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Community Empowerment through Training and Coaching for Pulmonary Tuberculosis Prevention and Control: A Health Education Intervention Supporting SDG 3

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Abstract: Tuberculosis (TB) remains a complex public health problem, not only because of the medical aspect but also because of the Stigma attached to it in society. Change agents such as cadres and recovered TB patients are crucial in disseminating information and reducing Stigma. Objective: This study aims to assess the effectiveness of training and Coaching in improving the knowledge and attitudes of cadres and recovered TB patients as agents of Change to prevent and control TB and reduce Stigma in the community. Method: The research design used a quasi-experiment with a pretest and post-test. Participants consisted of 20 people (16 recovered TB patients and four health cadres) from Tapian Dolok and Batu Anam villages. Data were analyzed using the Paired t-test. Results: There was a significant increase in the mean knowledge (from 48.00 to 95.50) and attitude (from 52.95 to 92.50) after the intervention, with a p-value of 0.001. All participants experienced an increase in the "good" category in knowledge and attitude after the training. Conclusion: Training and Coaching effectively improve participants' knowledge and attitudes as Agents of Change in preventing and controlling TB and reducing Stigma.

Keywords: Coaching; Education; Health; Training; Tuberculosis

Introduction

Tuberculosis, a significant public health problem worldwide, is among the 10 leading causes of death from a single infectious agent, especially in developing countries (Alema et al., 2019). Tuberculosis remains a public health problem of concern, affecting individuals in low- and middle-income countries (Shamanewadi et al., 2020). The government has taken preventive measures, but there are still many tuberculosis sufferers. This is triggered by a lack of community knowledge, attitudes, and actions about Tuberculosis and how to prevent it (Noer et al., 2021). TB treatment takes a long time and is highly contagious; the role of the family in the care and prevention of household transmission is vital. Various studies have shown a relationship between family support and medication adherence (Kristanti & Sekarwati, 2020; Nurlina, 2020).

The results of the research conducted found a high prevalence of Tuberculosis; negative Stigma is still found; emotional support from the family does not pay attention to their physical condition, support for appreciation for sufferers feeling alienated by their families because of infectious diseases; no one reminds them to take their medication regularly; and informative support: there are health workers providing counseling, but the family is indifferent, sufferers are bored with their illness and feel like they are a burden to their families, and feel less cared for by their families.

According to the Global Tuberculosis Report by WHO, in 2023 there will be around 10.8 million cases of TB in the world, up from 10.4 million in 2021 and 10.7 million in 2022. Although the overall global incidence

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rate is relatively stable, at around 134 cases per 100,000 population, the death rate from TB remains high. In 2023 alone, TB caused around 1.25 million deaths, making it the infectious disease with the highest number of deaths in the world. Indonesia is one of the countries with the highest TB burden in the world. In 2023, there will be around 1.06 million TB cases in Indonesia, with a case notification rate of 804,836. The COVID-19 pandemic caused a drastic decrease in TB case reporting, from 559,847 cases in 2019 to 384,025 cases in 2020. However, this figure began to increase again to 432,577 cases in 2021 and jumped significantly to 708,658 cases in 2022. Despite the increase in reporting and detection achievements, Indonesia still faces challenges in achieving TB elimination, especially in tracking latent cases, treatment compliance, and complete treatment coverage.

In North Sumatra Province, the burden of TB is also relatively high. In 2022, around 43,000 TB cases were recorded, and the cure rate was 90.4%. This figure increased in 2023, with 35,000 cases reported until October and a cure rate of 90.7%. Based on estimates by the Indonesian Ministry of Health, the number of TB cases in North Sumatra in 2024 reached 74,434, making this province the region with the third-highest TB cases in Indonesia after West Java and East Java.

One of the causes of the low coverage of tuberculosis patient detection is the low awareness of patients in undergoing the treatment and healing process. Tuberculosis is also inseparable from socio-cultural factors, especially related to knowledge and attitudes of the local community (Dithung, 2022; Namira, 2022). Knowledge, attitude, and behavior factors significantly influence the health status of individuals and communities and play an important role in determining the success of a disease control program and prevention of transmission, including Tuberculosis (Karame et al., 2024; Wangari et al., 2023). According to the results of Simak's research, people with low knowledge have a risk of contracting tuberculosis 2.5 times more than people with high knowledge. In contrast, those with poor attitudes have a 3.1 times greater chance of contracting it than people with good attitudes (Rahman et al., 2017).

