. All of them reported that they were negative for active tuberculosis. Seventy-four (11.9%) of the employees were requested to be tested with TST at their appointment; 9 (12.2%) out of the 74 reported that they were found positive. Two of the nine employees reporting a positive TST also reported that they had received treatment for latent TB infection (LTBI). In total, 17 (2.2%) employees reported that they had ever received treatment for tuberculosis (4 for active TB and 13 for LTBI).

TABLE 1. Characteristics of study population

Gender	N	(%)
Female	567	(71.9)
Male	222	(28.1)
Mean age ±SD, years	41.3 ±7.8	
Age	**N**	**(%)**
20-29 years	38	(4.8)
30-39 years	269	(34.1)
40-49 years	393	(49.8)
50-59 years	72	(9.1)
≥60 years	17	(2.2)
BCG vaccination	**N**	**(%)**
Yes	537	(68.1)
No	100	(12.7)
Do not know	152	(19.2)
Profession	**N**	**(%)**
Physicians	192	(24.3)
Nurses	436	(55.3)
Technicians (radiology, laboratory staff, etc.)	67	(8.5)
Auxiliary cleaning staff	72	(9.1)
Administrator	22	(2.8)
Mean work years ±SD	14.5 ± 8.1	
Years working in healthcare	**N**	**(%)**
0-5 years	133	(16.9)
5-10 years	113	(14.4)
10-15 years	119	(15.1)
15-20 years	109	(13.9)
≥ 20 years	313	(39.8)

Attitudes and knowledge of hospital employees on tuberculosis transmission (Tables 2 & 3)

The majority of employees (673, 87%) did not believe that they were infected with tuberculosis. There was no difference among profession groups (P=0.779), or among groups based on number of years working in the hospital (P=0.087). Half of the physicians and the administrative staff perceived that they had interacted with a potentially TB infected patient at least often. However, the majority of assistants perceived that they had rarely or never interacted with a potentially TB infected patient (P<0.001). The majority of the employees who worked less than 5 years in the hospital perceived that they had interacted with a potentially TB infected patient at least

TABLE 2. Attitudes and knowledge of hospital employees on tuberculosis transmission according to profession type

	Physicians n (%)	Nurses n (%)	Technicians n (%)	Assistants n (%)	Administrative staff n (%)	P-value
Do you believe that TB has infected you?	**N= 191**	**N= 434**	**N= 67**	**N= 72**	**N= 22**	
yes	25 (13.1)	64 (14.7)	15 (22.4)	8 (11.1)	1 (4.5)	0.779
no	166 (86.9)	370 (85.3)	52 (77.6)	64 (88.9)	21 (95.5)	
How often do you believe that you contact a TB infected person?	**N= 192**	**N= 435**	**N= 67**	**N= 72**	**N= 22**	
Extremely often	10 (5.2)	37 (8.5)	12 (17.9)	5 (6.9)	1 (4.5)	
Very often	21 (10.9)	57 (13.1)	12 (17.9)	9 (12.5)	4 (18.2)	
Often	64 (33.3)	148 (34.0)	19 (28.4)	16 (22.2)	6 (27.3)	<0.001
Rarely	90 (46.9)	170 (39.1)	20 (29.9)	23 (31.9)	10 (45.5)	
Never	7 (3.6)	23 (5.3)	4 (6.0)	1 (26.4)	1 (4.5)	
What is the transmission route for TB?	**N= 192**	**N= 436**	**N= 67**	**N= 72**	**N= 22**	
Respiratory droplets	171 (89.1)	383 (87.8)	54 (80.6)	56 (77.8)	15 (68.2)	0.02
Hand touch	13 (6.8)	28 (6.4)	10 (14.9)	3 (4.2)	3 (13.6)	0.335
Airborne particles	54 (28.1)	91 (20.9)	14 (20.9)	9 (12.5)	6 (27.3)	0.019
Blood	6 (3.1)	14 (3.2)	1 (1.5)	7 (9.7)	0 (0.0)	0.327
Do not know	4 (2.1)	21 (4.8)	6 (9.0)	11 (15.3)	4 (18.2)	<0.001
Which TB type may be transmissible?	**N= 192**	**N= 436**	**N= 67**	**N= 72**	**N= 22**	
Bone / joints	1 (0.5)	6 (1.4)	1 (1.5)	1 (1.4)	0 (0.0)	0.517
Pulmonary	177 92.2)	395 (90.6)	52 (77.6)	58 (80.6)	17 (77.3)	<0.001
Urinary bladder	5 (2.6)	11 (2.5)	3 (4.5)	2 (2.8)	2 (9.1)	0.345
Laryngeal	54 (28.1)	63 (14.4)	10 (14.9)	13 (18.1)	7 (31.8)	0.016
Eye	4 (2.1)	8 (1.8)	1 (1.5)	0 (0.0)	0 (0.0)	0.275
Do not know	9 (4.7)	30 (6.9)	12 (17.9)	12 (16.7)	3 (13.6)	<0.001

