



Original Article

Impact of educational intervention on knowledge and awareness of TB among secondary school students in The Gambia

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ABSTRACT

Objectives: Health education and awareness campaigns about tuberculosis (TB) can empower adolescents on different aspects of the disease and its management, resulting in early and appropriate care seeking behavior through their advocacy in the community. We assessed the impact of educational intervention on knowledge and awareness about TB among adolescents in the greater Banjul area of The Gambia where approximately 70% of national TB cases are notified.

Materials and Methods: A school-based, interventional analytical study, and interactive educational workshop was conducted among grade 12 students of the Methodist Academy Secondary School in Bakau, Banjul The Gambia. The workshop activities included illustrative demonstrations using posters, flipcharts, infographics, and games to convey TB messages in six domains: (1) Basic knowledge; (2) symptoms; (3) risk factors (4) modes of transmission; (5) treatment; and (6) care and support. Structured questionnaires were used to assess changes in the student's knowledge and awareness about TB in the six domains before and after the workshop. Data were analyzed using proportional percentages, mean (95% CI) and differences standard error (SE) and student paired *t*-test.

Results: Ninety-six students participated in the workshop out of which 92 (96%) students completed both pre- and post-test questionnaires. Sixty-eight percent of the students were females and 58% were from the science stream of the grade 12 students who participated in our workshop. The mean difference and SE between the pre- and post-workshop test scores in the six domains were: basic knowledge: +1.4 (0.2; $P < 0.0001$); symptoms: +1.5 (0.2; $P < 0.0001$); risk factors: +3.1 (0.3; $P < 0.0001$); modes of transmission: +1.2 (0.2; $P < 0.0001$); treatment: +0.8 (0.1; $P < 0.0001$); and care and support of TB: +0.5 (0.1; $P = 0.0001$).

Conclusion: This school-based educational interactive workshop significantly improved the knowledge and awareness of the students especially in understanding the causative agent and risk factors of TB disease. We recommend exposure of students to TB educational activities as part of the school curriculum. The knowledge acquired in this workshop is likely to have impact on the wider community and should be assessed in future follow-up studies to determine if it impacts positively on views held within the wider community.

Keywords: Tuberculosis, Workshop, Awareness, Intervention, The Gambia

INTRODUCTION

Tuberculosis (TB) caused by *Mycobacterium tuberculosis* can affect any part of the human body, especially the lungs.^[1] TB is the leading single infectious cause of death worldwide with annual global estimate for 2019 of 10 million people developed TB with 1.4 million deaths.^[2] Advocacy and promotional activities were one of the key actions defined by the World Health Organization (WHO), following the United Nations (UN) high-level meeting on TB in 2018 to increase TB awareness and scale up adolescent's mobilization to end TB.^[3] Young people (10–24 years) accounted for a quarter of the world's population^[4] and the global burden of TB in young people was estimated at 1.8 million in 2012, which constitutes 17% of all new TB cases globally.^[5] The adolescent period (10–19 years) is well known for its increased susceptibility to TB, due to waning of protection by Bacillus Calmette Guerin (BCG), immunological changes, and social characteristics.^[5,6] Poor knowledge about the signs and symptoms of TB and stigma associated with the disease is known factors leading to delayed diagnosis of TB,^[7,8] poor adherence to treatment and use of traditional healers over the freely available medical care.^[9] This highlights the need for public awareness campaigns among adolescents to raise awareness and improve knowledge about recognition of TB symptoms to enable early health seeking behavior. TB outbreaks have been reported among students in UK, Italy, Ireland, USA^[10-14] India, China, and Ethiopia.^[1,15,16] Therefore, high school students are an important group to be effectively mobilized and empowered with knowledge about TB to involve them as a driver of change.^[9] These are an important group in the community highly mobile and explorative with enthusiasm and keen interest to learn new things. As potential candidate for the wider community of education, commerce, and industry in a growing economy, they are suitable people group component of the society that can be used to take TB messages to both the illiterates and literate in the community when well trained as TB ambassadors.

Therefore, the aim of this study was to educate high school students in The Gambia and to assess the impact of simple educational intervention on the knowledge of the students about TB. This study is the first well-structured TB awareness campaign among school-based adolescents in The Gambia. Our working hypothesis was that improving the knowledge and awareness about TB in high school students will spread awareness to the general community.