Healthy living behavior of the community is one of the factors that causes someone to get Tuberculosis, socio-economic status, poor nutrition, environment, and healthy living behavior of the community (Agustina & Wahjuni, 2017). Patient behavior towards their disease can be seen from the knowledge, attitude, and actions of the patient towards their disease; if the community's knowledge of a disease is not or has not been known, then the possibility of attitudes and actions towards the risk of transmission of the disease is sometimes ignored (Menga, 2017). There is a correlation between knowledge and TB prevention efforts; the cause of the lack of public knowledge in efforts to prevent TB transmission is the lack of information and education from health workers or cadres related to Tuberculosis, resulting in lack of public knowledge about Tuberculosis (Huddart et al., 2019).

Other factors that can influence a person's attitude include family, influence of friends, personal experience, and information obtained from various sources (Van Toai et al., 2024). That is the level of knowledge and efforts to prevent tuberculosis transmission in family members. This is an important input for family knowledge and prevention of pulmonary Tuberculosis in families (Febriansyah & Rosyid, 2017). Tuberculosis control is more likely to be achieved if the knowledge about tuberculosis increases among health workers who manage high-risk groups (Paleckyte et al., 2021; Marni et al., 2024).

Studies on family empowerment have been widely conducted and are valuable material in this study. Research on empowering families of TB patients that has been conducted generally focuses on increasing knowledge about handling TB cases, family training (caregivers), family assistance and empowerment, and intensive supervision of TB patient treatment. Pratama et al.'s (2019) study was conducted on the general public, TB cadres, and TB patients in Medan City through a research design, namely the mixed method (Pratama et al., 2019).

Zarwita et al. (2019) research was conducted using a qualitative approach by implementing an intervention in the form of an analytical approach to the problem of finding TB sufferers at the Balai Selasa Health Center (Zarwita et al., 2019). Research in India in 2019, through a longitudinal approach, conducted an intervention by measuring knowledge before and after receiving Directly Observed Treatment, Short course in Children and Adults suffering from TB, and Directly Observed Treatment Short course (DOTS) treatment (Bossuroy et al., 2019). Research by Puspitha et al. (2020) on family empowerment in tuberculosis care (Puspitha et al., 2020).

The community and TB patients need to be empowered by providing adequate information about TB and the importance of TB prevention and control efforts so that IEC and community empowerment are needed. Health cadres, namely community members who work voluntarily to help control Tuberculosis, play a vital role in preventing the transmission of pulmonary TB. Community empowerment and mobilization of TB patient networks can increase the need for better TB services and explore other local resources in bringing TB services closer to the community, implementing TB control in various healthcare facilities in the community, and optimizing cost efficiency in the context of limited

infrastructure and human resources (Ministry of Health, 2011).

This is also supported by research by Yani et al. (2019) involving 48 health cadres in Karawang Regency to evaluate the effectiveness of health education about Tuberculosis. The results showed that the average knowledge of cadres increased from 12.56 (before) to 16.88 (after), with the Wilcoxon test showing a significance of p = 0.000. This indicates a very significant increase in knowledge. Health education has been proven effective in increasing cadres' understanding of TB. Cadres play an important role in community education and TB control (Yani et al., 2019). Research result (Ludita et al., 2024) showed an increase in the average score of participants' knowledge before and after training, with the results of the paired t-test showing a significance value of p = 0.000. This indicates a statistically significant increase in knowledge after the training. The study's results Rosya et al. (2024) showed that cadres experienced an increased ability to educate about TB, detect early symptoms, and monitor patients. This intervention also increased community awareness about the importance of regular treatment and TB prevention. Although not accompanied by quantitative data, the narrative results showed positive changes in the behavior of cadres and the community in TB control.

Community participation is very helpful in preventing disease. Conducting education or training programs involving the community for injury prevention provides increased knowledge. Changes in knowledge will also affect a person's actions in their environment. Therefore, it is expected that the involvement of religious communities will be significant as an agency and empowerment.