TB: Tuberculosis.

often. However, more than half of the employees who worked at least 20 years in the hospital perceived that they had rarely or never interacted with a potentially TB infected patient (P<0.001).

Most employees recognized respiratory droplets as transmission route (679, 86%) and pulmonary tuberculosis as infectious (699, 89%), but only 25% acknowledged that M. tuberculosis is carried in airborne particles. Physicians and nurses were more likely to consider pulmonary tuberculosis as infectious than technicians, assistants, and administrative staff (P<0.001). Few employees recognized laryngeal tuberculosis as infectious (147, 18.6%). Nurses, technicians, and assistants showed lower percentages of laryngeal tuberculosis being recognized as infectious than physicians and administrative staff (P=0.016) The number of years that employees worked in the hospital environment was not substantially related to differences

in the knowledge on TB transmission route or on the transmissible types of TB (Table 3).

Reported practices on the management of TB patients (Tables 4 and 5)

Among 491 employees, who had managed a suspected case, 75.8% used regular masks, 8.8% high protection masks while the remaining 15.4% did not wear masks. Physicians and administrative staff were more likely to have avoided taking any precautions when compared to other employee categories (P=0.004).

Employees who worked for at least 20 years were more likely to report regular mask (P=0.004) and less likely high protection mask use (P=0.001) when compared with employees who started working during the last 5 years. For patients with newly confirmed active tuberculosis, most of the employees, supported that care should be

TABLE 3. Attitudes and knowledge of hospital employees on tuberculosis transmission according to working years

	Up to 5 years n (%)	6 to 10 years n (%)	11 to 15 years n (%)	16 to 19 years n (%)	At least 20 years n (%)	P-value
Do you believe that TB has infected you?	**N= 133**	**N= 113**	**N= 119**	**N= 109**	**N= 313**	
yes	16 (12.0)	13 (11.5)	18 (15.1)	12 (11.2)	54 (17.3)	0.087
no	117 (88.0)	100 (88.5)	101 (84.9)	95 (88.8)	258 (82.7)	
How often do you believe that you contact a TB infected person?	**N= 133**	**N= 113**	**N= 119**	**N= 109**	**N= 313**	
Extremely often	6 (4.5)	8 (7.1)	10 (8.4)	12 (11.0)	29 (9.3)	
Very often	23 (17.3)	15 (13.3)	20 (16.8)	14 (12.8)	31 (9.9)	
Often	55 (41.4)	40 (35.4)	32 (26.9)	40 (36.7)	84 (26.9)	<0.001
Rarely	37 (27.8)	45 (39.8)	46 (38.7)	35 (32.1)	150 (48.1)	
Never	12 (9.0)	5 (4.4)	11 (9.2)	8 (7.3)	18 (5.8)	
What is the transmission route for TB?	**N= 133**	**N= 113**	**N= 119**	**N= 109**	**N= 313**	
Respiratory droplets	113 (85.0)	96 (85.0)	96 (80.7)	91 (83.5)	282 (90.1)	0.046
Hand touch	9 (6.8)	8 (7.1)	7 (5.9)	16 (14.7)	17 (5.4)	0.639
Airborne particles	30 (22.6)	21 (18.6)	28 (23.5)	37 (33.9)	57 (18.2)	0.411
Blood	6 (4.5)	6 (5.3)	5 (4.2)	6 (5.5)	5 (1.6)	0.044
Do not know	9 (6.8)	9 (8.0)	8 (6.7)	6 (5.5)	14 (4.5)	0.162
Which TB type may be transmissible?	**N= 133**	**N= 113**	**N= 119**	**N= 109**	**N= 313**	
Bone / joints	3 (2.3)	3 (2.7)	1 (0.8)	2 (1.8)	0 (0.0)	0.012
Pulmonary	114 (85.7)	102 (90.3)	100 (84.0)	98 (89.9)	283 (90.4)	0.161
Urinary bladder	4 (3.0)	4 (3.5)	4 (3.4)	3 (2.8)	8 (2.6)	0.627
Laryngeal	30 (22.6)	25 (22.1)	20 (16.8)	24 (22.0)	48 (15.3)	0.051
Eye	3 (2.3)	3 (2.7)	4 (3.4)	0 (0.0)	3 (1.0)	0.114
Do not know	13 (9.8)	9 (8.0)	14 (11.8)	8 (7.3)	22 (7.0)	0.264

