Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

The Effect of Wechat-Based Training on Improving the Village Doctors' Knowledge of Tuberculosis Management: A Pre-And-Post Intervention Study from China

Henan Xin
Chinese Academy of Medical Sciences & Peking Union Medical College Institute of Pathogen Biology
Haoran Zhang
Chinese Academy of Medical Sciences & Peking Union Medical College Institute of Pathogen Biology
Dakuan Wang
CDC of Zhongmu County
Bin Zhang
CDC of Zhongmu County
Xuefang Cao
Chinese Academy of Medical Sciences & Peking Union Medical College Institute of Pathogen Biology
Boxuan Feng
Chinese Academy of Medical Sciences & Peking Union Medical College Institute of Pathogen Biology
Zhusheng Quan
Chinese Academy of Medical Sciences & Peking Union Medical College Institute of Pathogen Biology
Ying Du
Chinese Academy of Medical Sciences & Peking Union Medical College Institute of Pathogen Biology
Yijun He
Chinese Academy of Medical Sciences & Peking Union Medical College Institute of Pathogen Biology
Ling Guan
The Sixth People's Hospital of Zhengzhou
Fei Shen
The Sixth People's Hospital of Zhengzhou
Jianmin Liu
The Sixth People's Hospital of Zhengzhou
Zisen Liu
CDC of Zhongmu County
Shouguo Pan
CDC of Zhongmu County
Qi Jin
Chinese Academy of Medical Sciences & Peking Union Medical College Institute of Pathogen Biology

Lei Gao (gaolei@ipbcams.ac.cn)
Chinese Academy of Medical Sciences & Peking Union Medical College Institute of Pathogen Biology
https://orcid.org/0000-0002-9957-4527

Research Article

Keywords: Tuberculosis management, WeChat-based training, Village doctors, China

Posted Date: January 5th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-138242/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Abstract

Background: In China, village doctors played a crucial role in TB cases referral and management. The current study aimed to evaluate the effect of WeChat-based training program on improving the village doctors' knowledge on TB management.

Methods: A One-year WeChat-based training was conducted by means of releasing original contents (in forms of text, poster, video or cartoon), through WeChat subscription account (WeChat SA) once a week. Pre-and post-training offline tests were hold using the same self-administered questionnaire to evaluate the training effect.

Results: A total of 467 village doctor were included in the study. During the training, sixty original articles were posted through WeChat SA. With respect to the two tests, the median score increased from 50 (40.0-60.0) to 60 (53.0-70.0) ($p<0.001$) after training. The median scores were always higher after training no matter what kind of article contents and forms. In addition, the effectiveness of such training was found to be influenced by gender and education level.

Conclusions: Our results indicated that WeChat-based training could partly improve the knowledge of village doctors on TB management. It is worthy to explore more effective new media-based training methods that might promote TB control work in rural China.

Background

According to the latest Global TB Report released by the World Health Organization (WHO), an estimated 10 million people developed active tuberculosis (TB) in 2018, and 1.45 million died of the disease. TB continues to be a major cause of morbidity and mortality, primarily in low-income and middle-income countries [1]. As the high burden country for both TB and latent tuberculosis infection (LTBI), China contributed nearly 10% of the new TB cases to the world and there were 350 million people living with *Mycobacterium tuberculosis* (MTB) infection [1–2]. In addition, around 71% active TB patients were occurred in rural China where with less developed public health infrastructure [3–4]. There are around 700 million farmers living in China, most of the healthcare works and primary medical services in rural areas were mainly provided by village doctors [5–7]. Therefore, village doctors are main forces responsible for TB management in rural China.

It has been reported that 62.6% of Chinese village doctors had contact with suspected pulmonary TB patients [8]. Although village doctors are front-line healthcare providers in rural areas and play a crucial responsibility in TB case referral and management, their knowledge and awareness on TB control is relatively poor due to lacking sufficient training during work [5, 7, 9]. To improve the village doctors' TB management capability is crucial for strengthening TB control in rural China. For example, improving their capability to early recognize TB-related symptoms and to better trace and manage TB patients have been proved to be helpful for reducing detection delay and irregular treatment [10]. Routine in-service trainings were usually given by teachers or experts through lectures, which were always nonsystematic because of

venue, time and human resource constraint [11]. In recent years, with the development of mobile communication and new media, E-health, a healthcare practice supported by electronic processes came into being. Among them, WeChat is a multi-functional social networking application covering 90% of mobile phones in China [12]. WeChat users could obtain information and browse resources from all kinds of WeChat platforms easily. WeChat-based training combining with synchronous communication, video, picture, and article were widely used because of its feasibility, acceptability and efficacy [13–14]. The current study aimed to explore the effect of WeChat-based training program on improving the knowledge of TB management for village doctors through a pre-and-post study design.

Methods

Study design and participants

A one-year WeChat-based training program was conducted among village doctors of Zhongmu County, Henan Province, which locates in middle China with a national average TB epidemic level. Two offline tests pre-and-post the training were hold to evaluate the effect of the program. All of the village doctors registered in Zhongmu County were included in the study with the following inclusion criteria: licensed doctor worked in the local village clinic or community health center; voluntarily sign the informed consent form and willing to participate in the training and tests during the study duration. Those without mobile phone or WeChat account were excluded.