The novelty of this study lies in its community-empowerment approach that integrates structured training and coaching for two key community actors—people who have recovered from tuberculosis and community health cadres—as agents of change in pulmonary TB prevention and control. Unlike previous studies that mainly focused on patient education, family support, or cadre training separately, this study combines these elements into a collaborative intervention designed not only to improve knowledge and attitudes, but also to reduce TB-related stigma and strengthen community-based prevention practices at the household and village levels. This research is important because Indonesia, particularly North Sumatra, remains a high-TB-burden setting where delayed detection, poor treatment adherence, limited family support, and persistent stigma continue to hinder TB control efforts. By empowering recovered patients and cadres to act as TB ambassadors, this study offers a practical and culturally relevant strategy to expand health education, improve community participation, and support national TB control efforts in line with Sustainable Development Goal 3 (Good Health and Well-Being).

Method

Research Design

This study uses a descriptive design, as if an experiment with a one-group pretest-posttest. In this design, the research subjects were first given initial measurements (pretest) before the intervention was implemented. Next, respondents received an intervention consisting of two days of training and mentoring. After the entire series of interventions was completed, respondents were given a final measurement (posttest) to assess changes resulting from the intervention. This training and mentoring activity aims to form former TB patients who have been declared cured and health cadres as agents of change, which can provide education to the public and play a role in reducing the stigma against TB. The material is delivered through lectures, question-and-answer sessions, and health education practices. This activity also selected a TB ambassador, who is expected to disseminate knowledge and foster positive attitudes in the surrounding environment, especially among the families of TB sufferers. The material provided includes the etiology of TB, TB symptoms, TB treatment, TB prevention, TB examination, medication monitoring, MDR TB and latent TB, TB stigma, the impact of TB stigma, the dangers of TB stigma, efforts to overcome TB stigma, health promotion, health promotion strategies, interpersonal communication, health promotion practices, the duties and responsibilities of change agents, and educational practices for the community to reduce TB stigma. This research has obtained ethical approval from the Research Ethics Committee of the Medan Ministry of Health Polytechnic with the number 01.25/615/Decision/Poltekkes Ministry of Health Medan/2024.

Population and Sample

The population in this study was former TB patients who had been declared cured and health workers in Tapian Dolok and Batu Anam Villages. The sample comprised 1,000 participants: 16 former TB patients who had been declared cured and 4 health cadres. All respondents involved in this study served as training and mentoring participants and were prepared to become agents of change in public education efforts to reduce stigma against TB patients. The involvement of former TB patients and health cadres is expected to strengthen the delivery of health messages, as both have close ties to the community and relevant experience in preventing TB stigma.

Research Instruments

The research instruments used in this study are pretest and posttest questionnaires, designed to assess respondents' condition before and after the intervention, respectively. The questionnaire was administered before training and mentoring to obtain an initial overview of the respondents, then re-administered after the intervention was completed to assess any changes. Furthermore, the intervention was supported by educational media in the form of leaflets, as well as presentation materials delivered via a laptop, PowerPoint, and projector. The use of this media aims to make it easier for respondents to understand the material provided during the training and mentoring process.

Data Analysis

The research data were analysed using SPSS. The analysis was conducted to determine differences in results before and after respondents received the intervention. The statistical test used was the Paired Samples t-test because this study compares pretest and posttest scores within the same group. This test can determine whether the training and mentoring provided influenced changes in respondents after the intervention was implemented.