TB: Tuberculosis.

administered in a special unit for infectious diseases (502, 63.6%), while 250 (31.7%) that the patient should be placed in a regular hospital ward. The fewer working years for an employee the more likely it was that he or she would have supported the special unit for infectious diseases as the appropriate management setting (P=0.021).

DISCUSSION

Employees in the University Hospital in Ioannina generally did not believe that they were infected with tuberculosis. The majority of assistants and half of physicians and the administrative staff perceived that they had rarely or never interacted with a potentially TB infected patient. Similarly, more than half of the employees who worked in the hospital at least for 20 years perceived that they had rarely or never come across patients with active tuberculosis. Most employees recognized respiratory droplets as transmission route and pulmonary tuberculosis as infectious; however, few employees recognized airborne particles as means of transmission, or laryngeal tuberculosis as infectious. The number of working years did not show an association with change in the type of answers related to the knowledge of TB transmission routes and transmissible types of TB. Most employees used regular mask or gloves as protection against a suspected patient or material. However, a considerable number of employees did not use masks at all. Very few employees, usually among those who were hired during the last 5 years in the hospital, reported the use of high protection mask. A special unit for infectious diseases was suggested by most of the employees as the appropriate setting for the management of newly confirmed active TB patients. However, almost one third of the employees suggested

TABLE 4. Reported practices on the management of patients with tuberculosis according to profession type

	Physicians n (%)	Nurses n (%)	Technicians n (%)	Assistants n (%)	Administrative staff n (%)	P-value
Have you ever managed without precautions a TB suspected patient or material that was later confirmed with active TB?	**N= 192**	**N= 436**	**N= 67**	**N= 72**	**N= 22**	
yes	63 (32.8)	168(38.5)	21 (31.3)	18 (25.0)	2 (9.1)	0.035
no	68 (35.4)	128(29.4)	23(34.3)	16 (22.2)	9 (40.9)	
Do not remember	61 (31.8)	140(32.1)	23 (34.3)	38 (52.8)	11 (50.0)	
Have you ever managed a TB suspected patient or material?	**N= 192**	**N= 436**	**N= 67**	**N= 72**	**N= 22**	
yes	119(62.0)	290(66.5)	43 (64.2)	35 (48.6)	4 (18.2)	0.026
no	73 (38.0)	146(33.5)	24 (35.8)	37 (51.4)	18 (81.8)	
If yes, what precautions did you take?	**N=119**	**N=290**	**N=43**	**N=35**	**N=4**	
Regular mask	77 (64.7)	233(80.3)	29 (67.4)	30 (85.7)	3 (75.0)	0.018
Whole body uniform	4 (3.4)	6 (2.1)	12 (27.9)	1 (2.9)	0 (0.0)	0.002
Gloves	62 (52.1)	202(69.7)	29 (67.4)	23 (65.7)	2 (50.0)	0.015
High protection mask	17 (14.3)	15 (5.2)	10 (23.3)	1 (2.9)	0 (0.0)	0.301
No precautions were taken	21 (17.6)	13 (4.5)	3 (7.0)	3 (8.6)	1 (25.0)	0.004
Where should a patient with newly diagnosed active TB be treated?	**N= 192**	**N= 436**	**N= 67**	**N= 72**	**N= 22**	
In infectious diseases special unit	114(59.4)	290 (66.5)	34 (50.7)	49 (68.1)	15 (68.2)	0.521
In regular hospital ward room	65 (33.9)	129 (29.6)	28 (41.8)	21 (29.2)	7 (31.8)	0.948
At home	7 (3.6)	16 (3.7)	4 (6.0)	2 (2.8)	0 (0.0)	0.926