Demographics survey

For each study participant, socio-demographic information was collected by a standardized questionnaire administered by trained interviewers. The collected information including age, gender, educational level, working year, ever managed TB patients and self-reported history of close contact with TB patients.

Pre-and-post training tests

Two tests were hold before and after the training with a self-administered questionnaire consisting of 30 choice questions (Additional file 1). Each question has five choices. Nine questions were single choice and the rest 21 questions were multiple choice. The village doctors were asked to circle the most appropriate answer independently without receiving any help.

WeChat-based training

The WeChat-based training lasted for one year from Dec, 2018 to Dec, 2019. A WeChat subscription account (WeChat SA) called “TB control commune of village doctors” was used to post training

materials. WeChat SA is a lightweight app on WeChat, which can transmit real-time information to subscribers. In order to ensure all village doctors could access to WeChat SA, all village doctors were taught to subscribe it hand to hand. WeChat SA posted original content, displayed mainly in form of text, once a week with the topics of TB detection, treatment, prevention and patient management. Then a poster summarized the main point of the article would be released later within week. Apart from text and poster, other article types such as video, cartoon and interview were used as well for the need of content expression.

Statistical analysis

The data were double entered in EpiData 3.1 (The EpiData Association, Odense, Denmark). After cleaning, the data were analyzed with SAS 9.4 (SAS Institute Inc., NC, USA) and GraphPad Prism 8 (GraphPad Prism Software Inc., San Diego, California). For each article posted, the amount of reading was recorded. With respect to the pre-and-post-training tests, the 30 questions were divided into four sections according to the contents: seven questions on general knowledge of TB; eight questions on TB detection and treatment; ten questions on TB patients care and management and the rest five questions on general knowledge of LTBI. Each participant will get a score in the two tests. Each question is assigned with corresponding score based on the number of questions of each subgroup and then normalized to 100 points for direct comparison between subgroups. For multiple-choice questions, only choosing all of the correct answers can get the point. Scores were presented as medians (25% quantile-75% quantile) and compared using Wilcoxon matched-pairs signed rank test for same person pre-and-post the training. Kruskal-Wallis tests were used to compare the distribution of scores among different groups. Multivariable linear regression was used to explore the possible factors related with score difference before and after the training. $P < 0.05$ was considered reaching statistical significance.

Results

Demographic information

There were 653 registered village doctors in study site. Among them, 594 village doctors met the inclusion and exclusion criteria and participated in the first test. While for the second test, 127 village doctors quit. The demographic distribution between those who took tests and those who only took first test was showed in additional file 2. Female and those without a history of close contact with TB patients were more likely to refuse the second test. Finally, 467 village doctors were included in the final analyses. As shown in Table 1, most of the subjects were males (342/467, 73.23%) and more than half of them (275/467, 58.86%) aged 40–60 years old. Most of the study participants (340/467, 72.81%) were only with a high school education. As approximately two thirds of village doctors had ever managed TB patients, thus most of them had close contact history. Nearly all of the subjects had subscribed the WeChat SA and 57.01% (248/467) of subscribers would read the WeChat SA once new article was updated.

Table 1
Characteristics of the study population

Variables	N*	%
Total	467	100
Gender		
Male	342	73.23
Female	125	26.77
Age		
≤ 40 years	109	23.34
41–50 years	191	40.90
51–60 years	84	17.99
> 60 years	83	17.77
Marriage status		
Ever married	463	99.14
Never married	4	0.86
Years of education		
≤ 9 years	27	5.78
10–12 years	340	72.81
> 12 years	100	21.41
Income per month		
≤ 2500 RMB	248	53.10
> 2500 RMB	219	46.90
Working years as village doctor		
≤ 25 years	237	50.75
> 25 years	230	49.25
With a history of close contact with TB patients		
Yes	352	75.37
No	115	24.63
Abbreviation: TB, tuberculosis; WeChat SA: WeChat subscription account		
* Sum might not always equal to total due to missing data		

Variables	N*	%
Number of TB patients ever managed		
0	140	29.98
1–5	146	31.26
> 6	181	38.76
Have subscribed the WeChat SA		
Yes	435	95.39
No	21	4.61
The frequency of reading the WeChat SA		
Always	248	57.01
Often	147	33.79
Occasion	40	9.20
Abbreviation: TB, tuberculosis; WeChat SA: WeChat subscription account		
* Sum might not always equal to total due to missing data		

Summary of released original content in WeChat SA

As shown in Table 2, a total of 70 original articles were posted in WeChat SA during the training. Apart form 10 extension articles focusing on HIV/TB, diabetes/TB or non-mycobacteria tuberculosis, the contents of the rest 60 articles were closely connected to the main points on the test paper. The average reading for each article was 144. When further stratified by contents and types, there are 19, 26 and 15 were displayed in the form of text, poster and other types (such as video or cartoon), respectively. The average reading for each article were 245, 38 and 199 respectively with respect to these 3 types. General knowledge of TB was mainly displayed in forms of video and general knowledge of LTBI were displayed in forms of text.