MATERIALS AND METHODS

Study design and setting

We used a school-based before and after educative interventional analytical study design to measure the level of impact of educational intervention about TB among high school students in The Gambia.

Participant selection

One hundred and twenty-six students aged between 14 and 19 years, constituted the entire population of students in Grade 12 of the school. They were sensitized for the workshop by our nurses and specialized TB field workers using an information sheet containing the aims, objectives and activities of the project with parental/guardian permission and informed assent from participants. Prior parental/guardian sensitization was performed at the school Parents and Teachers Association meeting.

Questionnaire development and validation process

An adapted questionnaire was developed for this study using the WHO guide for developing knowledge, attitude, and practice surveys tools.^[17] We tested the questionnaire among the teaching staff of the school for clarity of the questions to ensure the understanding of the students participating in the workshop. This serves as our internal consistency check rather than using the Cronbach's alpha to calculate the internal consistency. This is a limitation to our methodology.

TB awareness workshop strategy

A 1-day workshop involving five separate sessions aimed at improving TB-related knowledge in our target population was conducted. The facilitators of this workshop were TB researchers with over 10 years' experience in TB patients care, trainers of trainee, and community outreach campaigns on World TB day commemoration activities to schools and hard to reach communities.

Session 1

Session 1 focused on discussing the cause of TB, the various types of TB disease and TB infection with differences highlighted [Table 1] and the different classification of TB according to drug sensitivity pattern (Drug sensitive TB, multidrug-resistant TB, and extensively drug-resistant TB). How TB is diagnosed was illustrated using audio visual and infographics. Participants were shown materials for collection of sputum, microscope, and slide preparation using illustrative infographics.^[18] We illustrated the clinical presentation of TB through posters^[18] with common symptoms and signs emphasized, coupled with a snakes and ladder game^[19] for identification of the clinical features of TB by participants. This session was concluded with group work during which participants read the questions on the TB snake and ladder game chart and drew lines to the appropriate answers to reinforce knowledge acquired during the workshop.^[19]

Table 1: Description of workshop sessions.

Class Session	Title	Activities
1 st session	TB: Etiology, Types, Diagnosis and Symptoms	<ul style="list-style-type: none"> • Audio-visual illustration of TB germ, types of TB • TB tests infographics • TB symptoms and signs infographic display with TB snake and ladder games • Linking appropriate responses to questions task for understanding and discussion session contents
2 nd session	TB: Transmission, Infection control, and Prevention	<ul style="list-style-type: none"> • Glitter game to demonstrate TB germ spread • Cough etiquette demonstration and respiratory waste management • BCG vaccination scar display • Linking appropriate responses to questions task for understanding and discussion session contents • Linking appropriate responses to questions task for understanding and discussion session contents
3 rd session	TB: Risk factors, Treatment, Care and Support	<ul style="list-style-type: none"> • TB predisposing conditions discussion • TB treatment (DOTS) • TB snake and ladder game for identification of TB stigmatizing actions • Linking appropriate responses to questions task for understanding and discussion session contents
4 th session	TB show room	3 Posters display on workshop materials from sessions 1–3 with facilitators for participants to ask questions and clarify on learning points during the workshop
5 th session	TB musical shot	3 min TB musical composition with the workshop participants led by local musician

This table described the workshop sessions with activities the participants engaged in during the sessions. TB: Tuberculosis

Session 2

Session 2 began with an infographic illustration of TB using a glitter game which aimed to demonstrate how aerosolized respiratory droplets are generated during coughing and sneezing and spread as airborne droplets to nearby individuals. Facilitators demonstrated appropriate cough etiquette to reduce such spread. Respiratory waste management in public spaces and at home was also demonstrated by the facilitators. BCG scar identification by the facilitators was performed after taking permission from co-facilitator. Participants were also given the opportunity

to assess BCG scarring with their counterpart during the workshop as a mark of having received BCG vaccine during the neonatal period. However, participants were told about the variability of protection against TB conferred by such vaccination from no protection to 80% and that not all who received BCG showed scarring.

Session 3

Session 3 began with a PowerPoint presentation of risk factors for TB disease such as Diabetes, HIV, smoking, drinking, extremes of ages, and malnutrition. Participants were given an opportunity to advance plausible reasons under the guidance of the facilitators how each of these conditions could predispose to TB disease. TB treatment infographics were displayed showing the process of, patient pre-treatment counseling, and the TB treatment cards.^[18]

Session 4

Session 4 used a TB show room, which was dedicated to displaying all workshop materials in poster format for participants to refresh on the learning materials and activities during the workshop. Opportunities to ask questions were provided by our facilitators standing by the posters with one on one in-depth discussion to enhance participants learning.