TB: Tuberculosis.

TABLE 5. Reported practices on the management of patients with tuberculosis according to working years

	Up to 5 years n (%)	6 to 10 years n (%)	11 to 15 years n (%)	16 to 19 years n (%)	At least 20 years n (%)	P-value
Have you ever managed without precautions a TB suspected patient or material that was later confirmed with active TB?	**N=313**	**N=113**	**N=119**	**N=109**	**N=313**	
yes	38 (28.6)	32 (28.3)	34 (28.6)	35 (32.1)	133 (42.5)	
no	56 (42.1)	39 (34.5)	36 (30.3)	34 (31.2)	78 (24.9)	<0.001
Do not remember	39 (29.3)	42 (37.2)	49 (41.2)	40 (36.7)	102(32.6)	
Have you ever managed a TB suspected patient or material?	**N=133**	**N=113**	**N=119**	**N=109**	**N=313**	
yes	78 (58.6)	71 (62.8)	69 (58.0)	67 (61.5)	204 (65.2)	0.175
no	55 (41.4)	42 (37.2)	50 (42.0)	42 (38.5)	109 (34.8)	
If yes, what precautions did you take?	**N= 78**	**N= 71**	**N= 69**	**N= 67**	**N= 204**	
Regular mask	46 (59.0)	52 (73.2)	57 (82.6)	53 (79.1)	162 (79.4)	0.004
Whole body uniform	9 (11.5)	2 (2.8)	2 (2.9)	4 (6.0)	6 (2.9)	0.033
Gloves	45 (57.7)	48 (67.6)	53 (76.8)	49 (73.1)	121 (59.3)	0.408
High protection mask	14 (17.9)	6 (8.5)	8 (11.6)	6 (9.0)	9 (4.4)	0.001
No precautions were taken	12 (15.4)	6 (8.5)	4 (5.8)	2 (3.0)	17 (8.3)	0.201
Where should a patient with newly diagnosed active TB be treated?	**N= 133**	**N= 112**	**N= 116**	**N= 109**	**N= 300**	
In infectious diseases special unit	92 (69.2)	79 (69.9)	74 (62.2)	71 (65.1)	186 (59.4)	0.021
In regular hospital ward room	39 (29.3)	30 (26.5)	37 (31.1)	35 (32.1)	107 (34.2)	0.146
At home	2 (1.5)	3 (2.7)	5 (4.2)	2 (1.8)	17 (5.4)	0.04

TB: Tuberculosis.

that a regular hospital ward would also be sufficient for initiating treatment in these patients.

Our study had several limitations. First, as an attitude, knowledge, and practices survey, our study is subjected to the limitations of this study design. The fact that we did not use qualitative methodology may have led to information that was never revealed to us. Generally, close-ended questions offered in a multiple choice format may encourage guessing, which may result in a misrepresentation of the knowledge and practices of respondents. [10]

The absence of a standard methodology for attitude, knowledge, and practices survey disables comparison between different attitude, knowledge, and practices studies related to the same topic. However, this type of survey remains an important tool in assessing people's perceptions, willingness and ability to invest and participate in certain practices and programs. Another limitation is the fact that the issues that employees were requested to give information on were chosen so that all health care workers, regardless of profession group, would be expected to be familiar with to facilitate comparisons between groups. Consequently, questions on issues related to medical treatment or nursing but not to other professional categories were not included. However, the sample corresponded to almost half of the hospital employees with adequate representation of all profession groups. Additionally, response rate of the approached employees was 100%.