Table 2
Summary of content posted in WeChat SA

Contents related with test	Number of volumes	Average reading
Total	60	144
Classified by article contents and types		
Text	19	245
General knowledge of TB	0	NA
TB detection and treatment	11	216
TB patients care and management	4	143
General knowledge of LTBI	4	428
Poster	26	38
General knowledge of TB	4	38
TB detection and treatment	11	43
TB patients care and management	6	31
General knowledge of LTBI	5	34
Other	15	199
General knowledge of TB	5	212
TB detection and treatment	5	132
TB patients care and management	5	254
General knowledge of LTBI	0	NA

Abbreviation: LTBI: latent tuberculosis infection; TB, tuberculosis; WeChat SA: WeChat subscription account

Subgroup analyses on testing pre-and-post the training

The distribution of scores for each village doctor pre-and-post the training were described using histogram shown in Figure 1. The median score before the training was 50 (40.0-60.0). A remark right shift was observed and the median score after training was 60 (53.0-70.0) ($p<0.001$).

The 30 questions were divided into four sections according to the contents. Significantly increased scores were observed after training for each section as described in Figure 2A ($p<0.001$). For “General knowledge of TB” section, the core knowledge mainly focused on symptoms and mode of transmission, the median score increased from 71.4 (57.1-85.7) to 85.7 (71.4-99.9). For “TB detection and treatment” section, the

core knowledge mainly focused on qualified smear sample for microscopy, common first line anti-TB drugs, regimens and possible adverse events, the median score increased from 50.0 (25.0-62.5) to 62.5 (37.5-75.0). For “TB patients care and management” section, the core knowledge mainly focused on detailed obligation of village doctors on management of TB patients, free policy for TB treatment and detection and location and services provided by local dispensaries, the median score increased from 50.0 (40.0-60.0) to 60.0 (50.0-70.0). For “General knowledge of LTBI” section, the core knowledge mainly focused on the definition of LTBI, Bacillus Calmette - Guerin vaccination and tuberculin skin test, the median score increased from 20.0 (0-60.0) to 40.0 (20.0-60.0).

Among the 30 questions on test paper, apart from one question about which type of facial mask should be chose were not covered by contents in WeChat SA, the core points of the rest 29 questions were all covered by WeChat SA. According to the article types being displayed, the 29 questions were divided into two subgroups: 10 were published in the form of text and the rest 19 were released with combined types (text + other), significantly increased scores were observed after training for both types. (Figure 2B) ($p<0.001$). For core point for training in form of text on WeChat SA, the median score increased from 50.0 (40.0-60.0) to 60.0 (40.0-70.0). For core point for training in combined types on WeChat SA, the median score increased from 52.6 (36.8-63.1) to 63.1 (52.6-73.6).

Potential demographics factors related with score

Further analyses were conducted to describe the distribution of score pre-and-post training among different subgroups (Figure 3). No difference for the scores before the training were found for gender, but after training, female got a higher improvement. Individuals with less working year (≤ 25 years) had higher scores for both tests compared to those with working year > 25 years ($p<0.001$). Greater educational levels were associated with higher scores regardless of training ($p<0.001$). To our surprise, individuals never management of TB patients got higher scores compared with those ever management of TB patients before training ($p=0.01$). Differences in the distribution of education levels might be a confounder as nearly half of individuals who had never management of TB patients had an education level >12 years while the proportion was only 10% for those who had ever management of TB patients. While after training, the difference was no longer significant ($p=0.179$). Multivariable linear regression was used to explore the possible factors related with testing score difference before and after the training. Gender was the only factors related with improved TB knowledge level after training ($p=0.041$).

Discussion

As far as we know, this is the first study to explore the effect of WeChat-based training on improving the knowledge of TB management for village doctors in China. Offline tests before and after the training were hold to evaluate the effect of the training. We found the studied village doctors showed relatively poor knowledge on TB management with a median score of 50 in the pre-training test. To a certain extent, one-year WeChat-based training improved the capability of the village doctors and the median score

increased to 60 after training (p for difference < 0.001). The effectiveness of information transmission by means of the new media was found to be influenced by multiple factors including gender and education level.

As one of the TB high burden countries, China has launched a series of projects to tackle the epidemic. However, there was a huge gap between the official requirements and actual practices [15]. A meta-analysis including 12 studies evaluated the performance of TB control services in China. The summarized results showed that around halves of TB patients were treated by self-administration (52%) and that only 20% actually had their treatment observed by healthcare workers [16]. Another meta-analysis showed that self-administered therapy was associated with lower rates of treatment success, adherence, and sputum smear conversion as well as higher rates of development of drug resistance when compared with directly observed treatment short-course (DOTS). TB treatment outcomes improved when patient education, healthcare provider education, reminders and tracers, or mobile digital technologies were employed [17]. Village doctors are responsible for implementing health education, referring symptomatic TB patients, managing TB patients during treatment, reporting inappropriate discontinuation and side effects occurring under the DOTS strategy [18]. It was reported that village doctors need to manage 0.7 million current TB cases in China. Despite their crucial responsibility in TB management, their knowledge and awareness on TB level is generally lacking. Thus, it was essential to improve their capability through enhancing systematic training.