Session 5

Session 5 involved education through music with activities led by a local musician who was cured of TB 18 months before the workshop. The invited local musician composed a song about his experience with TB which lasted 2-min with lyrics: “Find and treat TB, it can happen to you, it can happen to me” all workshop participants were taught to sing this song.

Workshop flow

The preworkshop activities started with registration of students who had been consented and permitted by parents/guardians to attend [Figure 1]. The participants were randomly assigned to one of three groups and given unique identification numbers (for confidentiality) and workshop packs with stickers on all the materials. The facilitators were stationed at each of the stations while the participants rotated from one station to another. The school authority provided access to five large classrooms for the five stations/sessions and to allow easy movement of participants. Sessions 1–4 lasted a maximum of 30 min with 32 participants supported by three facilitators (two group instructors and a group timekeeper). All workshop participants and facilitators came together for the fifth session. In each of the groups, students were assessed using

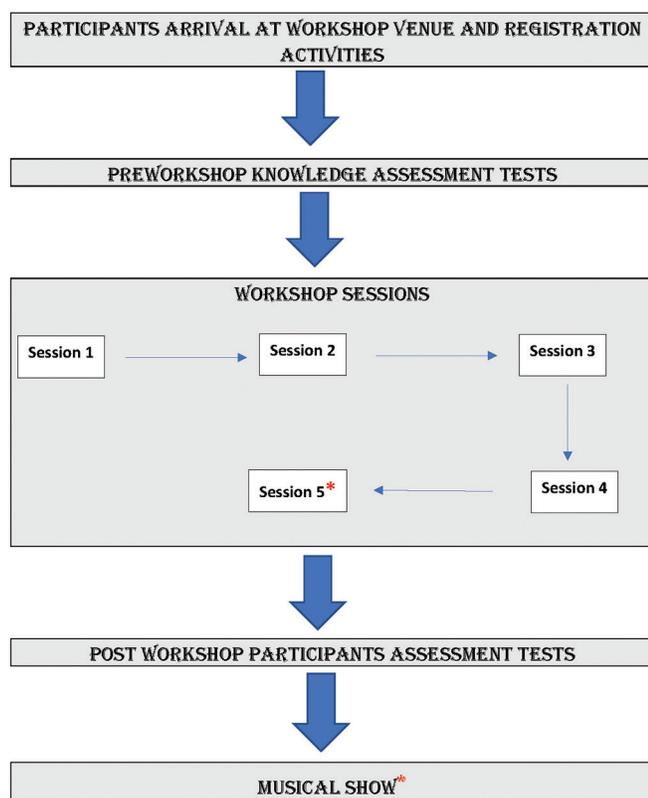


Figure 1: Described the flow chart of the workshop from participants arrival, briefing, and registration of participants by facilitators of the workshop to knowledge assessment before the workshop activities started, to the different sessions 1–4, the post-workshop test and concluded with musical show on TB song in session 5.

the structured self-administered questionnaire before and after the workshop exercises.

To ensure quality control during the workshop, the following measures were observed: (1) The facilitators also underwent trainers' workshop sessions where basic skills on effective workshop facilitation were taught with hands on practice sessions, (2) the facilitators underwent training and practice sessions using the educational materials meant for the workshop by the lead facilitator and facilitated a pilot workshop 2 weeks before the students' workshop, and (3) the same facilitators were stationed at each session throughout the workshop to ensure consistency.

Data collection

Data were collected using self-administered structured questionnaires to assess (1) general knowledge of TB, (2) symptoms, (3) mode of transmission of the most common form of TB (pulmonary TB), (4) risk factors (5) TB treatment; and (6) care and support for TB patients. Assessment of knowledge was based on dichotomized yes/no, or presence/absence responses. Independent variables obtained were

age, sex, and subjects studied (Science, Commerce or Arts). Parental/guardian permission and participants' assent were obtained before the workshop day.

Data analysis

All data were analyzed using STATA 16. The statistics are presented as mean (95% CI), differences and standard error (SE) between the pre- and post-workshop test scores in each of the six domains with percentages and frequencies used for all categorical data. Student's *t*-test paired analyses were performed comparing pre- and post-workshop tests. $P \leq 0.05$ was considered significant.