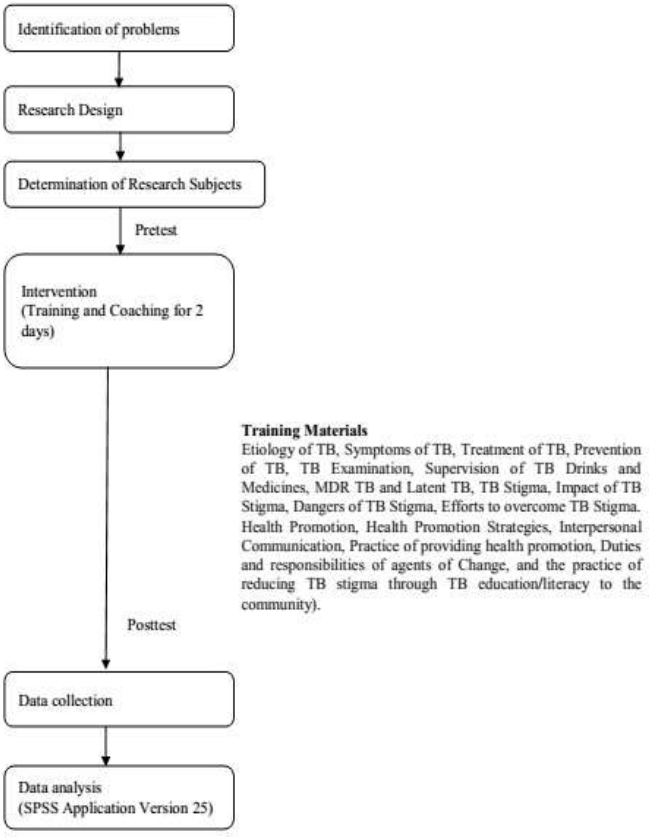

Figure 1. Research flow

Result and Discussion

Result

The characteristics of training participants can be seen in the following table:

Table 1. Characteristics of Participants in Training and Coaching for Prevention and Control of TB and Reducing the Stigma of TB

Variables	n	Percentage (%)
Age		
25-30	5	25
31-36	9	45
37-42	3	15
>43	3	15
Last Education		
SD	3	15
Junior High School	10	50
Senior High School	6	30
College	1	5
Work		
civil servant	1	5
Self-employed	7	35
Extension worker	1	5
Trader	1	5
Farmer	10	50

Table 1 presents the characteristics of participants involved in the training and coaching program for the prevention and control of tuberculosis (TB) and efforts to reduce TB-related stigma. A total of 20 participants took part in th is activity.

Based on age, the largest proportion of participants were in the 31–36 years age group (45%). Participants aged 25–30 years contributed 25%, while those aged 37–42 years made up 15%. Another 15% were participants older than 43 years. This shows that most participants were in the productive age range, which is favorable for adopting and applying TB preventive behaviors.

Regarding educational background, half of the participants (50%) had completed junior high school, which represents the largest educational category. Meanwhile, 30% had senior high school education, 15% had only elementary school, and a small proportion (5%) had completed college. These results suggest that participants generally had low to moderate formal education levels, highlighting the importance of accessible and practical health education approaches.

In terms of occupation, Table 1 shows that the majority of participants worked as farmers (50%), reflecting that the program primarily reached individuals in the agricultural sector. Additionally, 35% were self-employed, while the remainder consisted of civil servants (5%), extension workers (5%), and traders (5%). The predominance of informal-sector occupations

indicates the need for flexible and community-based TB prevention strategies.

Overall, Table 1 illustrates that the training program successfully engaged participants who are in productive age groups, with moderate educational backgrounds and predominantly working in informal and agricultural sectors—groups that are essential targets for community-based TB prevention and stigma reduction efforts.

Table 2. Frequency Distribution of Participants' Knowledge and Attitude Categories (n=20)

Variables	Pre Test		Post Test	
	n	%	n	%
Knowledge				
Good	1	5	20	100
Enough	2	10	0	0
Not enough	17	85	0	0
Attitude				
Good	0	0	20	100
Enough	2	10	0	0
Not enough	18	90	0	0
Amount	20	100	20	100

Table 2 presents the frequency distribution of participants' knowledge and attitude categories before (pre-test) and after (post-test) the training and coaching program on TB prevention, control, and stigma reduction.

For the knowledge variable, the pre-test results indicate that the majority of participants (85%) had insufficient knowledge, while 10% had moderate knowledge, and only 5% demonstrated good knowledge. Following the intervention, there was a substantial improvement, with 100% of participants achieving a good level of knowledge in the post-test. No participants remained in the moderate or insufficient categories. This finding demonstrates that the training effectively enhanced participants' understanding of TB-related topics.

Regarding attitude, pre-test results show that 90% of participants exhibited poor attitudes toward TB prevention and control, and 10% had a moderate attitude, while none displayed a good attitude. After the training, a complete shift occurred, with 100% of participants demonstrating good attitudes in the post-test. No participants remained in the moderate or poor categories.