Although several studies had investigated the awareness of different populations on TB knowledge previously in China, few were conducted in village doctors. A study published in Chinese reported that the awareness rate of TB knowledge improved obviously from 46.8–87.1% for 205 village doctors after training [19]. However, only eight questions were used for testing and evaluation in this study, the core points covered are limited. A cross-sectional study were performed among 1088 medical students using self-administered questionnaire to evaluate their TB knowledge level. Similar to our research, 32 multiple-choice questions were used and each question had five possible answers. The total mean percentage of correct answers for TB knowledge was 44.4% [20]. Another study conducted among medical students as well found only 24.1%, 27.2% and 34.1% of the students had knowledge of TB symptoms of cough/ blood-tinged sputum, their local TB dispensaries and free TB treatment policy, respectively [21]. Although the questions designed in above study were not exactly the same and the rate of awareness could not be compared directly, it still indicated that no matter for village doctors or medical students with higher level of education, their TB knowledge were inadequate, and necessary education are needed to promote TB knowledge and practices in healthcare workers.

It is well known that exposure to health education was significantly associated with increased knowledge. A study from India showed community training including community radio, wall painting and street plays might contribute to increase in knowledge of TB [22]. As has been observed in our study, the median score increased by 20% after one-year WeChat SA-based training. Female doctors got a better improvement after adjusting other covariate such as education level, working year and reading frequency (increased by 20.0% vs 26.4%). Biological, learning ability or memory performance between female and

male might partly result in the difference. In addition, a positive relation was found between education level and the performance of learning. Recruiting medical students with undergraduate or graduate degree to rural areas to be a village doctors might be an important step to fill in the gap. While the fact is, it is difficult to attract new blood to work in rural areas due to identity recognition, career development and low income [8]. Therefore, for most village doctors with lower education level, apart from routine in-service trainings, instant training that had good feasibility and accessibility and was not subjects to venue and time constraint needs to be enhanced. A number of studies had explored the effect of WeChat-based training on others health disorders, such as mental health or chronic cardiovascular and cerebrovascular diseases [13, 23]. Our research took TB as an entry point, which may be a good attempt to provide new insights for further improving rural doctors' knowledge of other infectious diseases.

Several limitations of this study should be kept in mind. First, only a 20% increase in median score was observed in self-controlled testing. Low average reading times might at least partly explain such a limited improvement. The efficacy of such designed training was essentially depended on self-learning willingness. Therefore, how to improve village doctors’ engagement through enriching the article content or controlling article length should be considered in further practice. Second, parts of the village doctors in our study were mainly responsible for general medical care but not disease prevention, thus they might lack interests in the content of this WeChat SA specifically on TB. Expanding WeChat SA among more village doctors especially responsible for disease control might achieve more sound effect. Third, currently, there is no standard testing questionnaires for evaluating the level of TB knowledge for healthcare workers. Most studies using self-designed questionnaire only set two options (Yes/No) for choice question. In our study, the set of multiple choices increased the difficulty of the test. In the future, establishing evaluation method that can be widely used will be important for improving the consistency and generalizability of such studies. Fourth, follow-up bias was inescapable as one fifth of village doctors did not participate in the post-training test, but it might not significantly influence the current results as no difference ($p = 0.244$) was found between them and those included in final analyses.

Conclusions

Our study indicated that TB management knowledge level of village doctors needs to be greatly improved and new media-based training could be an effective tool. Along with the popularity of mobile telecommunication, further studies are needed to explore effective and innovative ways to optimize the training of village doctors.

Abbreviations

WHO, World Health Organization; TB, Tuberculosis; LTBI, Latent Tuberculosis Infection; MTB, Mycobacterium Tuberculosis; WeChat SA, WeChat Subscription Account; DOTS: Observed Treatment Short-Course.

Declarations

Ethics approval and consent to participate:

The study protocol was approved by the ethics committees of the Institute of Pathogen Biology, Chinese Academy of Medical Sciences (IPB-2016-6).

Consent for publication:

Not applicable

Availability of data and materials:

All data generated or analysed during this study are included in this published article [and its supplementary information files].

Competing interests:

All co-authors declare that we have no conflicts of interest.

Funding:

This work was supported by the CAMS Innovation Fund for Medical Sciences [2019-I2M-2-005], the Fundamental Research Funds for the Central Universities [3332018111] and the National Science and Technology Major Project of China [2017ZX10201302-002]. They did not involve in trial design, patient recruitment, data collection, analyses, interpretation or any aspect pertinent to the study.

Authors' contributions:

LG and QJ designed the study. HNX, HRZ, XFC, BXF, ZSQ, YD, YJH were responsible for the contents of WeChat SA and designing the test paper. DKW, LG, FS, and JML were responsible for reviewing the released article. BZ, ZSL and SGP recruited the village doctors and held the two tests. HNX did data management and data analyses. LG and HX wrote the report. All authors contributed to review and revision and have seen and approved the final version of manuscript.