RESULTS

One hundred and six (84.1%) students submitted consent/assent forms with parental permission to participate in the workshop. The number of students that ended up participating in the workshop dropped to 96 (76.2%) with 92 (73%) completing both the pre- and post-test questionnaires. Of the ten students who had provided consent but did not participate, 5 came late and 5 had parental permission withdrawn on the day of the workshop for unknown reasons. Our findings are thus based on the 92 participants who completed the pre- and post-test questionnaires. The median age (range) was 17 (14–20) years. Sixty-seven percent of the workshop participants were females and 60% were taking science classes [Table 2].

Assessment of students' basic knowledge of TB

Pre-workshop, 88% of participants identified the cause of TB as a germ, 97% knew that lungs were the most affected part of the body, and 76% identified the sputum as the most common biological sample used for diagnostic tests. After the workshop these increased to 100%, 98.9%, and 89.1%, respectively. The most common misconceptions about the cause of TB by participants pre-workshop included: Drinking bad water (14.1%); evil spirits (3.3%); and mosquito bites (3.3%) [Table 3].

The level of awareness of the participants pre-workshop varied in terms of the response of TB patients to TB medications, with 47.8% aware of drug sensitive TB, 50% of multidrug-resistant TB, and 55.4% of extensively drug resistant TB. Post workshop, the level of awareness improved with 73.9% aware of drug sensitive TB, 90.2% of multidrug-resistant TB, and 79.3% of extensively drug-resistant TB. The mean (95% confidence interval) and mean difference (SE) between pre- and post-workshop on TB basic knowledge were 7.7 (7.4–8.0), 9.1 (8.9–9.3), and +1.4 (0.2), $P < 0.0001$, respectively [Table 4].

Table 2: Socio demographic characteristics of workshop participants ($n=92$).

Variables	Frequency (%)
Sex, $n=90$	
Male	30 (33)
Female	60 (67)
Class stream, $n=87$	
Science	52 (59.8)
Commercial	20 (23)
Arts	15 (17.2)
Religion, $n=87$	
Christianity	13 (14.9)
Islamic	74 (85.1)
Nationality, $n=91$	
Gambians, $n=88$	88 (96.7)
Other nationality (Nigerian)	3 (3.3)
Tribe, $n=88$	
Mandinka	26 (29.5)
Wolof	17 (19.3)
Fula	7 (7.9)
Aku	8 (9.1)
Manjago	6 (6.8)
Serer	5 (5.7)
Others*	6 (6.8)
Unclassified	13 (14.8)

*Jola 2, Bambara 2, Sarahule 2. This table described the socio-demographic characteristics of the workshop participants

Knowledge of symptoms and spread of TB

Most participants knew coughing for 2 weeks or more was a symptom of TB (96.7%) with associated chest pain (92.4%), unintended weight loss (87%), and fever (82.6%) as other symptoms of TB. However, fewer participants knew excessive night sweats (53.3%) and coughing out blood (66.3%) were symptoms of TB [Table 3].

The students demonstrated varied knowledge about the spread of TB. The majority knew TB was an airborne disease (84.8%) spreading through coughing and sneezing (97.8%) for pulmonary TB. However, there were a relatively high % who had incorrect assumptions on how TB was spread including sharing utensils (58.7%), shaking hands (20.7%), sharing clothing (12%), drinking bad water (16.3%), using the same toilet (22.8%), kissing (68.5%), and sex (15.2%). At the end of the workshop, these assumptions were still shared by a high proportion of participants including sharing utensils (17.4%), shaking of hands (13.1%), kissing (13.1%), and use of same toilet (12%) [Table 3].

The mean (95% confidence interval) and mean difference (SE) pre- and post-workshop on the symptoms were 8.1 (7.8–8.4), 9.6 (9.4–9.8), +1.5 (0.2), $P < 0.0001$ and spread of TB 8.1 (7.8–8.4), 9.2 (9.0–9.5), +1.2 (0.2), $P < 0.0001$, respectively [Table 4].