Despite the proof from previous studies that airborne route via inhalation of small aerosolized droplet nuclei exclusively spreads TB,[12-16] most employees in our study erroneously believe that TB is spread only through large respiratory droplets. This may have led to decreased adherence to standard airborne disease precautions, such as wearing high efficiency masks when entering a room of a patient with a diagnosis or a highly suspicion of active pulmonary tuberculosis. Infrequent use of mask has been previously supported in the literature.[17,18] High protection masks are considered effective against contact with M. Tuberculosis[19] while regular masks can be transparent to molecules with a diameter less than 5μm, which is the case of TB mycobacterium.[20-21] Several organizations have suggested the use of N95 high protection mask by health care staff and visitors, and by patients with suspected active TB infection.[7,22,23] Although N95 mask is more expensive than a regular mask there are ways to reduce that cost.[24] Nonetheless, the effectiveness of high protection masks is still in question by certain centers for TB control and some advocate use of N95 masks only in extremely high

risk environments.[25] Timely diagnosis, isolation of the infected patient, and immediate treatment remain the major tools we have to prevent further TB transmission.[25]

Employees were aware of pulmonary TB as infectious but not of other types, i.e., laryngeal TB. A potential explanation for that may be the fact that Ioannina University Hospital Pulmonary Department mainly admits patients with pulmonary TB (10 to 15 cases per year) while non-pulmonary TB cases are scant. Despite the fact that routes and types of TB transmission are taught in Health Sciences School curricula, a number of graduates remain unaware of this knowledge, as previous studies have also supported.[26,27] Additional knowledge gaps among health care workers are related to risk factors for TB, the assessment of treatment effect, and the consequences of potential treatment failure.[28] The role of the Health Sciences Schools in the dissemination of knowledge related to TB transmission is crucial.[29] Although limited time has been allocated for this purpose in undergraduate curricula,[24,25] there is evidence that educational processes may increase knowledge on TB transmission.[17]

Several employees suggested that a regular hospital ward would be sufficient for initiating treatment in these patients. Specific barriers that have been described elsewhere[6,22,23] including lack of special unit for infectious diseases or lack of personnel may discourage hospital employees to suggest the appropriate treatment modality. However, other barriers suggested in previous research, such as insufficient knowledge of TB transmission routes[26] and delay in diagnosis,[25,30] cannot be excluded.

Economic austerity in Greece and other European countries have consequences on health. Lower standard of living make several diseases that were considered under control, including TB, come to surface. Restrictions in health care budget may compromise several aspects that are related to TB control, such as the availability of reagents and of high protection masks, or the appropriate function of the special units for infectious diseases. However, effective interventions to adequately raise the barriers related to lack of knowledge and harmful attitudes should be identified. Additionally, health associations should support the dissemination of these interventions to ensure the implementation of practices that would prevent TB transmission.

Safety in working environment may be influenced by knowledge, attitudes, and practices of health care employees. Hospital employees, especially physicians and nurses, in our study showed a low level of knowledge on routes of less classical TB transmission and transmissible TB

disease types. Additionally, they did not practice specific guidelines when they managed a suspected patient. Lack of knowledge and inappropriately established perceptions often lead health care workers to disregard clinical recommendations. Continuous education programs should be tailored to help health professionals overcome identified barriers.

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APPENDIX. Survey questionnaire (translated from the greek language in english)

Do you believe that TB has infected you?

yes

no

How often do you believe that you contact a TB infected person?

Extremely often

Very often

Often

Rarely

Never

What is the transmission route for TB?

Respiratory droplets

Hand touch

Airborne particles

Blood

Do not know

Which TB type may be transmissible?

Bone / joints

Pulmonary

Urinary bladder

Laryngeal

Eye

Do not know

Have you ever managed without precautions a TB suspected patient or material that was later confirmed with active TB?

yes

no

Do not remember

Have you ever managed a TB suspected patient or material?

yes

no

If yes, what precautions did you take?

Regular mask

Whole body uniform

Gloves

High protection mask

No precautions were taken

Where should a patient with newly diagnosed active TB be treated?

In infectious diseases special unit

In regular hospital ward room

At home

TB: Tuberculosis.