Acknowledgements:

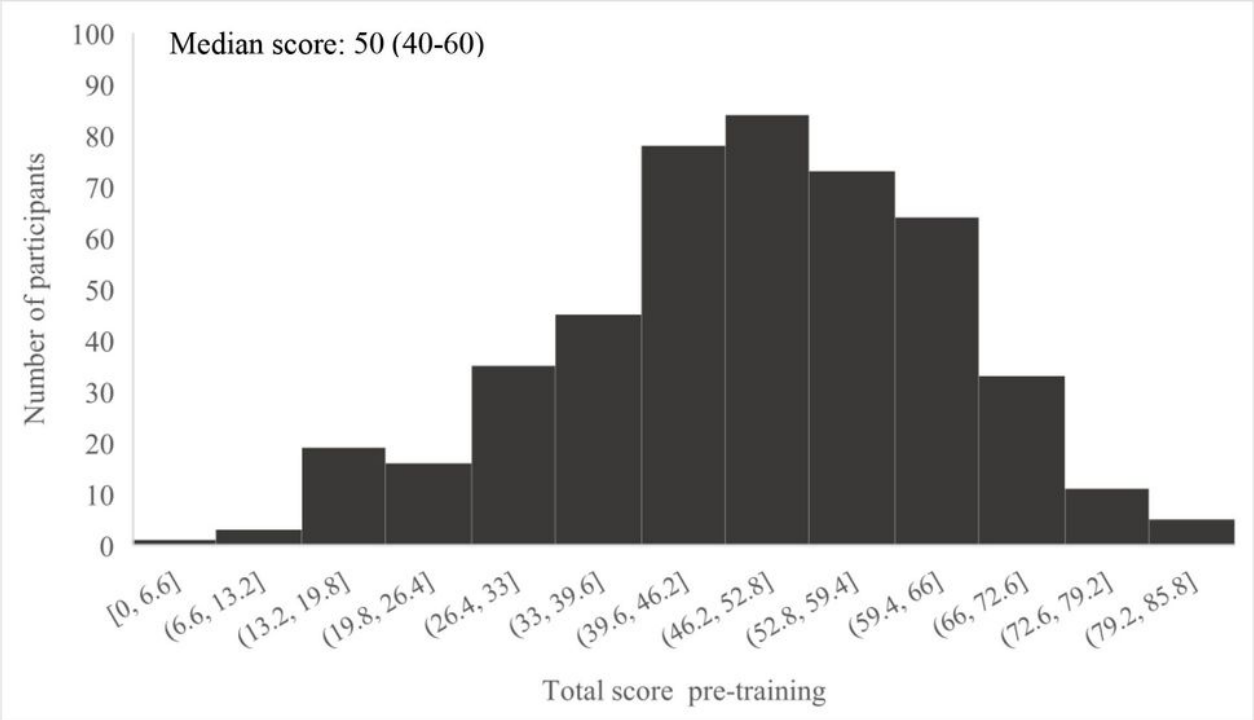
We thank YDG, YXD and XS from Peking University for their contributions on editing the WeChat SA. We thank LYW for her guidance on contents of published article.

References

1. World Health Organization. Global tuberculosis report 2020. https://www.who.int/publications/i/item/9789240013131. Accessed 26 Oct 2020.
2. Houben RM, Dodd PJ. The Global Burden of Latent Tuberculosis Infection: A Re-estimation Using Mathematical Modelling. PLoS Med 2016; 13(10): e1002152
3. Wang L, Liu J, Chin D. Progress in tuberculosis control and the evolving public-health system in China. Lancet 2007; 369: 691-6.
4. Wang L, Zhang H, Ruan Y, Chin DP, Xia Y, Cheng S, Chen M, Zhao Y, Jiang S, Du X, He G, Li J, Wang S, Chen W, Xu C, Huang F, Liu X, Wang Y. Tuberculosis prevalence in China, 1990-2010; a longitudinal analysis of national survey data. Lancet. 2014 Jun 14;383(9934):2057-2064.
5. Ni Q, Xie F, Wu M. The plight of China's village doctors. Lancet 2016; 388(10062): 2869-70.
6. National Technical Steering Group of the Epidemiological Sampling Survey for Tuberculosis. Report on fourth national epidemiological sampling survey of tuberculosis. Chinese Journal Tuberculosis and Respiratory Disease 2002; 25: 3-7. (in Chinese).
7. Hu D, Zhu W, Fu Y, Zhang M, Zhao Y, Hanson K, Martinez-Alvarez M, Liu X. Development of village doctors in China: financial compensation and health system support. Int J Equity Health. 2017 Jul 1;16(1):9.
8. Zhang W, Tian BC, Wang QY. The KAP of TB control and prevention among village doctors in China: a cross-sectional study. Chinese Journal of Health Education 2008; 24: 572-4. (in Chinese).
9. Fang T, Liu YL. Investigation and analysis of rural doctors on tuberculosis prevention and control knowledge in Chongqing. Chongqing Medicine 2011; 40: 2351-3. (in Chinese).
10. Yuen CM, Amanullah F, Dharmadhikari A, Nardell EA, Seddon JA, Vasilyeva I, Zhao Y, Keshavjee S, Becerra MC. Turning off the tap: stopping tuberculosis transmission through active case-finding and prompt effective treatment. Lancet 2015; 386 (10010): 2334-43.
11. Huang W, Long H, Li J, Tao S, Zheng P, Tang S, Abdullah AS. Delivery of public health services by community health workers (CHWs) in primary health care settings in China: a systematic review (1996-2016). Glob Health Res Policy 2018; 3: 18.
12. WeChat user number statistics. Tech Business analysis. http://seonew.cn/yxzj/2016/0407/707.html.
13. Li X, Li T, Chen J, Xie Y, An X, Lv Y, Lin A. A WeChat-Based Self-Management Intervention for Community Middle-Aged and Elderly Adults with Hypertension in Guangzhou, China: A Cluster-Randomized Controlled Trial. Int J Environ Res Public Health 2019; 16(21): 4058.
14. Li Y, Guo Y, Hong YA, Zhu M, Zeng C, Qiao J, Xu Z, Zhang H, Zeng Y, Cai W, Li L, Liu C. Mechanisms and Effects of a WeChat-Based Intervention on Suicide Among People Living With HIV and Depression: Path Model Analysis of a Randomized Controlled Trial. J Med Internet Res 2019; 21(11): e14729.
15. Chen MC. Investigation on the awareness rate of tuberculosis knowledge among the village doctors and cadres. Chin J Dis Control P 2008; 12 (3): 262-4.