Knowledge of factors influencing development of TB disease

The knowledge of participants on the risk factors for development of TB disease was grossly deficient in relation to HIV infection and diabetes mellitus as potent risk factor for the rapid development of TB disease TB exposed individuals. After the workshop, there was marked improvement in knowledge acquired by the students on risk factors diabetes (19.6% pre to 73.9% post) and HIV infection (39.1% pre to 87% post) [Table 3]. The mean (95% confidence interval) and mean difference (SE) pre- and post-workshop on the risk factors for the development of TB were 4.1 (3.7–4.5), 7.2 (6.8–7.6), and + 3.1 (0.3), $P < 0.0001$, respectively [Table 4].

Knowledge of TB prevention, treatment, care, and support

Eighty-four percent of participants knew that BCG vaccine could offer protection against disseminated TB disease in children, 93.5% responded that TB is curable and 74% with the use of TB medications (DOTS strategy). All the participants recognized covering your mouth and nose when you cough and sneeze as an infection control measure to reduce spread of TB. Seventy-seven percent of respondents knew that there is free treatment for TB in The Gambia before the onset of the workshop [Table 3].

However, <60% of the participants knew the duration of TB treatment to be 6 months minimum for drug sensitive TB, and 18.5% indicated there are local treatments for TB in the community. After the workshop, there were improvements in knowledge [Table 3].

The mean (95% confidence interval) and mean difference (SE) pre- and post-workshop on TB prevention, treatment, care, and support were 7.6 (7.3–7.9), 8.4 (8.2–8.7), +0.8 (0.1), $P < 0.0001$ and 6.7 (6.4–6.9), 7.2 (6.9–7.4), +0.5 (0.1), $P = 0.0001$, respectively [Table 4].

DISCUSSION

The results of this workshop showed that misinformation exists among adolescents about the cause of TB, the factors that can increase the risk of development of TB, its signs and symptoms, the mode of transmission and duration of treatment of TB among high school students in The Gambia.

The participants demonstrated good knowledge about the cause of TB being a germ, but there were some misconceptions on the cause of TB including the role of evil spirits, mosquito bites, and drinking of bad water. Similar confusion about the cause of TB has been reported in the previous studies of high school students in China^[20] and Malawi^[21,22] with the mention of evil spirits, bad luck, drinking bad water, and genetics as causes of TB. This misinformation could be from

Table 3: Impact of TB awareness workshop on knowledge level of participants.

Questions	Expected response	Correct responses (%)		Impact (%)
		Pre-test	Post-test	
Basic TB knowledge				
Tuberculosis is caused by germ (bacteria)	Yes	88.0	100.0	12
Lung is the most affected organ in TB disease	Yes	96.7	98.9	2.2
TB is caused by drinking bad water	No	85.9	96.7	10.8
Multidrug-resistant TB is a type of TB	Yes	50.0	90.2	40.2
TB is caused by mosquito bite	No	96.7	97.8	1.1
Ordinary (drug sensitive) TB is a type of TB	Yes	47.8	73.9	26.1
TB is caused by evil spirits	No	96.7	100.0	3.3
Extreme drug resistant TB is a type of TB	Yes	55.4	79.3	23.9
Sputum test can be used for diagnosis of TB	Yes	76.1	89.1	13.0
Mantoux test is used for diagnosis of TB infection	Yes	78.3	82.6	4.3
TB symptoms and signs				
Chest pain	Yes	92.4	98.9	6.5
Cough for 2 weeks or more	Yes	96.7	100.0	3.3
Feeling tired all the time (Fatigue)	Yes	73.9	79.8	23.9
Coughing out blood	Yes	66.3	92.4	26.1
Excessive drenching night sweat	Yes	53.3	92.4	39.1
Unintended weight loss	Yes	87.0	98.9	11.9
Loss of appetite	Yes	83.7	95.7	12.0
Fever	Yes	82.6	96.7	14.1
Risk factor for TB disease				
Individuals with diabetes	Yes	19.6	73.9	54.3
HIV infected persons	Yes	39.1	87.0	47.9
Prisoners	Yes	51.1	55.4	4.3
Tobacco users/smokers	Yes	90.2	94.6	4.4
Alcoholics	Yes	56.5	84.8	28.3
Elderly persons	Yes	41.3	81.5	40.2
Pregnant women	Yes	18.5	62.0	43.5
Children under 5 years	Yes	44.6	90.2	45.6
Malnourished individuals	Yes	52.2	90.2	38.0
TB transmission methods				
By sharing cups, spoon, and cooking pots	No	41.3	82.6	41.3
By shaking hands	No	79.3	86.9	7.6
Through sex	No	84.8	93.5	8.7
Through kissing	No	31.5	86.9	55.4
By sharing clothing materials	No	88.0	96.7	8.7
Through the air from one person to another	Yes	84.8	98.9	14.1
Through coughing and sneezing	Yes	97.8	98.9	1.1
By drinking bad water	No	83.7	92.4	8.7
By using same toilet with TB patients	No	77.2	88.0	10.8
TB treatment				
TB treatment is free	Yes	77.2	89.1	11.9
DOTS refer to a method of TB treatment	Yes	73.9	92.4	18.5
TB treatment is for 6 months minimum	Yes	54.3	83.7	29.4
TB can be treated by prayers	No	85.9	91.3	5.4
There is an effective local TB treatment	No	81.5	84.8	3.3
TB care and support				
BCG vaccine prevents from severe TB in children	Yes	83.7	94.6	10.9
TB is a preventable disease	Yes	98.9	97.8	1.1
TB cannot kill	No	83.7	81.5	2.2
TB is curable	Yes	93.5	96.7	3.2
Everybody should run away from TB patient	No	96.7	97.8	1.1
TB patients should cover with handkerchief while sneezing/cough	Yes	100.0	100.0	0.0
TB patients should be isolated throughout period of treatment	No	96.7	97.8	1.1