Overall, Table 2 illustrates a significant improvement in both knowledge and attitudes following the intervention. The training and coaching program proved highly effective in strengthening participants' cognitive and affective competencies related to TB prevention and in promoting positive attitudes toward reducing TB stigma in the community.

Table 3. Distribution of Average Knowledge and Attitudes of Training and Coaching Participants (n=20)

Variables	Mean ± SD	Mean Change ± SD	p-value*
Knowledge			
Before	48.00 ± 11.517	42.50 ± 2.647	0.001
After	95.50 ± 8.870		
Attitude			
Before	52.95 ± 7.258	39.55 ± 3.291	0.001
After	92.50 ± 3.967		

*difference within groups (before and after) using paired t-test, at a significance level of 5%

Table 3 presents the mean scores and standard deviations of participants' knowledge and attitudes before and after the training and coaching program, along with the mean changes and the corresponding p-values obtained from the paired t-test.

For the knowledge variable, participants' mean pre-test score was 48.00 ± 11.517, indicating a relatively low baseline level of understanding regarding TB prevention and stigma reduction. After the intervention, the mean score increased substantially to 95.50 ± 8.870. The mean change in knowledge was –42.50 ± 2.647, and the difference between pre-test and post-test scores was statistically significant ($p = 0.001$), showing that the training had a strong positive impact on participants' knowledge.

Similarly, for the attitude variable, the mean pre-test score was 52.95 ± 7.258, reflecting generally inadequate initial attitudes toward TB prevention and control. Following the intervention, the mean score improved to 92.50 ± 3.967. The mean change in attitude was –39.55 ± 3.291, and this difference was also statistically significant ($p = 0.001$). This indicates that the intervention effectively enhanced participants' attitudes, promoting more positive perceptions and behaviors related to TB prevention and stigma reduction.

Overall, Table 3 demonstrates that the training and coaching program resulted in significant improvements in both knowledge and attitudes among participants. The consistently low p-values highlight the strong effectiveness of the intervention in strengthening participants' cognitive and attitudinal readiness for TB prevention and stigma reduction efforts.

Discussion

Training and Coaching of Participants as Agents of Change aims to provide training to TB Patients who have been declared cured and health cadres who are agents of Change to educate the community and reduce the Stigma of TB in the community. The results of the implementation of training and Coaching showed that

after training Cadres and Patients who had recovered from TB for 2 days, there was an increase in the average value of knowledge by 42.50 points, and attitudes experienced an increase in the average value of 38.55. All training participants had good knowledge and attitudes about training participants as Agents of Change. The results of statistical tests with paired t-test statistics showed a difference in the average knowledge of TB training participants before and after training p-value = 0.001.

The importance of knowledge Agent of Change about TB prevention and transmission. This knowledge can raise community participation as one of the resources for solving TB problems. This will be achieved through the formation of behavior that supports the cessation of transmission, including increasing attention to maintaining personal hygiene and the environment that is a means of TB transmission, as well as increasing efforts to seek TB treatment services. Another behavior that is expected to be possessed by community members to minimize the possibility of TB transmission is not to judge sufferers. A society that is more encouraging of recovery will give a positive response to the desire to seek treatment for TB patients compared to those who place the blame entirely on the sufferer (Addo et al., 2022; Kurniawan et al., 2021).

TB health education is needed as an effort to strengthen the dissemination of accurate information to promote healthy TB knowledge and attitudes (Kandasamy et al., 2024; Kigozi et al., 2017; Xie et al., 2025). This is in line with the research of Andriani and Sukardin, which explains that knowledge is a very important domain in forming a person's actions because good knowledge will form good behavior (Andriani & Sukardin, 2020).