16. Ou Y, Luo Z, Mou J, Ming H, Wang X, Yan S, Tan A. Knowledge and determinants regarding tuberculosis among medical students in Hunan, China: a cross-sectional study. BMC Public Health 2018; 18(1): 730.
17. Zhao Y, Ehiri J, Li D, Luo X, Li Y. A survey of TB knowledge among medical students in Southwest China: is the information reaching the target?. BMJ Open 2013; 3(9): e003454.
18. Thapa B, Prasad BM, Chadha SS, Tonsing J. Serial survey shows community intervention may contribute to increase in knowledge of Tuberculosis in 30 districts of India. BMC Public Health 2016; 16 (1): 1155.
19. Guo Y, Hong YA, Cai W, Li L, Hao Y, Qiao J, Xu Z, Zhang H, Zeng C, Liu C, Li Y, Zhu M, Zeng Y, Penedo FJ. Effect of a WeChat-Based Intervention (Run4Love) on Depressive Symptoms Among People Living With HIV in China: A Randomized Controlled Trial. J Med Internet Res 2020; 22(2): e16715.

Figures



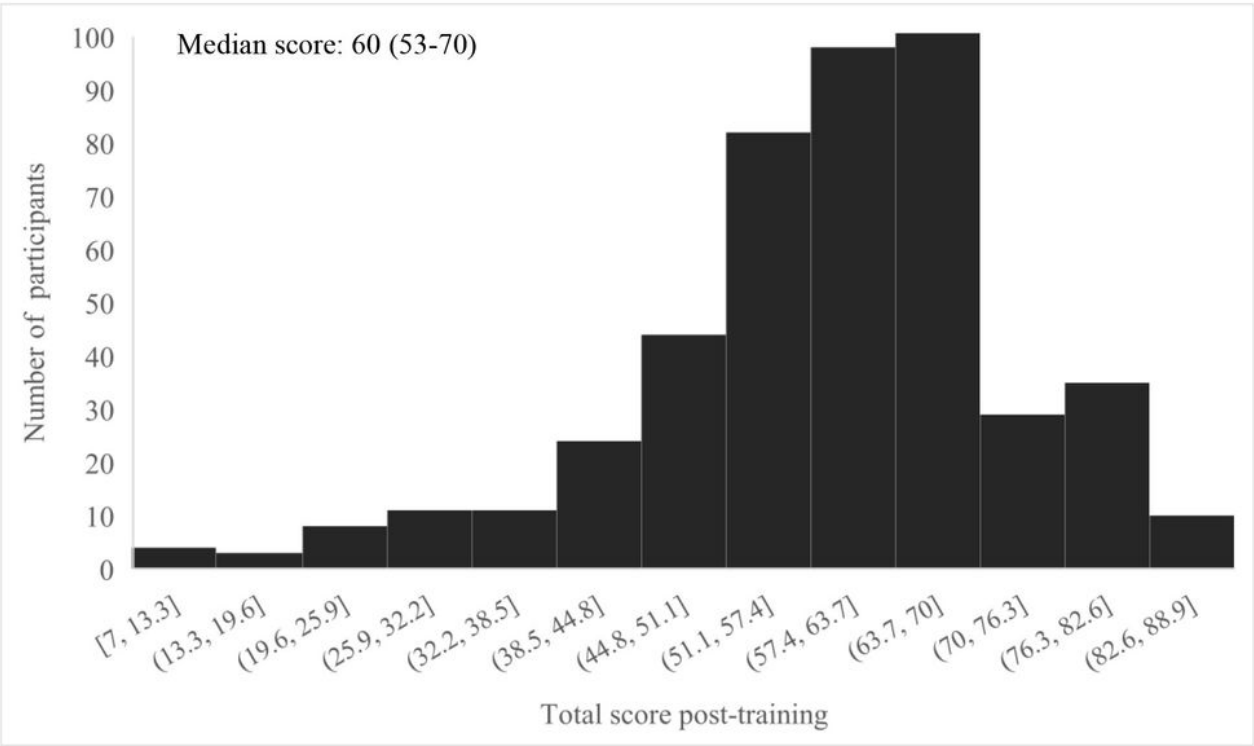
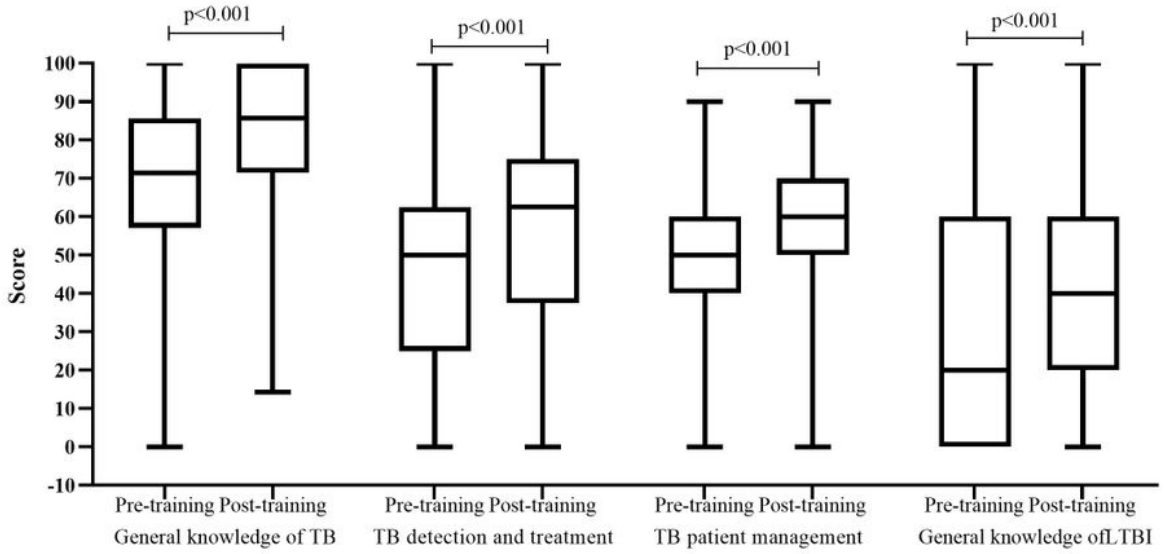
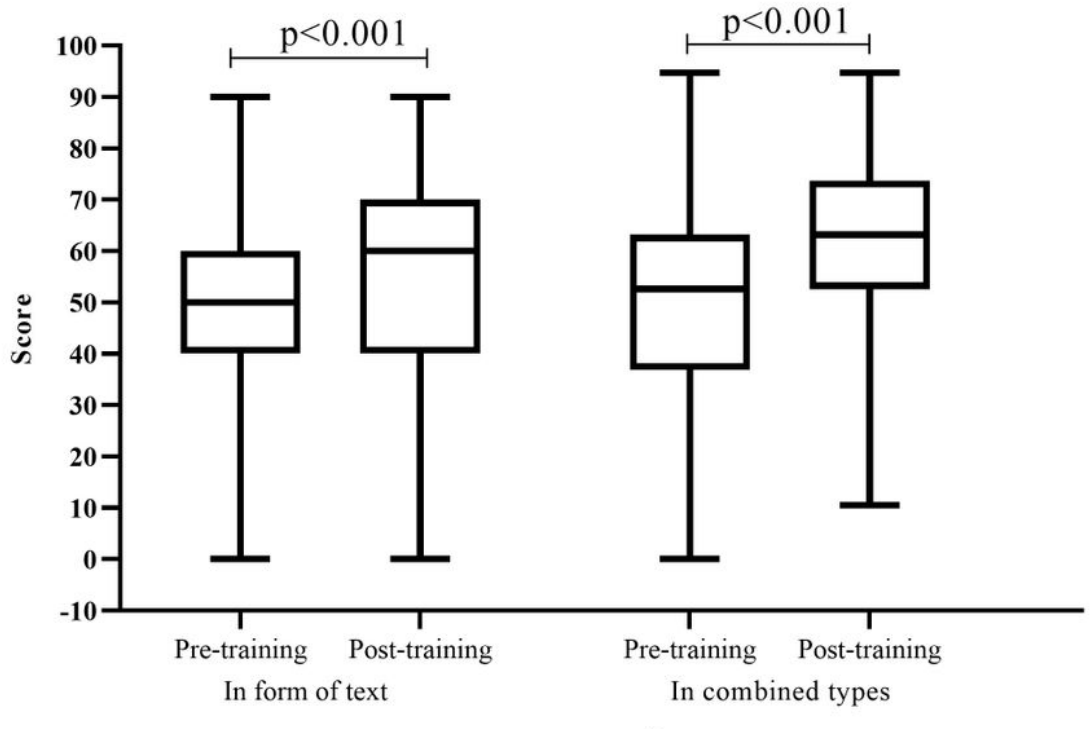


Figure 1

The distribution of score pre-and-post training Histograms were used to describe the distribution of score pre-and-post training. The median score was 50 (40-60) and 60 (53-70) pre-and-post training, a right shift was observed after training.