This table described the impact of the workshop on the participants comparing the pre-workshop and post-workshop knowledge acquired through the interactive sessions. TB: Tuberculosis, BCG: Bacillus Calmette Guerin

Table 4: The mean scores of participants pre-and post-educational intervention.

Educational domain	Mean (95% CI)		Mean difference (Standard Error)	P-value
	Pre-workshop	Post-workshop		
Basic TB knowledge	7.7 (7.4–8.0)	9.1 (8.9–9.3)	+1.4 (0.2)	<0.0001
TB symptoms and signs	8.1 (7.8–8.4)	9.6 (9.4–9.8)	+1.5 (0.2)	<0.0001
Risk factors for TB disease	4.1 (3.7–4.5)	7.2 (6.8–7.6)	+3.1 (0.3)	<0.0001
Methods of TB transmission	8.1 (7.8–8.4)	9.2 (9.0–9.5)	+1.2 (0.2)	<0.0001
Treatment of TB	7.6 (7.3–7.9)	8.4 (8.2–8.7)	+0.8 (0.1)	<0.0001
TB care and support	6.7 (6.4–6.9)	7.2 (6.9–7.4)	+0.5 (0.1)	0.0001

This table showed the mean scores with 95% confidence intervals and the mean differences with the standard errors pre-and post-workshop in each of the educational domain explored during the workshop with the levels of significance at 5%. TB: Tuberculosis

the communities,^[23] emanating from cultural beliefs of the people passed down over the decades. The understanding of the cause of a disease can influence care seeking behavior of patients, worsening their symptoms with the development of complications that can negatively affect outcome of treatment and continued transmission of TB in the community.^[21] Our workshop did improve the knowledge of these students on the cause of TB although future, longer follow-up studies will need to determine if this impacts on views held within the wider community.

Participants had poor knowledge about important risk factors for the development of TB disease, most especially comorbidities such as HIV/AIDS and Diabetes mellitus, social habits such as alcohol use, and extremes of age. This might by proxy reflect the poor knowledge in the societies and the need to improve on the knowledge and awareness about these conditions in the general population. It can significantly impact on early expanded screening for TB and prompt initiation of prophylaxis treatment for high risk candidates and full TB treatment for active cases of TB that might find and treat missing TB cases.

Participants demonstrated improved knowledge after the workshop on TB symptoms such as coughing blood and excessive night sweats in addition to other common TB symptoms. The recognition of common symptoms of TB is fundamental to seeking diagnosis opportunities by patients and early treatment initiation and curtail spread of TB.^[9] Our study participants demonstrated better awareness and knowledge on the common symptoms of TB than undergraduate health-care students without clinical experience in Malaysia, who had poor knowledge and awareness about common TB symptoms, cough more than 2 weeks (17% vs. 96.7%) and weight loss (10% vs. 87%).^[24] However, their knowledge level on TB being an airborne disease and prevention of TB spread through covering mouth and nose while coughing and sneezing were comparably high as observed in our study.^[24] The ability to recognize presumed TB symptoms is helpful in TB endemic areas where other infectious disease such as malaria, Coronavirus infection

(COVID-19), and flu-like syndromes could be confused with TB in the society leading to prolonged delay before presentation, diagnosis, and continued transmission of TB.