Education is needed to obtain information such as things that support health so that it can improve the quality of life (Amalia et al., 2022; Wedayani et al., 2024; Oktaviani et al., 2024). Something that someone has experienced will increase knowledge about something normal. Experience, in this case, does not always have to be direct personal experience but can be obtained from experience in sensing to do things around him or the experiences of other people who are seen or heard (Faot, 2019). This is by the definition of knowledge (2010), which states that knowledge results from someone knowing an object through their senses. Research results (Ariyatiningsih et al., 2012) Mother's Knowledge of Pulmonary Tuberculosis The majority of mothers' knowledge of Tuberculosis is good, with as many as 56 mothers with a percentage of 80%. Knowledge results from human sensing or someone knowing an object through their senses. Internal and external factors influence this. Internal factors include education, work, and age, while external factors include socio-culture, mass media, and the economy (Notoatmodjo, 2010). Education requires information that can be accessed from various sources, such as books or magazines. In addition, it can also be accessed via the internet as one source of information currently considered quite complete regarding information availability. The more information that mothers get, the more their understanding will increase, so their knowledge about pulmonary Tuberculosis will also increase (Dzunurain & Wasisto, 2022).

This result is supported by Widianti et al. (2024) research, there is a significant relationship between parental knowledge about Tuberculosis in children and compliance in giving anti-tuberculosis drugs to children at the Yogyakarta lung treatment center. In handling the TB program, the role of the TB Ambassador is enormous, not only in terms of case finding but also in treating TB patients who function as PMO (Drug Swallowing Supervisor). Research conducted by Sari shows that there is a significant relationship between knowledge and attitudes toward family support as PMO for TB sufferers. Family support as PMO is essential for the healing process of Pulmonary TB sufferers. This is so that it can improve the implementation of the healing program for Pulmonary TB sufferers (Sari, 2019).

Previous research (Balakrishnan et al., 2021) stated that providing intermittent training to health workers can update their knowledge about TB as part of their important role in health education in TB prevention. This shows that participants' cognitive and psychomotor understanding can be improved through training in explaining/reviewing materials and Q&A and class simulations to be better prepared to carry out educational practices in the field/residents' homes.

Research result Santoso et al. (2023) The importance of TB ambassadors who will provide education to the surrounding community. This will help the role of cadres in controlling TB in the community. TB prevention training activities for adolescents have a significant impact on their knowledge, as shown by an increase in knowledge about TB. After the training, out of 12 participants, 34% were in the good knowledge category, 58% were in the sufficient category, and 8% were in the poor category in the pretest. However, in the post-test results, knowledge in the good category increased by 100%. This training can help overcome challenges when entering the community, such as the Stigma of Pulmonary TB. Therefore, involving adolescents in TB preventive and promotive efforts is a practical approach.

A training method that aims to build and improve team solidity or cohesiveness by forming and supporting team synergy to be able to work independently in achieving training goals and their teams, starting from training needs analysis, training

approach design, training material development, training implementation with a team building approach, and training evaluation.

TB Prevention Ambassadors were formed as Agents of Change at the end of the two-day training. Agent Of Change is formed by peer educators, families, and communities who disseminate health information and reduce Stigma in the community, especially in each village selected as Agent Of Change. EveryAgent of Change has the task of providing education to their respective villages. The education provided results from training activities related to TB Prevention and Control and Reducing Stigma in the community. The hope is that Agents of Change who promote health can break the Stigma in society about TB sufferers and educate the community.

Conclusion

Training and coaching programs for recovered TB patients and health cadres as Agents of Change have proven effective in increasing knowledge and attitudes related to TB prevention and control and reducing Stigma in the community. After the training, there was a significant increase in average knowledge (by 42.5 points) and attitude (by 39.55 points). All participants experienced a shift in the category of knowledge and attitude from "less" or "enough" to "good" after the training. The formation of TB Ambassadors as Agents of Change is expected to sustainably drive education and change community behavior towards TB issues. Suggestion: Based on the characteristics of the participants in this study, most of whom were farmers and had junior high school education, future TB education programs should use simple language, visual-based materials, and practical demonstrations that are easier to understand in low-literacy and agrarian communities. Education sessions should also be scheduled in ways that fit community work patterns, so participation can be maintained. In addition, trained TB ambassadors need periodic follow-up and mentoring to help them consistently deliver TB education and stigma-reduction messages at the household and community levels.

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Author Contributions
ES conceived the study, designed the research methodology, and drafted the manuscript. ESS and MYS contributed to the research design and data analysis. MP and JH assisted in data collection and reviewed the manuscript. All authors read and approved the final manuscript.

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Conflict of Interest
The authors declare that they have no conflict of interest related to the study and its publication.

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