A



B

Figure 2

Subgroup analyses of the score pre-and-post training classified by content and type The 30 questions were clustered into four sections according to the content each item belong to, significantly increased scores were observed after training for each section as described in Figure 2A. During the training, different types were used to display each theme, apart from text, video, caricature, picture were also used

to attract the readers. The 30 questions were divided into two subgroups according to types (only text and combined types), significantly increased scores were observed after training for both types (Figure 2B).

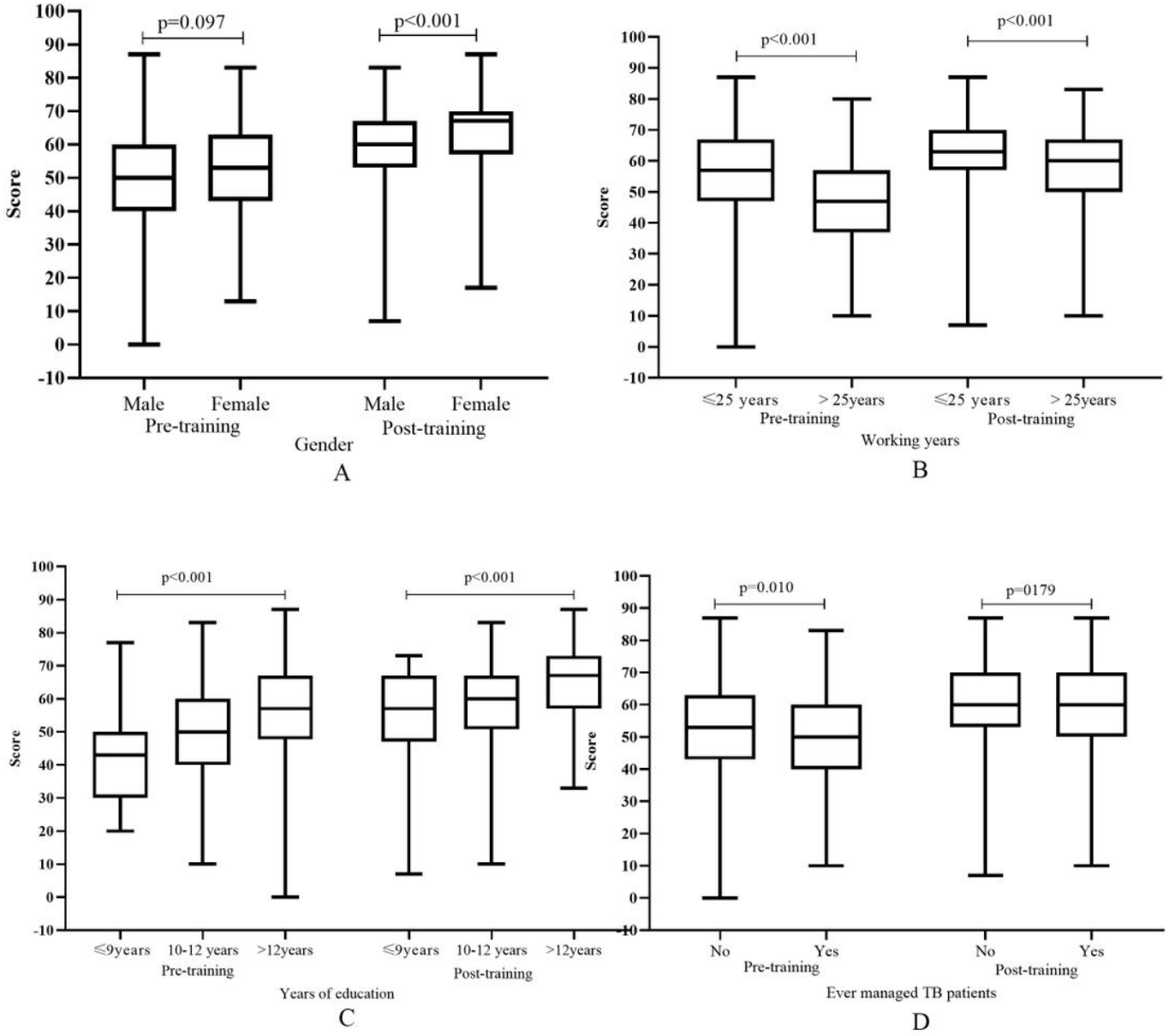


Figure 3

The distribution of score pre-and-post training among different subgroups Village doctors were classified into subgroups by gender (A), working years (B), years of education (C) and ever managed TB patients (D). The distribution of scores pre-and-post training among subgroups were showed in Figure 3. The median scores were always higher after training compared with pre-training for each subgroup.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Additionalfiles.docx