The mode of transmission of TB was a major area of misconception among our workshop participants. Few participants could correctly identify the appropriate mode of transmission of TB of the chest before the workshop, being airborne disease spread through coughing and sneezing. More than half responded that TB is spread through sharing of eating utensils and kissing. This was improved by the end of the workshop, but misconceptions still existed indicating that this should be a major focus for future studies. Appropriate knowledge about spread of TB can help avoid risky behaviors that might increase chances of spread of TB^[25] while inappropriate knowledge can foster stigma against TB patients in the society and lead to concealment of TB status by patients from neighbors.

The participant's knowledge about prevention of TB, infection control, and curability of TB was high and support findings from a study of Malaysian undergraduate health-care students.^[24] However, lower proportion of the participants was aware of the duration of treatment to be a minimum of 6 months for simple uncomplicated drug sensitive TB before the workshop activities. A similar study conducted in India reported a lower level of awareness (28%) about the duration of TB treatment,^[25] and much lower (12.6%) in another study in a slum community of Delhi, India.^[26] This knowledge gap among our participants was not surprising because studies done in Malawi on both adults and children with TB showed lack of knowledge about the duration of TB treatment.^[21,27] However, poor understanding about the duration of treatment could result into abrupt stoppage of treatment which potentially results in drug-resistant TB and continued spread of TB.

The high level of awareness about TB by the students in some of the domains explored through our workshop activities could reflect their exposure from other sources such as radio, television, social and print media, and friends/neighbors. Another important source could be information transfer to

the participants from the teaching staff of the school that participated in our TB pilot workshop. However, we did not explore sources of TB information during the workshop from the participants. Our study is the first to explore TB disease risk factors among students, using workshop methodology in TB endemic setting to our knowledge.

After the workshop the students and teachers pledged their willingness to take the messages learnt from the workshop to their immediate environment, hopefully influencing health-seeking behaviors of their contacts. However, further studies need to be performed to ascertain how much (if any) information was disseminated. It would also be important to set up social media avenues such as WhatsApp or Facebook groups to ensure accurate dissemination of information.

The school authority has started to engage other students in the school through peer education method, utilizing participants trained at the workshop as peer educators in the school.

Limitations

Due to limited resources and time, we could not conduct a follow-up survey of the longer-term impacts of our workshop on the participants. The generalizability of our findings in the greater Banjul area is limited by the sample size, sampling method, and inability to apply the Cronbach's alpha coefficient calculation for the internal consistency of our adapted questionnaires. However, it provides pilot data for further research into this subject amongst the general populace of The Gambia. We could not delve into the aspects of TB stigma under the structure of this workshop meant to raise awareness about TB in the adolescents. This is meant for further studies in the future among this population.

CONCLUSION

TB awareness workshop in schools as part of TB control in the communities is needful. Advocacy communication and social mobilization strategy deployed in schools to inform students who ultimately shall serve as agent of change, influencing their colleagues at schools and the communities at large. We, therefore, recommend inclusion of TB education in school curriculum starting from the elementary to high schools in TB endemic and high burden countries as it applies in high income settings in Europe.

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managers; and the authority of Methodist Academy school, Parents and Teachers Association of the school, study participants and their families who participated in the workshop project.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Vanaja K, Banu R, Reddy L, Kumar PC, Srinivas C, Rajani T, *et al.* A study on knowledge and awareness about tuberculosis in senior school children in Bangalore, India. *Indian J Tuberc* 2016;63:192-8.
2. World Health Organization. Global Tuberculosis Report. Geneva: World Health Organization; 2020. p. 232.
3. World Health Organization. Global Tuberculosis Report 2019. Geneva: World Health Organization; 2019. p. 1-297.
4. United Nations. Department of International E. World Population Prospects 2017. United States: United Nations; 2017. p. 24.
5. Snow KJ, Cruz AT, Seddon JA, Ferrand RA, Chiang SS, Hughes JA, *et al.* Adolescent tuberculosis. *Lancet Child Adolesc Health* 2018;2:223-8.
6. Sawyer SM, Azzopardi PS, Wickremarathne D, Patton GC. The age of adolescence. *Lancet Child Adolesc Health* 2018;2:223-8.
7. World Health Organization. Global Tuberculosis Report. Geneva: World Health Organization; 2016.
8. Osei E, Akweongo P, Binka F. Factors associated with DELAY in diagnosis among tuberculosis patients in Hohoe Municipality, Ghana. *BMC Public Health* 2015;15:721.
9. Gothankar JS. Tuberculosis awareness program and associated changes in knowledge levels of school students. *Int J Prev Med* 2013;4:153-7.
10. A school-and community-based outbreak of *Mycobacterium tuberculosis* in Northern Italy, 1992-3. The Lodi tuberculosis working group. *Epidemiol Infect* 1994;113:83-93.
11. Ridzon R, Kent JH, Valway S, Weismuller P, Maxwell R, Elcock M, *et al.* Outbreak of drug-resistant tuberculosis with second-

- generation transmission in a high school in California. *J Pediatr* 1997;131:863-8.
12. Hoge CW, Fisher L, Donnell HD Jr., Dodson DR, Tomlinson GV Jr., Breiman RF, *et al.* Risk factors for transmission of *Mycobacterium tuberculosis* in a primary school outbreak: Lack of racial difference in susceptibility to infection. *Am J Epidemiol* 1994;139:520-30.
 13. Quigley C. Investigation of tuberculosis in an adolescent. The outbreak control team. *Commun Dis Rep CDR Rev* 1997;7:R113-6.
 14. Shannon A, Kelly P, Lucey M, Cooney M, Corcoran P, Clancy L. Isoniazid resistant tuberculosis in a school outbreak: The protective effect of BCG. *Eur Respir J* 1991;4:778-82.
 15. Zhang S, Li X, Zhang T, Fan Y, Li Y. The experiences of high school students with pulmonary tuberculosis in China: A qualitative study. *BMC Infect Dis* 2016;16:758.
 16. Mekonnen A, Petros B. Burden of tuberculosis among students in two Ethiopian Universities. *Ethiop Med J* 2016;54:189-96.
 17. World Health Organization STP. Advocacy, Communication and Social Mobilization for TB Control: A Guide to Developing Knowledge, Attitude and Practice Surveys. Geneva: World Health Organization; 2008. p. 1-68.
 18. Chapmar Industries CC. Tuberculosis Training, Educational and Awareness Products; 2016.
 19. TB Alert. Teaching TB in a Game: The Snake and Ladders of TB; 2018.
 20. Zhang S, Li X, Zhang T, Fan Y, Li Y. The experiences of high school students with pulmonary tuberculosis in China: A qualitative study. *BMC Infect Dis* 2016;16:758.
 21. Nyasulu P, Kambale S, Chirwa T, Umanah T, Singini I, Sikwese S, *et al.* Knowledge and perception about tuberculosis among children attending primary school in Ntcheu District, Malawi. *J Multidiscip Healthc* 2016;9:121-31.
 22. Banerjee A, Harries AD, Nyirenda T, Salaniponi FM. Local perceptions of tuberculosis in a rural district in Malawi. *Int J Tuberc Lung Dis* 2000;4:1047-51.
 23. Abebe G, Deribew A, Apers L, Woldemichael K, Shiffa J, Tesfaye M, *et al.* Knowledge, health seeking behavior and perceived stigma towards tuberculosis among tuberculosis suspects in a rural community in southwest Ethiopia. *PLoS One* 2010;5:e13339.
 24. Jamaludin TS, Ismail N, Saidi S. Knowledge, awareness, and perception towards tuberculosis disease among international Islamic University Malaysia Kuantan students. *Enferm Clin* 2019;29 Suppl 2:771-5.
 25. Gopichandran V, Roy P, Sitaram A, Karthick, John K. Impact of a Simple educational intervention on the knowledge and awareness of tuberculosis among high school children in Vellore, India. *Indian J Community Med* 2010;35:174-5.
 26. Singh MM, Bano T, Pagare D, Sharma N, Devi R, Mehra M. Knowledge and attitude towards tuberculosis in a slum community of Delhi. *J Commun Dis* 2002;34:203-14.
 27. Nyirenda M, Sinfield R, Haves S, Molyneux EM, Graham SM. Poor attendance at a child TB contact clinic in Malawi. *Int J Tuberc Lung Dis* 2006;10:585-7.

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